REPORT ON THE DANISH OCEANOGRAPHICAL EXPEDITIONS 1908—10
TO THE MEDITERRANEAN AND ADJACENT SEAS

Vol. II. Biology.

D. 2.

Hyperiidea-Amphipoda

(*Lanceolidæ, Scinidæ, Vibiliidæ, Thaumatopsidæ*)

by

K. Stephensen.

With 32 figures including 202 detail figures and 7 charts in the text.

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CONTENTS

I. INTRODUCTION

1. The Material.

The present work comprises Part II of the *Crustacea*; Part I, including the *Isopoda*, *Tanaidacea*, *Cumacea* and *Amphipoda* (excl. *Hyperiidea*) will be found in Vol. 2, No. 3, D. 1, 1915 and contains naturally almost only bottom forms. Owing to the enormous extent of the material, which in number of individuals exceeds that of all other expeditions together (see separate families) it has been found necessary to divide up the *Hyperiidea* into 2 parts.

The value of the material lies not so much in the contribution of new species, as in its offering so many specimens of those already known, and thus enabling us, at any rate in the main, to elucidate the biology of several species.

The limits of the area investigated in the Atlantic are taken as 50°—30° N and 30° W.

Such a wealth of material naturally invites one to closer consideration of morphological details; this has not, however, here been attempted, as it would involve far too great an extension of the work, and lies, moreover outside the original purpose of the expedition. No attempt has therefore been made to give anything like a monograph on the *Hyperiidea*; the matter has been dealt with exclusively from a biological point of view, and may thus perhaps serve as an attempt at a biological monograph. Morphological characters are as a rule only touched upon where they can be of service in the certain determination of the species, without which, of course, the biological results themselves would be unattainable.

With regard to the order in which the families are taken, I have followed that employed by Bovallius in his works in the *Hyperiidea*, deviating, however, in a single instance from his principle, *viz.* in the case of the *Paraphonimidæ*, which will be relegated to Part. II of the *Hyperiidea*. My reason for this is that a great number of specimens of this family were grouped with the *Phronimidæ*, and I am not certain of having sorted out all the *Paraphronimidæ*.

2. Statistics.

In the absence of any available statistical material, I have worked out tables showing the various stations and hauls there made. These tables comprise only stations from the "Thor" itself, and only from 1908—10, as the Atlantic stations of the "Thor" for the years 1905—06 cannot be utilised for quantitative investigations, owing to the fact that not all the material from those years was preserved.

The hours from 6·01 p. m. to 6·00 a. m. are throughout reckoned as night, and from 6·01 am. to 6·00 pm. as day.

As a rule, hauls made at spots with less than 500 m to bottom are disregarded, these having almost invariably given negative results.

In most cases, hauls made during the day furnished so poor a yield that they must be left out of consideration altogether.

The nets with which *Hyperiidea* were taken are as follows:

Young-fish trawl	200	cm in diam. at opening	(noted as Y. 200)
— —	330	- - — - —	(- - Y. 330)
Ringtrawl	200	- - — - —	(- - C. 200)
—	130	- - — - —	(- - C. 130)
Stramin-net, open, conical,	100	- - — - —	(- - S. 100)
— - -	150	- - — - —	(- - S. 150)
— - -	200	- - — - —	(- - S. 200)

Some of the small species, (especially of the genus *Hyperia*) were, however, taken with a pelagic bag (silk net, open, conical, 100 cm in diam. at opening), noted in the lists as P. 100. Where the net is not noted it is always Y. 200.

Mediterranean, night hauls, depth of the sea > 500 m

M W	Winter, 1908—09	Summer, 1910	total
10—35	15	52	67
50—100	18	17	35
135—250	5	1	6
300—400	11	38	49
500—800	5	8	13
1000—1200	2 } 12	20 } 34	22
1400—1800	4	1	5
2000—	1	5	6
total...	61	142	203

Mediterranean, no. of night hauls, depth of the sea > 500 m

M W	Western Basin	Eastern Basin	total
10—35	43	24	67
50—100	25	10	35
135—250	5	1	6
300—400	39	10	49
500—800	10	3	13
1000—1200	11	11	22
1400—1800	4	1	5
2000—	5	1	6
total...	142	61	203

Mediterranean, no. of hauls, depth of the sea 501—1000 m.

W. B. = Western Basin, E. B. = Eastern Basin, N. = Night, D. = Day.

M. W.	Winter				Summer				Total (W. B. + E. B.)				Total	
	W. B.		E. B.		W. B.		E. B.		Winter		Summer			
	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.
10—35	1	—	3	—	10	1	4	—	4	—	14	1	18	1
50—100	..	..	3	—	3	—	2	—	3	—	5	—	8	—
135—250	..	..	3	—	—	—	—	—	3	—	—	—	3	—
300—400	..	..	2	1	9	2	2	—	2	1	11	2	13	3
500—800	..	..	—	1	3	—	1	—	—	1	4	—	4	1
1000—1200	..	..	—	1	2	1	2	—	—	1	4	1	4	2
1400—1800	1	1	—	—	—	—	—	—	1	1	—	—	1	1
2000—	..	..	—	—	—	—	—	—	—	—	—	—	—	—
total...	2	1	11	3	27	4	11	—	13	4	38	4	51	8

Mediterranean, no. of hauls, depth of the sea > 1000 m.
W. B. = Western Basin, E. B. = Eastern B, N. = Night, D. = Day.

M. W.	Winter				Summer				Total (E. B. + W. B.)				Total	
	W. B.		E. B.		W. B.		E. B.		Winter		Summer			
	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.
10—35	6	1	5	—	24	1	14	2	11	1	38	3	49	4
50—100	11	5	4	2	8	3	4	—	15	7	12	3	27	10
135—250	2	2	—	—	—	1	1	—	2	2	1	1	3	3
300—400	9	7	..	5	19	4	8	3	9	12	27	7	36	19
500—800	5	2	—	1	2	1	2	—	5	3	4	1	9	4
1000—1200	1	2	1	4	8	—	8	1	2	6	16	1	18	7
1400—1800	3	2	—	—	1	—	—	—	3	2	1	—	4	2
2000—	1	2	..	..	4	4	1	2	1	2	5	6	6	8
total...	38	23	10	12	66	14	38	8	48	35	104	22	152	57

In the quantitative tables, the actual results of all hauls have been worked out to the respectively corresponding figures for a normal haul of 30 minutes, hauls being most commonly made with Y. 200 and of 30 min. duration. The size of the implement has not been taken into consideration here, but only the duration of the haul; the yield from a haul of 15 min. duration for instance, being multiplied by 2 to give the value for a normal 30 min. haul. Fractions arising through this method of procedure are approximated to the nearest whole number.

Mediterranean, no. of hauls. (N. = Night, D. = Day.)

Depths of the stations	Winter				Summer						Total no. of hauls, winter and summer. East. + West. Basin		Total no. of hauls, night + day
	West. Basin		East. Basin		West. Basin		East. Basin excl. Dard.		Dardanelles, Sea of Marmora				
	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	
0—250 m	8	7	3	—	15	3	3	3	—	5	29	18	47
251—500 -	—	—	—	—	3	—	6	1	—	—	9	1	10
501—1000 -	11	3	2	1	27	4	10	—	1	—	51	8	59
1001—2000 -	18	7	7	6	25	1	12	2	9	—	71	16	87
2001—3000 -	16	11	1	4	34	12	5	4	—	—	56	31	87
> 3000 -	4	5	2	2	7	1	12	2	—	—	25	10	35
total...	57	33	15	13	111	21	48	12	10	5	241	84	325

3. Biology and General Results.

It is interesting to note, from a zoogeographical point of view, that the "Thor" Expedition has advanced the northern limit a considerable distance further north in the case of several species, in some cases even as far as abt. 60° N. In most instances, however, this will of course not imply that the animals in question are constantly to be found in such high latitudes, but merely that they were there as accidental visitors, carried thither by the ocean currents. It was noted many years back, for instance that some fish were found on the coasts of Norway, though having their habitat much farther south; and we now see that also pelagic Invertebrata can likewise be transported by the current.

As far as I am aware, the first writer to mention this phenomenon was Tattersall, who, in his Amphip. Ireland 1906 p. 4—5, mentions several species of *Hyperiidea* as having been carried northward by a strong north-going Atlantic current in 1905, and the Leader of the "Thor" Expedition, Dr. Johs. Schmidt, has given a detailed report (Distrib. of the pelagic fry and the spawning regions of the Gadoids in the North Atlantic from Iceland to Spain; Rapp. et proc. verb. du conseil internat. explor. de la mer, vol. 10, 1909 p. 158 seq., chart fig. 15) as to the immigration of *Salpæ*, especially *S. fusiformis*, W. and N. of the British Isles in 1905 and 1908, with a chart showing the manner in which the immigration took place during the course of the summer. There can be no doubt that some of the *Hyperiidea* were actually carried by the *Salpæ* in which they live; others must have been carried independently by the currents. Canon A. M. Norman, on the other hand, notes (Transact. Hertfordsh. Nat. Hist. Soc. vol. 14 pt. 1, 1909 p. 26) a number of species which have been carried from the north eastward round the coast of Scotland in the spring; he states that such immigrations took place in 1868, April 1886, Feb. 1892, April 1894, 1898, 1901, 1904, 1906—08, nearly always in Feb. or March, only once in May.

Atlantic, no. of hauls, depth of the sea > 500 m. (N. = Night, D. = Day).

M. W.	N. of 40° N.						S. of 40° N.						Total		Total
	Winter		Summer		Total		Winter		Summer		Total				
	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	N.	D.	
10—35	3	—	2	—	5	—	4	—	6	—	10	—	15	—	15
50—100	3	1	4	—	7	1	6	1	3	1	9	2	16	3	19
135—250	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
300—400	2	1	2	1	4	2	3	2	5	1	8	3	12	5	17
500—800	2	1	—	1	2	2	3	2	—	—	3	2	5	4	9
1000—1200	—	—	1	1	1	1	—	1	4	—	4	1	5	2	7
1400—1800	—	2	—	—	—	2	—	2	—	1	—	3	—	5	5
2000—	—	1	1	—	1	1	1	—	1	—	2	—	3	1	4
total...	10	6	10	3	20	9	17	8	19	3	36	11	56	20	76

Atlantic, no. of hauls. N. = Night, D. = Day.

Depth of the stations	No. of 40° N.		S. of 40° N.		Total		Total of hauls, night + day
	N.	D.	N.	D.	N.	D.	
0—250	5	8	7	7	12	15	27
251—500	4	1	4	1	8	2	10
501—1000	—	1	17	2	17	3	20
1001—2000	2	3	10	8	12	11	23
2001—3000	—	2	—	—	—	2	2
> 3000	18	3	9	1	27	4	31
total...	29	18	47	19	76	37	113

In the case of each family, a brief survey is given of the results furnished by the material, new species are mentioned, etc. A thorough survey of the general results must be postponed to the last part of the *Hyperiidea*, when the entire mass of material has been treated. It would seem, however, that we may already lay down as a general rule, that the Mediterranean has its surface fauna of *Hyperiidea* (from 0—300 m. w., night) common to the Atlantic outside, and especially south of, the Straits of Gibraltar, whereas Atlantic species living essentially deeper down do not penetrate into the Mediterranean, and of the families treated in the present part of the work, none are endemic Mediterranean species. It is also seen that the western Basin of the Mediterranean is richer than the eastern.

In the last part of the work, it is intended to give a comprehensive list of all known families and species in order to show which of the species are found in the area investigated by the "Thor"; a list of works on the subject will also be furnished, as BOVALLIUS' bibliography from 1887—90 is now very far from up to date.

Finally, I wish to express my thanks to all those writers who have kindly sent me works which I was unable to gain access to by other means.

As in my earlier works, an asterisk * is used to denote the most important description — as a rule with figures — of a species or family, or a publication containing a particularly important reference list of other works.

In all measurements of specimens, the length is taken as from the fore-end of the head to the point of the telson, the antennæ being omitted.

II. THE FAMILIES AND SPECIES

Fam. Lanceolidæ Bovallius.

Lanceolidæ Bovallius, Syst. list 1887, p. 5.
— — Monograph pt. 1, 1887, p. 27.
— Stebbing, Amphip. Challenger 1888, p. 1301.
— Woltereck, Bull. Mus. Comp. Zool. Harvard Coll., vol. 52, No. 9, 1909, p. 156.

Of the 3 genera (12 species) of this family, the "Thor" found only the genus *Lanceola,* of which 4 species, 240 spec.

None of the species of this family have ever been taken in the Mediterranean; the "Thor" found all the four species previously known from the area here investigated. The earliest general survey, Bovallius' monograph, of 1887 had 6 species. The "Challenger" (Stebbing 1888) had 8(?) species (3 new), with 8 spec. in all. Chevreux has in the "Hirondelle", 1900, only *L. Sayana,* and only 3 specimens of this. Even more remarkable is the fact that the great German Plankton Expedition (Vosseler 1901) only has the same species and only 2 specimens thereof, despite the large area of the Atlantic embraced by these investigations. Stebbing (Biscayan Plankton 1904) has only 2 species, with 4 specimens in all. Tattersall, however (1906) has 3 species from W. Ireland, the two of them represented by only a few, the third, *L. Sayana,* by nearly 200 specimens; this is therefore the only collection which can be compared with that of the "Thor".

Biology. These species are found at very great depths, 1000 to over 4000 m, and are as a rule very far down during the day, at a depth answering to a length of at least abt. 1500—2000 m w.; by night, however, they may come up so near to the surface as answering to 300 m w.; or in exceptional instances even higher. They are thus rather good deep sea species. *L. Sayana* has in some few cases been taken symbiotically (in *Pelagia*).

This doubtless explains why they are not found in the Mediterranean, as the Atlantic temperature at 1000 m is abt. 5° C, while that of the Mediterranean is abt. 10° higher, at which they evidently cannot live.

It is interesting to note that the species from the "Thor" were only taken in 1905—06, not in 1908—10; nearly all Tattersall's specimens were taken in 1904—05. There can hardly be any doubt that this is due to the strong northgoing Atlantic current, which is mentioned by Dr. Johs. Schmidt as making itself apparent in 1905 by an enormous immigration of *Salpa fusiformis* (Johs. Schmidt, The Distribution of Pelagic fry . . . Gadoids in the North Atlantic. Rapp. et proc. verb. conseil internat. explor. de la mer vol. 10, 1909, p. 159, fig. 15). As far back as 1908, the entire stock of these earlier immigrants must have died out; I can find no other explanation of the fact that the "Thor" altogether failed to encounter the species in 1908—10. It is remarkable, however, that Dr. Schmidt should have noticed the same current in 1908, when no immigration of *Lanceola* seems to have resulted.

Genus Lanceola, Say.

Lanceola Say, Account Crust. of U. S.; Journ. Acad. Nat. Sci. Philadelphia, vol. 1, pt. 2, 1818, p. 317.
— Bovallius, Syst. list 1887, p. 5.
* — — Monograph, pt. 1, 1887, p. 28 (lit.).
— Stebbing, Amphip. Challenger 1888, p. 1301.
— Woltereck, Physosoma-larve d. Lanceoliden (Mitt. Hyper. Valdivia-, Gauss- u. Schwed. Südpolar-exp.); Zool. Anzeiger, vol. 29, 1905—06, p. 416, textfig.
— — l. c. 1909, p. 156 etc.
* — Stebbing, Biscayan Plankton; Transact. Linn. Soc. London, ser. 2, Zool., vol. 10, pt. 2, 1904, p. 29 (key to the species).

1. LANCEOLA SAYANA, Bovall. (fig. 1—3) (Chart 1.)

A. Lanceola Sayana typica.

Lanceola Sayana Bovallius, Some forgotten gen. Amphip. Crust., 1885, p. 7 fig. 1.
* — — Bovallius, Monograph, pt. 1, 1887, p. 30, Pl. 4, Pl. 5 fig. 1.

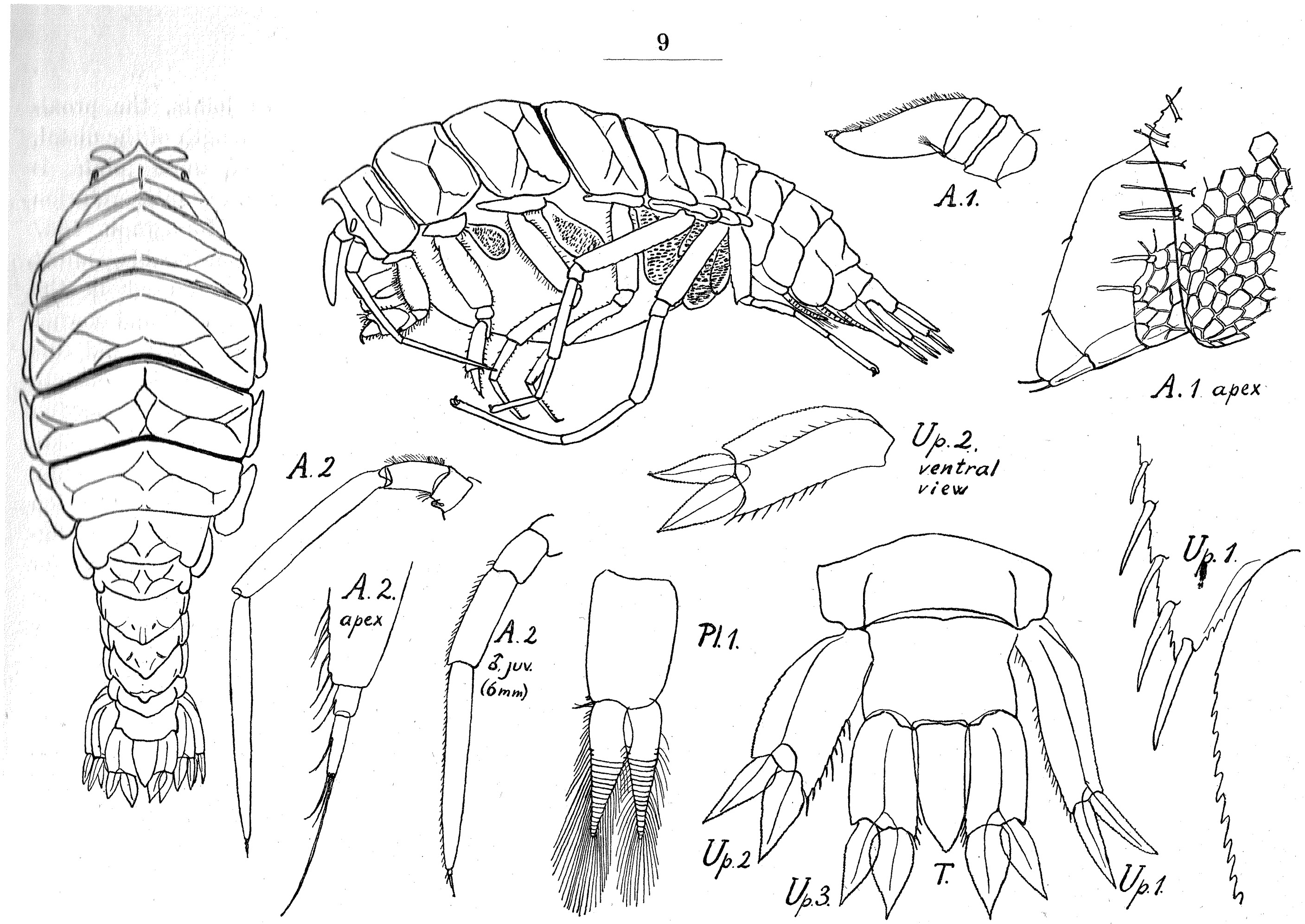

Fig. 1. Lanceola Sayana ♂, 27 mm. St. 178, 1800 m w.

Lanceola Sayana Chevreux, Amphip. Hirondelle 1900, p. 134, Pl. 14 fig. 10 (colour. fig.).

— — *typica* Woltereck, l. c. 1909, p. 158, fig. 17, 18, 19.

? — *pelagica* Say, Account Crust. of U. S.; Journ. Acad. Nat. Sci. Philadelphia, vol. 1, pt. 2, 1818, p. 318.

? — — Bovallius, Monograph, pt. 1, 1887, p. 29 (lit.).

B. Lanceola Sayana var. longipes, Woltereck, l. c. 1909, p. 158, fig. 16, 18 b, 19.

Atlantic.

St. 62. 2480 m. *50°25′N, 12°44′W*. 4-6-1906. 300 m. w. (Y. 330) 9^{55} pm. 120 min. 10 spec. (4♀♀, 6♂♂) 15 mm. each.

St. 62. 1500 m. w. (Y. 330) 120 min. 2^{45} am. 1 spec. 20 mm., 3 spec. (1♀) 13 mm. each, 6 spec. 8—10 mm. each.

St. 72. 2660 m. *48°41′N, 11°30′W*. 8-6-1906. 200 m. w. (Y. 330) 60 min. 10^{15} pm. 2 spec. 17 mm. each.

St. 74. 1245—1298 m. *49°23′N, 12°13′W*. 10-6-1906. 2000 m. w. (Y. 330) 6^{35} am. 60 min. 5 spec. (♀♀) 14 mm. each, 4 spec. (2♀♀)) 12 mm. each, 31 spec. 10 mm. each, 3 spec. 6 mm. each.

St. 76. > 2600 m. *49°27′N, 13°33′W*. 12-6-1906. 100 m. w. (Y. 330) 0^{20} am. 120 min. 1 ♀ 24 mm., 3 spec. (1♀) 18-20 mm., 2 spec. 14 mm. each.

St. 76. 2800 m. w. (Dredge) 9^{45} pm. 30 min. 1 spec. 19 mm., 1 spec. 18 mm., 1 spec. 17 mm., 3 spec. 15—16 mm. each, 8 spec. 12—13 mm. each, 20 spec. (1 ♀) 10—11 mm. each, 40 spec. 5—8 mm. each.

St. 91. 1500—900 m. *47°13′N, 6°12′W*. 22-6-1905. 500 m. w. (Y. 330) 4^{30} pm. 120 min. 3 spec. (1 ♀), 10—12 mm.

St. 93. 1270—1310 m. *49°25′N, 12°20′W*. 25-6-1905. (Y. 330) 200 m. w. 1^{15} am. 120 min. 15 spec. (7 ♀♀, 8 ♂♂), 17—24 mm. each.

St. 178. 4000 m. *48°04′N, 12°40′W*. 2-9-1906. 1000 m. w. (Y. 330) 7^{05} am. 60 min. 1 ♀, 36 mm.

St. 178. 1800 m. w. (Y. 330) 9^{05} am. 120 min. 2 spec., 27 mm. each.

St. 179. 4000 m. *47°20′N, 12°23′W*. 3-9-1906. 600 m. w. (Y. 330) 0^{00} am. 120 min. 1 spec., 25 mm.

St. 179. 1800 m. w. (Y. 330) 3^{40} am. 120 min. 1 spec. 30 mm., 1 spec. 24 mm., 1 spec. 23 mm., 1 ♀ 15 mm.

St. 180. 4000 m. *48°19′N, 13°53′W*. 3-9-1906. 300 m. w. (Y. 330) 9^{00} pm. 60 min. 1 spec. 27 mm., 1 spec. 23 mm., 1 spec. 22 mm., 1 spec. 18 mm.

St. 181. 1350 m. *49°22′N, 12°52′W*. 4-9-1906. 300 m w. (Y. 330) 7^{50} am. 60 min. 1 spec. 22 mm.

St. 181. 1800 m. w. (Y. 330) 10^{35} am. 60 min. 1 spec. 28 mm.

St. 190. 4000 m. *46°30′N, 7°00′W*. 11-9-1906. 2700 m. w. (Y. 330) 150 min. 8^{25} am. 1 spec. 24 mm.

Where nothing is stated as to sex, the specimens are ♂. None of the ♀♀ seemed to be mature; the marsu-

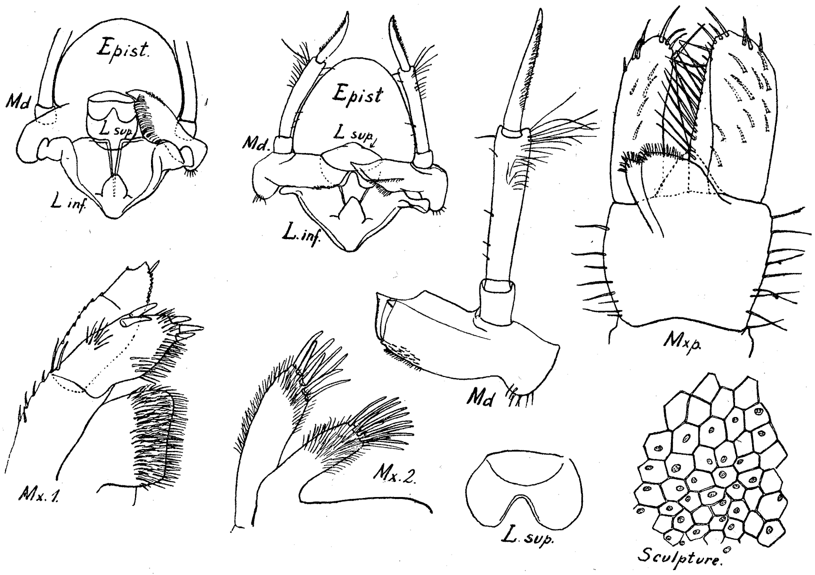

Fig. 2. Lanceola Sayana ♂.

pial plates in all of them were small, and none had marginal bristles such as shown by Bovallius in *L. serrata* (l. c. 1887 Pl. 5 fig. 11).

All the specimens from the "Thor" belong to the subspecies *L. Sayana typica* Woltereck. The only extant complete description is that in Bovallius l. c. 1887, but as Bovallius' drawings are inadequate and partly schematic, I have found it best to give entirely new figures of the whole animal, as also for all limbs in order to show the great similarity between this species and *L. pacifica* Stebbing (*vide infra*).

In Bovallius' figure of the whole animal (l. c. 1887 Pl. 4 fig. 2) the body-sculpture is too regular; the true sculpture will be seen from my figures in lateral and in dorsal view; more over, the ventral portion is in most of my specimens far more inflated than shown by Bovallius, and the eyes are somewhat larger. Viewed through a strong lens, the skin is seen to be covered with a raised reticulate pattern in more or less hexagonal mesh (shown in a detail figure of the sculpture and of the apex of ant. 1); these hexagonal meshes must be cells in the epidermis, a nucleus being visible in most of them (the nucleus not shown in the figure of ant. 1 apex).

The apex of ant. 1 is very difficult to understand, and I am not altogether certain that I have made it out correctly; at any rate, however, neither Bovallius'figure (l. c. 1887, Pl. 4 fig. 5) nor that of Woltereck (l. c. 1909, Pl. 6 fig. 19) is correct. The point appears to be divided into two joints, the proximal abt. 3—4 times the length of the distal. The ventral margin of these joints is thickened, and Bovallius' interpretation of this part (see his Monograph 1887 Pl. 4 fig. 5) is thus pardonable, albeit hardly true. Particularly marked is the thickening of the ventral proximal corner in the first of these two joints, and this part exhibits the abovementioned reticulate sculpture, whereas the remaining portion of the two joints is composed of a plate altogether devoid of sculpture. In young specimens, ant. 2 is thicker in proportion than in older individuals. Bovallius' figures of the oral parts are correct, save for the fact that what he shows as labrum superior (l. c. 1887, Pl. 5 fig. 8) is in reality labrum inferior. Labrum superior consists of an anterior, almost circular portion and a posterior, nearly regularly cleft portion. The labrum inferior will be seen in my figures of the oral area. A lobe extends on either side, fixed to the lower margin of the mandibles; Stebbing's figure of the mandibles in *L. pacifica* (Challenger Amphip. Pl. 151) where general features are otherwise exactly as in the present species, shows this lobe attached to the mandibles as if forming a part of these, but by dissecting several specimens I was able to discover the true state of the case. The mandibles are almost immobile, being fixed not only at the proximal end, but also throughout almost the whole of the upper edge; on the side turning inward towards the mouth there

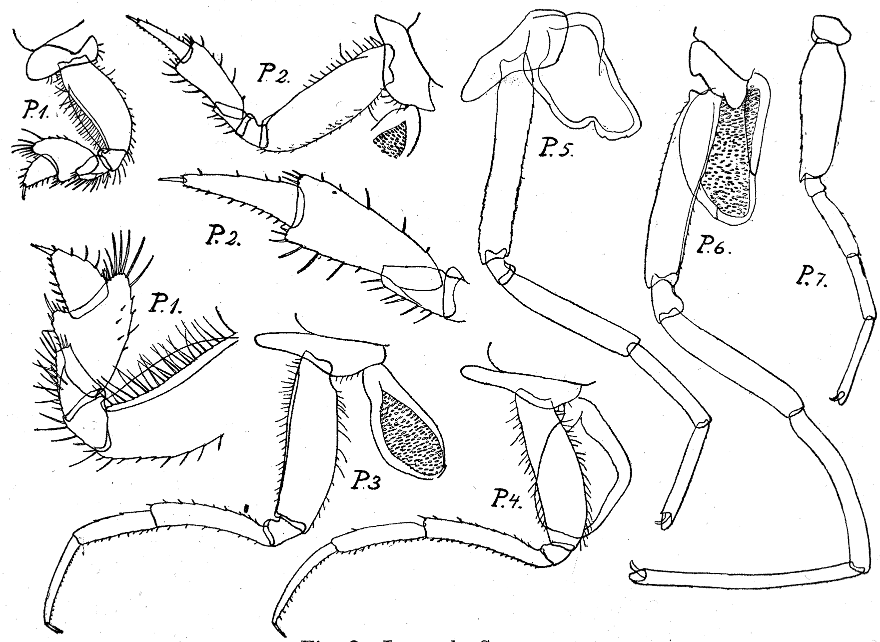

Fig. 3. Lanceola Sayana ♂.

is a setose longitudinal carina (Bovallius l. c. 1887, Pl. 4 fig. 9).

Bovallius' figure of the epimeral plates on the pereiopoda (l. c. 1887, Pl. 4 fig. 1) are too highly schematized (see my figures) and in none of my specimens do these limbs touch. The pleopoda are attached in pairs with spines of exactly the same shape as those shown by Stebbing in *L. pacifica* (Challenger Amphip. Pl. 152). All three pairs of uropoda have on the underside a carina furnished with bristles, so that both pedunculus and inner and outer ramus are triangular in transverse section.

For similarity to *L. pacifica* Stebbing see under this species.

Biology. This species was taken by the "Thor" only during the months of June 1905 and 1906 and Sept. 1906, in all 178 spec. and only north of 40° N. All the localities are situated off the S.W. of Ireland save two (in the Bay of Biscay) (Chart I). For negative stations see above, under Fam. Lanceolidæ.

The depths at stations where the hauls were made are as follows:

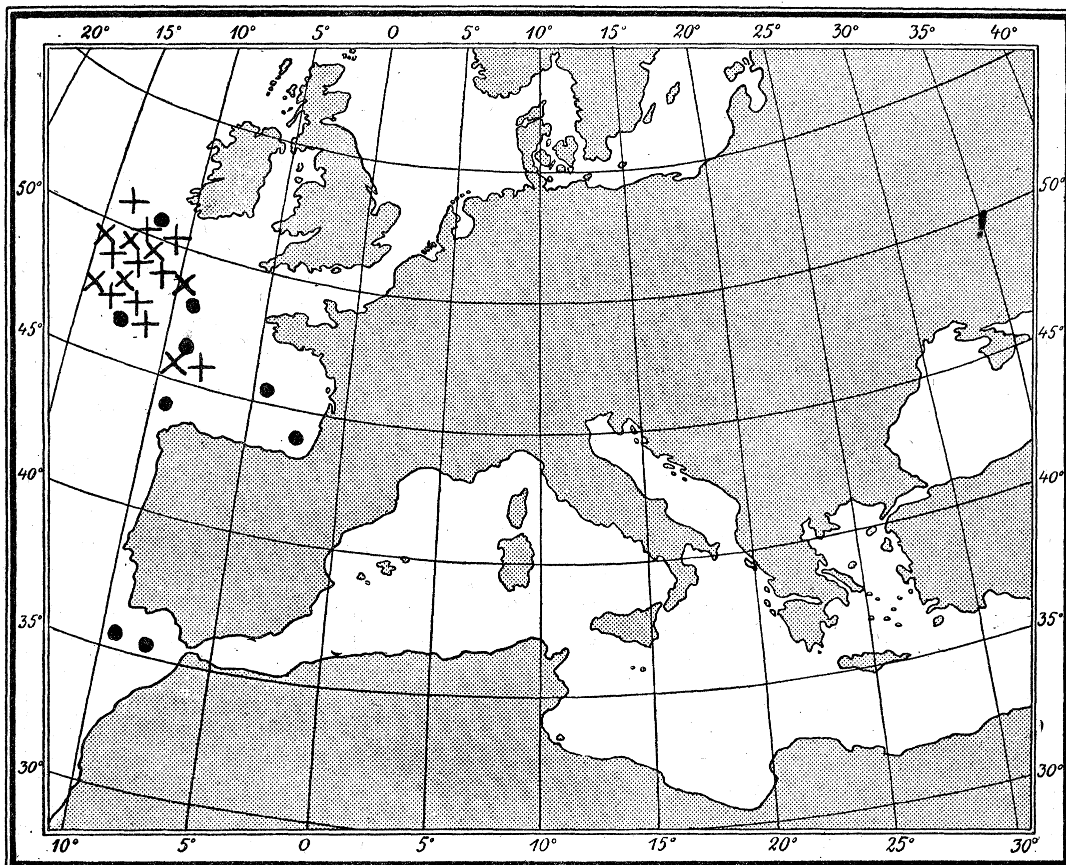

Chart 1. Lanceola.
+ Lanceola æstiva. × Lanceola Sayana. ● Lanceola pacifica var. robusta.

Depths in m	No. of stations	No. of hauls	No. of specimens
0—1000	0	0	0
1001—2000	4	5	63
2001—3000	3	5	102
3001—4000	4	6	13
Total	11	16	178

It will thus be seen that the species was taken at depths from 1000—4000 m, especially between 2001—3000 m, only a very few between 3001—4000 m.

Vertical occurrence. During the night, the species was taken at nearly all depths between 100 and 2800 m. w.; by day, however, it does not go so near the surface, not having been taken with less than 300 m. w. Otherwise, the vertical distribution is the same as at night.

The maximal distribution lies at a depth answering to 2000—2800 m. w.; at any rate, the greatest depth within this range (St. 76, 1906) gave no fewer than 74

m w.	Night		Day		On the whole	
	hauls	spec.	hauls	spec.	hauls	spec.
100	1	6	..	..	1	6
200	2	17	..	..	2	17
300	2	14	1	1	3	15
500—600	1	1	1	3	1	4
1000	..	..	1	1	1	1
1500	1	10	..	..	1	10
1800—2000	1	4	3	46	4	50
2700—2800	1	74	1	1	2	75
Total	9	126	7	52	16	178

specimens, or almost half the total number (178) taken by the "Thor". This also agrees with TATTERSALL's statement (Amphip. Ireland 1906) as to its having been taken with the Petersen trawl at 1150 fath. (depth 1200 fath), 110 spec., no time stated; and with the Petersen trawl at 750 fath. (depth 860 fath.) 50 spec. The "Thor" has also, by the way, taken 43 spec. with 2000 m. w. (St. 74 1906). At all other stations, both those of the "Thor" and those mentioned by TATTERSALL (l. c.) only a few specimens were taken, 15 at the outside, even when using the large young fish trawl (Y 330) for up to 120 min. TATTERSALL (l. c.) mentions several specimens as taken at the surface (but without noting whether night or day) and the same applies to three individuals taken by CHEVREUX (Hirondelle 1900) which, strangely enough, were taken during the day; these were, however, under *Pelagia*. That the species may not altogether infrequently occur close to the surface seems evident from the fact that we have in our Zoological Museum 9 specimens (+ two taken from the stomach of an Albacore) from earlier times (mentioned below under Distribution); true, there is here nothing stated as to depth, but from the date at which they were found (1843—66) they must doubtless have been taken near the surface.

Despite the fact that the peculiar posterior pereiopoda in this genus suggest semi-parasitic or at least symbiotic life, there is, as far as I am aware, nothing on record as to this save the taking of 2 of CHEVREUX' specimens (Hirondelle 1900) under *Pelagia*.

For vertical distribution of the individuals according to size, *vide infra*.

Propagation and growth. The largest (36 mm) is a ♀, otherwise ♂ and ♀ appear to be of about the same size, though ♀ may at times be larger than the ♂. The size most frequently occurring is 10 mm. (nearly 25 % of all specimens). This agrees with what TATTERSALL states (l. c. 1906): "this species has proved to be rather abundant on the west coast of Ireland in the young state, though large specimens are rare". TATTERSALL's largest specimen is a ♀, 38 mm.

The time of propagation I have been unable to ascertain, nor have I found anything regarding this in other works. As far as I can see from the literature no females with ova have ever been taken. In the Zoological Museum at Copenhagen, most of BOVALLIUS' types and cotypes are preserved (with regard to these see under Geographical distribution). I have also been through these, without arriving at any result as regards the point in question. All that I have been able to find in extant literature is a remark of CHEVREUX (Hirondelle 1900) to the effect that the three ♀ mentioned by him (l. c.), 28—30 mm. had ova ("les oeufs, en quantité considérable, forment une masse volumineuse d'un rouge brun, et communiquent cette teinte á l'ensemble du mésosome") but, though CHEVREUX does not expressly say so, it is nevertheless clearly evident from his figure that the eggs were not "laid", but still contained in the ovary. His specimens were taken on the 9th July (4.50 pm.), 17th July (hour?) and 22th July (10.00 am.) Of all the specimens to which I have had access, only one, the large ♀ 36 mm. from the "Thor" St. 178, 2-9-1906, had eggs in the ovary; they are quite small, abt. 0.25 mm. diam. It would seem reasonable to suppose that this species, like the others of the genus, carries its eggs in the marsupium, as other species of the same genus have been found with large marsupial plates having marginal setæ (but probably not with eggs); no such specimens are known, however, in the case of the present species, only specimens with quite small marsupial plates having been found. Even in the largest specimen from St. 178, they are still quite undeveloped; at p. 2 they are slightly smaller than the gill, at p. 3 comparatively somewhat smaller, but of similar shape; at p. 4—p. 6 quite short and very narrow, and specimens with more developed marsupial plates appear, as above indicated, hardly to be known.

On arranging the specimens according to size and length of wire, we obtain the result shown in the accompanying table, where day and night are kept separate.

Vertical distribution; specimens arranged in order of size. N = Night, D = Day.

Size in mm	100 m w.		200 m w.		300 m w.		500—600 m w.		1000 m w.		1500 m w.		1800—2000 m w.		2700—2800 m w.		Total no. of specimens	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
36 mm	..	..	..	..	..	..	..	..	—	1	..	..	..	..	..	..	—	1
26—30	..	..	..	..	1	—	..	..	..	..	..	..	1	3	..	..	2	3
21—25	1	—	..	..	2	1	1	—	..	..	..	..	2	—	—	1	6	2
16—20	3	—	9	—	1	—	—	—	..	..	1	—	..	..	4	—	18	—
11—15	2	—	8	—	10	—	—	1	..	..	3	—	1	9	20	—	44	10
5—10	..	..	..	..	..	..	..	2	..	..	6	—	—	34	50	—	56	36
Total	6	—	17	—	14	1	1	3	—	1	10	—	4	46	74	1	126	52

Here, unfortunately, as in all other cases where dealing with the collections made by the "Thor" in 1905—06, it must be borne in mind that not all the material was preserved, and we cannot therefore entirely trust to the results arrived at; it would seem, however, that the small ($<$ 11 mm.) specimens are as a rule only found very deep down, (27—2800 m. w.) while the larger ones may be found scattered through all water layers, especially at great depths ($>$ 1800 m. w.) though not so deep as the smaller ones.

Taking all extant records in conjunction with the material from the "Thor", the life-history of the species would appear to be as follows: The small individuals, ($<$ 11 mm.) keep almost entirely to very great depths, ($>$ 2000 m. w.); little by little they move higher up, at any rate during the night, and the adult or nearly adult specimens may occur very close to the surface (100 m. w.) or even at the surface itself. They can also relinquish their free-swimming life and attach themselves to *Medusæ* (*Pelagia*). The fact that only so few specimens (two only) were taken in *Medusæ*, is easily explainable as due to their swimming out when captured, after which it would be very difficult to determine whence they had come. The presumption that the small stages, in contrast to the large, live freely, is also supported by the fact that the small ones are found in far greater numbers in each haul; truly pelagic animals can of course occur here in greater numbers than such as live symbiotically in other (larger) pelagic forms.

Small specimens (5—15 mm.) have only been found in June, whereas individuals over 24 mm. do not occur in this that month. (The same will be seen from TATTERSALL l. c. 1906). In September, on the other hand, specimens of less than 22 mm. are only rarely found, while the size may reach 36 mm. The fact however that even the largest ♀ (36 mm.) has no setæ on the margin of the marsupial plates, is very remarkable, since there are small eggs in the ovary; this last seems nevertheless to suggest that the laying cannot be far off. The time of year in the case of this specimen agrees more or less with the specimens with ova found by CHEVREUX (9—22th July). The time for laying the eggs must thus probably occur later in the year, presumably in the last months of the year, and as neither females with ova in the marsupium nor young stages below 5 mm. were taken by the "Thor", it is likely that the species propagates outside the area here investigated. The smallest specimens taken would then probably be about half a year old, and as no year' classes can be set up, we may say that maturity in all probability sets in when the individuals are about 1 year old. If this should be the case, then all the specimens from the south-west of Ireland would have been spawned in the Atlantic, and since immigrated to the Irish waters.

Distribution (of *L. Sayana typica*): As seen from the above, all the specimens taken by the "Thor" are from the great deep SW of Ireland, except St. 91 and 191, in the Bay of Biscay. In the Mediterranean, no specimens were taken by the „Thor", nor has this species ever been encountered there by other expeditions. The material from the "Thor" thus affords, as will be seen from the following, no extension of our knowledge as to the geographical distribution of the species.

BOVALLIUS records it (Monograph) from the North and South Atlantic, without precise statement as to locality: The Zoological Museum in Copenhagen possesses a considerable number of the specimens used by BOVALLIUS, and I have gone through them all. Most are from SW Ireland. (*49^1/$_2$° N, 11^3/$_4$°W*, S. FRIIS, 1 ♂ 34 mm; *47° N, 7°30′ W*, Kapt. GRØNSUND, 1863, 1 ♂ 23 mm, 1 ♀ 17 mm; *46°N, 20° W*, from the stomach of an Albacore (*Orcynnus germo*) HYGOM 1860, 1 ♂ 12 m, 1 spec. defective (♀? 30 mm?); *46° N. 18° W*, HYGOM 1856, 1 ♂, 30 mm). Some are from the adjacent parts of the Atlantic (*50°N, 24°16′W*, ANDRÉA 1866, 1 ♂ 26 mm; *41°N 33°W*, HYGOM 1856, 1 ♂ 25 mm, 1 ♀ 25 mm).

Far more interesting are two other specimens from BOVALLIUS' material, these serving to extend our knowledge of the distribution very considerably. One of them was taken at the mouth of Davis Straits (Insp. MØLLER 1843, 1♀ 23 mm.) so that the species can now with certainty be noted for Greenland (mentioned with a query in my Greenland Conspectus 1913, p. 94); the other is from W of Cape Colony (32°30′S, 15°E. ANDRÉA 1862, 1 ♀ 20 mm.).

The remaining information furnished by extant works as to distribution is given below. The specimen which I have myself noted with a query as from W Greenland in the "Tjalfe" Expedition (Vid. Medd. Naturh. Foren. Copenhagen vol. 64, 1912 (1913) p. 82) seems on renewed investigation hardly to belong to this species, but is probably a badly preserved specimen of *L. serrata*, differing, however, from BOVALLIUS' description of *L. serrata* in having the telson, as in *L. Sayana*, slightly longer, not a little shorter than the peduncle of urop. 3. VOSSELER, in his Plankton Exped., notes the species with a query from the Irminger-Sea, 0—600 m. "Porcupine" 1869, St. 22, *56°8′ N, 13°34′ W*; south of Rockall (NORMAN, Ann. Mag. Nat. Hist., ser. 7, vol. 5, 1900, p. 135). 6 stations at SW Irrland (TATTERSALL, Amphip.; Fisheries, Ireland, Sci. Invest., 1905, pt, 4 (1906), p. 16). *42°38′ N, 21°54′W*, surf.; *41°01′N, 41°01′W*, surf,; *39°12′ N, 28°20′ W*, surf. (CHEVREUX l. c. 1900), c. *5° N*

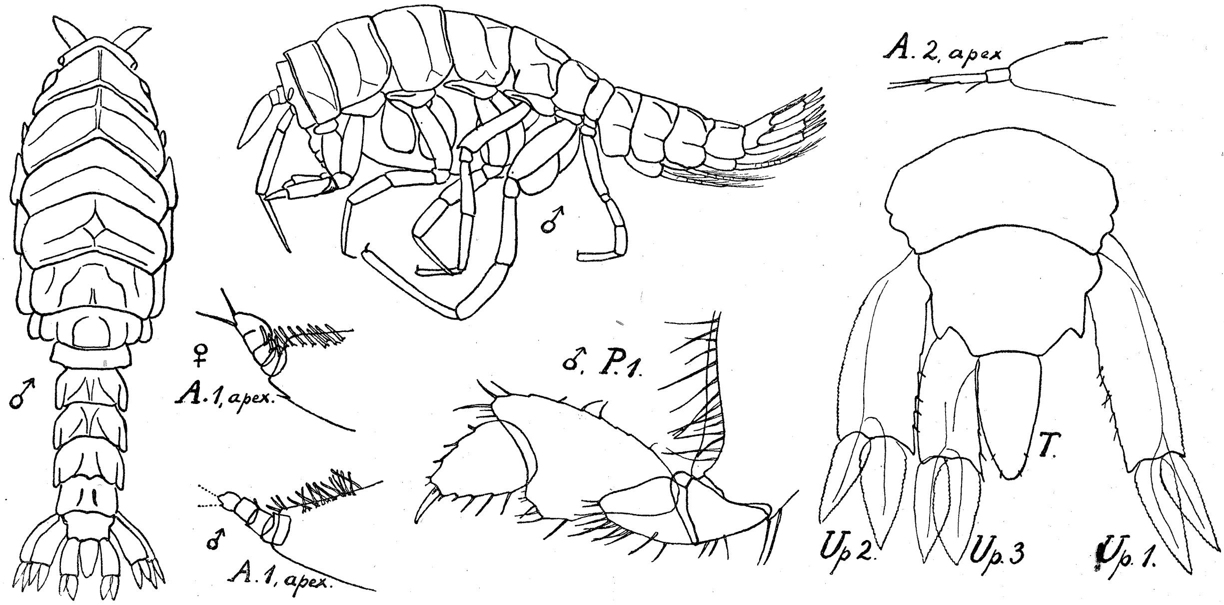

Fig. 4. Lanceola pacifica var. robusta.

19°W (Guinea-current), 0—400 m (VOSSELER, Plankton-Exped.) Indian Ocean, 200 and 750 fath. (WALKER, Transact. Linn. Soc. London, Zool., vol. 13, 1909—10, p. 53). Albatross St. 4604 (Pacific) (WOLTERECK, l. c. 1909, p. 159).

2. LANCEOLA PACIFICA Stebbing (fig. 4) (Chart 1, p. 11).

A. Lanceola pacifica typica.

**Lanceola pacifica* Stebbing, Amphip. Challenger, 1888, p. 1302, Pl. 151—52.

— — — Biscayan Plankton 2, Amphip. and Cladoc.; Transact. Linn. Soc., Zool., vol. 10, pt. 2, 1904, p. 30.

B. Lanceola pacifica var. robusta.

Lanceola pacifica var. *robusta* Woltereck, Bull. Mus. Comp. Zool., Harvard Coll., vol. 52, No. 9, 1909, p. 160.

Atlantic.

St. 36. 1125—1050 m. *44°21′N, 2°37′W.* 10-5-1906. 1250 m. w. 5^{55} am. (Y. 330) 120 min. 1 spec. 16 mm.

St. 48. 1015 m. *45°43′N, 3°47′W.* 18-5-1906. 300 m. w. (Y. 330) 1^{50} am. 120 min. 1 ♀, 18 mm.

St. 52. 1860—1910 m. *48°42′N, 12°20′W.* 21-5-1906. 300 m. w. (Y. 330) 120 min. 0^{35} am. 1 spec. 16 mm.

St. 65. 1300 m. *35°53′N, 7°26′W.* 24-2-1909. 0^{30} pm. 120 min. 1600 m. w. 1 spec. 9 mm.

St. 74. 1247—1298 m. *49°23′N, 12°13′W.* 10-6-1906. 2000 m. w. (A. 2.) 60 min. 1^{20} pm. 4 spec.: 13,13,11,7 mm.

St. 76. > 2600 m. *49°27′ N, 13°33′ W.* 12-6-1906. 2800 m. w. 3^{00} pm., 120 min. 1 ♀ 21 mm.

St. 88. 600—995 m. *48°09′ N, 8°30′ W.* 20-6-1905. 300 m. w. 120 min. 8^{45} pm. 2 spec.: 14,10 mm.

St. 179. 4000 m. *47°20′ N, 12°23′ W.* 3-9-1906. 1800 m. w. (Y. 330). 120 min. 3^{40} am. 3 spec.: 15 ,12, 12 mm.

St. 181. 1350 m. *49°22′ N, 12°52′ W.* 4-9-1906. 1800 m. w. (Y. 330). 10^{35} am. 60 min. 1 spec. 5 mm.

St. 182. 2200 m. *50°11′ N, 12°05′ W.* 4-9-1906. 600 m. w. (Y. 330). 120 min. 6^{45} pm. 1 spec. 18 mm.

St. 190. 4000 m. *46°30′ N, 7°00′ W.* 11-9-1906. 2700 m. w. (Y. 330). 150 min. 8^{25} am. 1 ♀, 21 mm.

St. 232. 3760 m. *36°28′ N, 9°06′ W.* 9-9-1910. 2000 m. w. 30 min. 11^{45} pm. 1 ♀ 14 mm., 1♂ 9 mm.

St. 240. 2500 m. *44°34′ N, 8°16′ W.* 15-9-1910. 300 m. w. 9^{00} pm. 15 min. 1 spec. 13 mm.

All the 20 specimens from the "Thor" were ♂♂ save where expressly stated to the contrary. The ♀ appear to reach maturity at a length of abt. 20 mm; a ♀ of 21 mm (St. 190) had setæ on the margin of the marsupial plates, while these setæ are altogether lacking in a ♀ of 18 mm. length from St. 148. Nearly all the specimens belong to the variety *robusta*; this, however, I dare not assert altogether definitely with regard to those from St. 232, and the largest spec. (15 mm.) from St. 179 is possibly *L. pacifica typica.*

WOLTERECK gives no figures of his new subspecies or variety *L. pacifica robusta*, but states that it is "vor allem durch ihre ausserordentlich feste, panzerartige Körperwand und die kräftigen Kieferfüssen . . . ausgezeichnet". The statement as to the hard "Körperwand" is excellently applicable to my specimens, of which I have drawn a ♂ (18 mm., St. 182) to show the sculpture. The "Kieferfüssen" on the other hand (p 1—p 2) are not more "kräftig" than in *L. pacifica typica*, if by "kräftig" we are to understand broader and heavier, but their consistency (as indeed that of the whole animal) altogether resembles that of *L. Sayana*. The only point of difference I have been able to discover in comparison with STEBBING's figures of the limbs is that the anterior lower corner of the 5. joint of p 1 (STEBBING's gn. 1) is not pointed, but more rounded. I append figures showing the apex of the two pairs of antennæ, as STEBBING gives no detail figures of these parts.

Relation between *L. pacifica* and *L. Sayana*. STEBBING makes mention, both in the Challenger Amphip. and in l. c. 1904, of the relation between these two species, which, it is true, closely resemble each other, but are nevertheless distinctly different (I can here only speak of *L. pacifica robusta*, as I am not certain about *L. pacifica typica*). The body sculpture is altogether different, (see my figures) and the rostrum is large in *L. Sayana*, whereas in *L. pacifica* it is either quite small (STEBBING, pacific spec.) or altogether lacking (STEBBING l. c. 1904; specimens from the "Thor"). For ant. 1 in *L. Sayana* see under this; in *L. pacifica* it terminates in three (♀) or 4 (♂) small joints, the two outermost joints of the ♂ being partly fused together in the ♀. and the setose appendix in the 3. joint in *L. Sayana* seems to be altogether lacking. The limbs of the two species exhibit a remarkable similarity.

Biology. The depth is, with a single exception, from 1000—4000 m. During the day, it has not been taken nearer the surface than a depth answering to 1600 m. w. but at night it was found at all depths between 300 and 3000 m. w.

Nothing can be said as to propagation, and no ♀♀ with ova were found.

Distribution. 1. *L. pacifica robusta*. The "Thor" specimens were taken from SW Ireland to the Bay of Biscay and outside the Straits of Gibraltar. That the "Thor" did not encounter the species off the NW of Spain and West coast of Portugal is probably due to the fact that the stations along this range lie for the most part in too shallow water. The species is strangely enough not mentioned by TATTERSALL (Amphip. Ireland 1906). Otherwise, this variety is only stated as found in the tropical waters of the Pacific (Albatross St. 4683, WOLTERECK l. c.).

2. *L. pacifica typica*. The specimen on which STEBBING founded the species was taken at the "Challenger" St. 241, 35°41′N, 157°42′E, 2300 fath. In addition, it has been found in the Bay of Biscay, (?) 100 to 0 faths, and 100 to 0 fath. (STEBBING l. c. 1904).

3. LANCEOLA SERRATA Bovallius.

Lanceola serrata Bovallius, On some forgotten gen. Amphip. Crust. 1885, p. 7.
— — — Monograph Amphip. Hyper. 1887, p. 34, Pl. 5 fig. 2—13.
Lanceola Suhmii Stebbing, Amphip. Challenger 1888, p. 1513, textfig. 28 (p. 1315) (*teste* Stebbing l. c. 1904, p. 29).

St. 76. > 2600 m. *49°27′ N, 13°33′ W.* 22-5-2906. 2800 m. w. (D. 2). 9^{45} pm. 30 min. 2 spec. 22,10 mm.

Distribution. TATTERSALL mentions the species (Amphip. Ireland 1906 p. 17) from two places at SW Ireland, >1000 fath. and 750 fath. It has also been found at the mouth of Davis Strait (BOVALLIUS) and W Greenland 63°18′N, 54°55′W, 1300 m., 1530 m. w.; 64°22′N, 55°48′W, 1040 m., 1200 m. w. (K. STEPHENSEN, Vid. Medd. Naturh. Foren. Copenhagen vol. 64, 1912 (1913) p. 81) and possibly 62°53′N, 54°15′W, 1600 m., 1500—1200 m. w. (see above under *L. Sayana*). Off Nova Scotia (STEBBING, Challenger). This species thus likewise belongs to depths greater than 1000 m., but does not seem to have been met with outside the northern Atlantic.

4. LANCEOLA ÆSTIVA Stebbing.

Lanceola æstiva Stebbing, Amphip. Challenger 1888, p. 1309, Pl. 153.
— — — Biscayan Plankton 1904, p. 29.

Atlantic.

St. 62. 2480—2775 m. *50°25′ N, 12°44′ W.* 5-6-1906. 1500 m. w. 120 min. 2^{45} am. 10 spec. 7—10 mm.

St. 74. 1245—1298 m. *49°23′ N, 12°13′ W.* 10-6-1906. 2000 m.w. (A. 2.) 60 min. 1^{20} pm. 1 spec. 11 mm.

St. 76. > 2600 m. *49°27′ N, 13°33′ W.* 11-6-1906. 2800 m. w. (D. 2). 9^{45} pm. 30 min. 1 spec. 17 mm., 3 spec. 7 mm. each.

St. 82. 840—1350 m. *51°0′ N, 11°43′ W.* 15-6-1905. 1200 m. w. (Y. 330). 120 min. 0^{45} pm. 1 spec. 7 mm.

St. 178. 4000 m. *48°04′ N, 12°40′ W.* 2-9-1906. 1800 m. w. (Y. 330). 120 min. 9^{05} am. 3 spec. 12—17 mm.

St. 179. 4000 m. *47°20′ N, 13°20′ W.* 3-9-1906. (Y. 330). 120 min. 3^{40} am. 1800 m. w. 1 spec. 9 mm.

St. 180. > 4000 m. *48°19′ N, 13°53′ W.* 3-9-1906. 1800 m. w. (Y. 330). 60 min. 5^{05} pm. 1 spec. 10 mm.

St. 181. 1350 m. *49°22′ N, 12°52′ W.* 4-9-1906. 1800 m. w. (Y. 330). 60 min. 10^{35} am. 3 spec. 12—16 mm.

St. 182. 2200 m. *50°11′ N, 12°05′ W.* 4-9-1906. 600 m. w. (Y. 330). 120 min. 6^{45} pm. 1 spec. ca. 14 mm.

St. 190. 4000 m. *46°30′ N, 7°00′ W.* 11-9-1906. 2700 m. w. (Y. 330). 150 min. 8^{25} am. 9 spec. 10—18 mm.

All spec. are ♂♂, save those from St. 178 (1 ♀ 18 mm.) 181 (1 ♀ 16 mm.) and St. 182 (14 mm.). Total no. taken 34.

Biology. The "Thor" has no specimens taken at depths less than 1000 m.; the depth is 1000—4000 m. During the night it has been taken at a distance from the surface answering to 600—2810 m. w., in the daytime always deeper than 1200 m. w.

From the size of the specimens it would seem that they only attain an age of one year, but the material affords no information as to time of propagation.

Distribution. (see chart 1, p. 11). All the localities from the "Thor" lie at depths beyond 1000 m. off the SW Ireland, except St. 90 (in the middle of the Bay of Biscay.) TATTERSALL records it (Amphip. Ireland 1906, p. 17) from 6 stations in the same area, and STEBBING (Biscayan Plankton, 1904, p. 30) from two places in the Bay of Biscay, 2000—1000 fath. and 350—0 fath. It was also taken by the "Challenger" (St. 120 and 106) 8°37′S, 34°48′W, 675 fath. and 1°47′N, 24°26′W. 1850 fath. (STEBBING, Challenger Amphip.). The species has thus never been found outside the Atlantic.

Fam. Scinidæ Stebbing.

*Tyronidæ Bovallius, Monograph pt. 1, 1887, p. 4 (*lit. et syn.*).

*Scinidæ Stebbing, Challenger 1888, p. 1270 (*lit. et syn.*)

— Chun, Über die Amphip. fam. d. Scinidæ; Zool. Anz. vol. 12, 1889, No. 308, p. 286, No. 309, p. 308.

— Stebbing, New spp. Amphip. tropic. Atlantic; Transact. Zool. Soc., London vol. 13, pt. 10, 1895, p. 349.

— Vosseler, Plankton-Exp. 1901, p. 100.

* — Stebbing, Biscayan Plankton 2; Transact. Linn. Soc. London, ser. 2, London, vol. 10, pt. 2, 1904, p. 18 (*key to the genera*).

— Chevreux, Liste des Scinidæ de la Princesse Alice; Bull. Mus. Océan. Monaco, No. 37, 1905.

— G. O. Sars, Account of the Crust. of Norway, vol. 1, 1895, p. 18.

— Chevreux, Sur quelques Amphipodes pélagiques nouveaux ou peu connus provenant des Campagnes de S. A. S. le Prince de Monaco, I. Scinidæ. Bull. Inst. Océanogr. Monaco No. 291, 1914.

Of the three genera belonging to this family (*Archæoscina* is ascribed by WOLTERECK to a new family, the *Pycmæidæ*), two are represented in the material from the "Thor".

The only species of the genus *Parascina*, *P. Fowleri*, is found in the material.

The genus *Acanthoscina*, on the other hand, is not represented at all, though all its three species are known from earlier finds in the Atlantic between the Azores and Ireland, albeit only a few specimens.

The "Thor"s material of the genus *Scina* contains in all 1280 specimens. including the following 11 species out of the total 19: *S. crassicornis*, *S. Vosseleri*, *S. marginata*, *S. pacifica*, *S. similis*, *S. Rattrayi*, *S. lepisma*, *S. borealis*, *S. uncipes*, *S. curvidactyla* and *S. latipes* n. sp. Of these, by far the greatest number of specimens fall to *S. crassicornis*, of which we have 1132; of *S. marginata* 17, and *S. borealis* 115; of the other species only a few specimens were found. The table shows the occurrence of the species, the results of the "Thor" expedition furnish a nice supplement to our previous knowledge here, almost all those species hitherto known from the area investigated having been taken. The exceptions are as follows: New to the Mediterranean is *S. pacifica*; on the other hand, *S. Rattrayi* was not found by the "Thor" in the Mediterranean, though earlier encountered here, and *S. curvidactyla* was taken at Gibraltar (formerly known both from Mediterranean and Atlantic). Altogether new to science is *S. latipes*, found in the Bay of Cadiz.

The following four species previously known from the area investigated by the "Thor" are not represented in the present material: *S. oedicarpus* (Atlantic), *S. stenopus* (*S. Chuni*) (Atlant. and Medit.), *S. submarginata* (Atlantic) and *S. incerta* (Atlant.); these are, however, more or less rare, and only a few specimens have been found.

Of all the 23 species belonging to this family, the "Thor" has thus found 12, including one n. sp. The great extent of the "Thor"s material will best be seen by comparison with some of the most important collections of which records are available.

The "Challenger" expedition found only *S. crassicornis*, 7 (8) spec. at 2 (3) localities. The "Pola" exped. mentioned by GARBOWSKI (1896) in the Mediterranean has about 30 specimens, comprising 3 species, of which, however, *S. crassicornis* is by far the most numerously represented. The best collections described from the 19th century* would seem to be those of the "Buccaneer" and the "Hirondelle". The collection made from the telegraph ship "Buccaneer" described by STEBBING in Amphip. trop. Atlant. 1895, yielded 9 species, of which 7 new; on the whole, however, there appear to be but single specimens of each. The "Hirondelle" described by CHEVREUX 1900, has 4 species (1 new) with 10 specimens in all. The German Plankton exped. (VOSSELER 1901) found 10 species, 1 new) with 114 specimens in all. The Prince of Monaco's collections, described by CHEVREUX (Bull. Mus. Monaco No. 37,

* Here not included the largest of all collections up to date (save that of the "Thor") of *S. crassicornis* (*v. infra* p. 19) belonging to the Copenhagen Museum, determined by BOVALLIUS and utilised in his Monograph, in which, however, he makes not a single mention of the quantities of individuals taken.

1905, and No. 291, 1914) almost exclusively from the "Thor" area, contain 12 species (2 new), some of them represented by many specimens. STEBBING (Biscayan Plankton 1904) has 7 species (1 new) with from 1—15 spec., and TATTERSALL (1906) from W. Ireland 10 species (2 new), some with many specimens.

It will thus be seen that the "Thor" collection, as regards wealth of species, is not surpassed by any other up to date, and in number of specimens is larger than all other collections together.

Biology. As far as can be seen from the literature,

	Medit.	Atlantic.
S. crassicornis	×	×
- Vosseleri	..	×
- marginata	×	×
- pacifica	n[1]	×
- similis	×	×
- Rattrayi	(×)[2]	×
- lepisma	..	×
- borealis	×	×
- uncipes	..	×
- curvidactyla	×	×
- latipes (n. sp.)	..	n
- oedicarpus	..	(×)
- stenopus (Chuni)	(×)	(×)
- submarginata	..	(×)
- incerta	..	(×)

[1] n = new to the area in question
[2] (×) = species not taken by the "Thor".

none of the species here concerned have ever been taken symbiotically in *Salpæ* or *Medusæ*; they appear always to live freely.

The only species of the genus *Parascina*, *P. Fowleri*, belongs to the deep water layers, but unfortunately we have not sufficient information to afford even an approximate statement as to depth. It is not found in the Mediterranean.

Of the genus *Scina* (here referring only to the species met which on the "Thor"-exped.) several are denizens of the upper water layers, answering to 10—300 m. w., as for instance *S. crassicornis*, *S. marginata* and *S. pacifica*; the others are doubtless on the whole from deeper or much deeper levels, *viz. S. Vosseleri*, *S. similis*, *S. Rattrayi*, *S. lepisma*, *S. borealis*, *S. uncipes*, *S. curvidactyla* and *S. latipes*; unfortunately, however, we know very little indeed with regard to several of these species.

As will be seen from the above survey, the Mediterranean has no endemic species of the genus. The Atlantic, on the other hand, contains several species not hitherto found in the Mediterranean, and while this applies to several of the deeper species, the surface-species are common to both seas. Among the "Thor" material, however, there are 4 of the deeper-living species which have been found in both these regions; *viz. S. Rattrayi*, *S. similis*, *S. borealis* and *S. curvidactyla*. This seems to form an exception to the rule otherwise valid for Hyperinae, that the species from the deeper levels of the Atlantic do not penetrate into the Mediterranean. Of *S. similis* and *S. curvidactyla* only very few specimens were found, so that we know very little about them. *S. Rattrayi* is represented by several specimens, but appears thus to be less susceptible to salinity and temperature.

This is at any rate true of *S. borealis*, which is highly eurythermic and highly euryhaline. I have myself taken it in a closing net in Greenland waters, at 450—350 m., and in a ringtrawl with 800 m. w., the temperature here being abt. 3.5°, salinity 34,7 $^0/_{00}$, and in the Arctic Sea it has even been met with at a temperature of $<$ 0°. In contrast to this, we find it in the Mediterranean at a temperature of 13° and salinity of $>$ 38 $^0/_{00}$.

1. Genus Parascina Stebbing.

Parascina Stebbing, l. c. 1904, p. 20.

1. PARASCINA FOWLERI Stebbing (figs. 5—6).

**Parascina Fowleri* Stebbing, l. c. 1904, p. 21, Pl. 2 fig. B.
— — Chevreux, Scinidæ 1905, p. 1.
— — Tattersall, Amphip. Ireland 1906, p. 6.
* — — Th. Scott, Ann. Mag. Nat. Hist., ser. 8, vol. 4, 1909, p. 33, Pl. 2 fig. 10—16, Pl. 3 fig. 16—17.

St. 62. 2480—2775 m. *50°25′ N*, *12°44′W*, 5-6-1906. 1500 m. w. (Y. 330). 2^{45} am. 120 min. 1 spec., ♂, 7 mm.

At this station, the "Thor" brought up a specimen which may with some degree of certainty be said to belong to this species, despite the fact that it differs considerably in several respects from the descriptions given by STEBBING and SCOTT of the ♀; it agrees on the other hand well with the characters noted by CHEVREUX as distinguishing the ♂. As, however, there is no extant figure of the ♂, and the sexual difference is more or less considerable, I have drawn the whole animal and all limbs.

Length 7 mm.

The eyes I was not quite able to find. Ant. 1 ter-

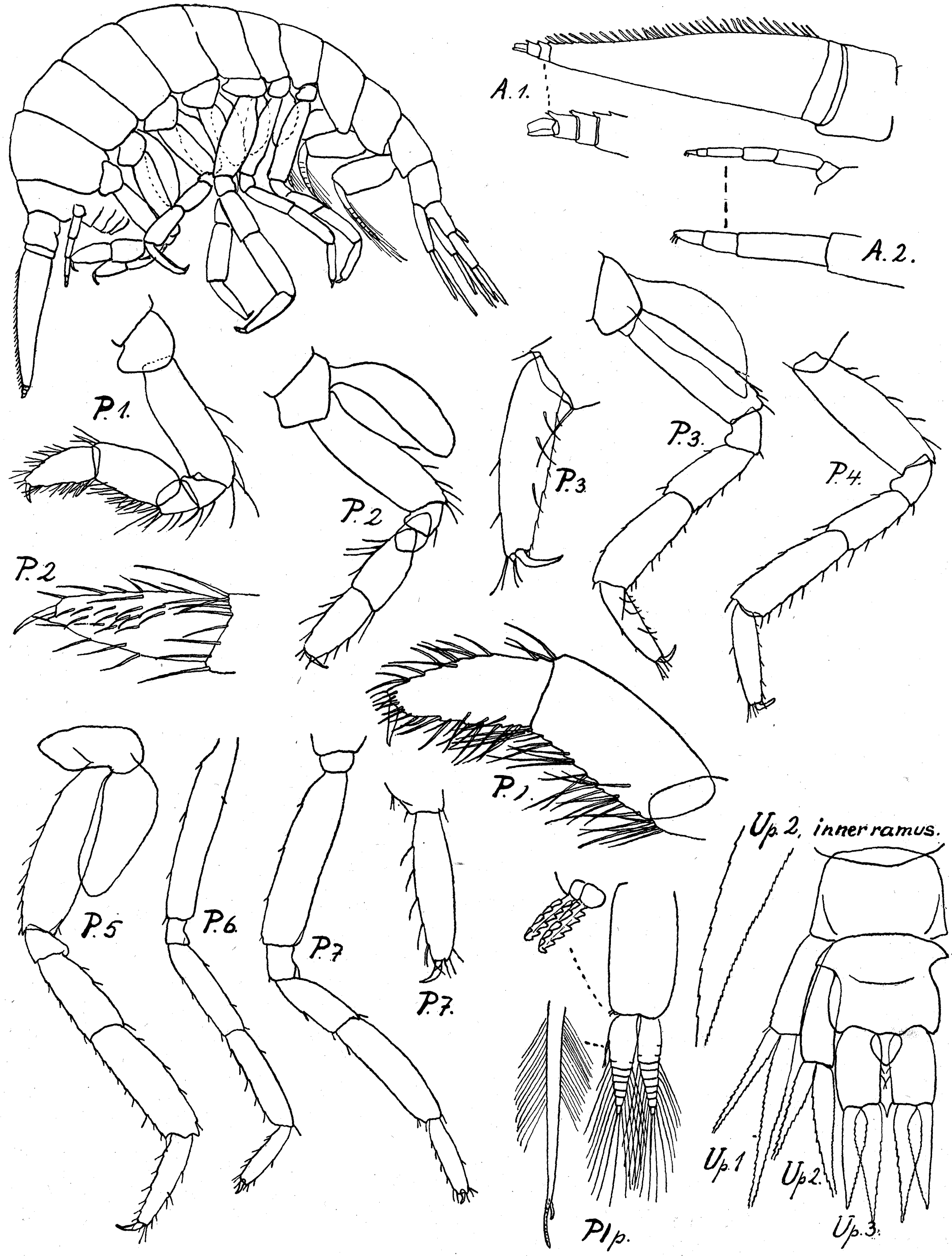

Fig. 5. Parascina Fowleri ♂.

minates in three small joints, as also mentioned by Stebbing in the case of the ♀, though he does not figure this. Ant. 2 is much longer than in the ♀, between ½ and $^1/_3$ as long as ant. 1, consisting in all of 6 joints (♀ three, Stebbing). As the oral parts differ considerably with regard to setose covering both from Scott's and Stebbing's figures, this feature must be presumed to be a sexual character; it will be noted that both mx 1 and 2 and mxp have, in my specimen, far fewer setæ than the ♀. Lab. supr. is of the form usual in *Scinidæ*; lab. infr. I did not succeed in dissecting out. The two mand. are almost immobile, being attached not only at the proximal end, but also along nearly the whole of the upper side. The masticatory parts are not alike in both mandibles; in the right, the entire distal end is formed by a series of teeth, the left, on the other hand, terminates in a point with an articulated, dentate spine on either side.

With regard to the pereiopoda and uropoda I can refer to Chevreux; my figures may serve as illustrations to his text. The pleopoda are attached together in pairs with spines of exactly the same shape as in *Lanceola* (*vide supra*). The telson is considerably broader than in ♀.

Distribution. Stebbing's two specimens were taken in the Bay of Biscay, 1250—0 fath., and 2000—1500 fath.; Tattersall's specimen at 88 m. (?) WSW of the Fastnet, Co. Cork, 470 fath., Petersen trawl at 350 fath. Chevreux mentions it from the following three stations; (St. 1639) 46°15′N, 7°09′W, 0—3000 m.; (St. 1781) 31°06′N, 24°06′45″W, 0—5000 m.; (St. 1851) 36°17′N, 28°53′W, 0—3000 m. (depth 3400 m.). The total distribution can thus be stated as eastern Atlantic with the Bay of Biscay abt. 31°N — abt. 50½°N, (0) 700—5000 m.; Chevreux' hauls go, it is true, right up to the surface, but it is to be presumed that the animals are really from a greater depth.

2. Genus Scina Prestandrea.

Scina Prestandrea, Su di alcuni nuovi crustacei dei mare di Messina; Effemeridi scientifiche e letterarie per la Sicilia, tome 6, Palermo 1833.
Tyro Bovallius, Monograph pt. 1, 1887, p. 5 (*lit. and syn.*).
Scina Stebbing, Challenger, 1888, p. 1270 (*lit. and syn.*).
— — New Amphip. tropical Atlantic; Transact. Zool. Soc., London, vol. 13, pt. 10, 1895, p. 350.
* — G. O. Sars, Account vol. 1, 1895, p. 18.
Fortunata Chun, K. K. Akad. Wiss. Berlin, Math.-nat.-wiss. Mitth., 1889, p. 342.
**Scina* Stebbing, Biscayan Plankton 2; Transact. Linn. Soc., ser. 2, Zool., vol. 10, pt. 2, 1904, p. 23 (*key to the species*).
— Woltereck, Zool. Anz. vol. 31, 1906, No. 5, p. 129.

1. SCINA CRASSICORNIS Fabr. (Chart 2).

Astacus crassicornis Fabricius, Systema Entomologiæ 1775, p. 415.
Clydonia gracilis Dana, Crust. 1852, p. 834, Pl. 55 fig. 6a—b.
Tyro cornigera Milne-Edwards, Hist. Nat. Crust. 1840, vol. 3, p. 80.
— *atlantica* Bovallius, Bihang K. Svenska Vet. Akad. Handl. vol. 10, No. 14, 1885, p. 14.
* *Scina Edwardsii* Garbowski, Denkschr. K. K. Akad. Wien, vol. 63, 1896, p. 103 (67), Pl. 1, fig. 2, Pl. 3 fig. 19—33, Pl. 4—7, Pl. 8 fig. 97—109.
**Tyro Sarsii* Bovallius, Monograph pt. 1, 1887, p. 9, Pl. 1 fig. 1—17, Pl. 2 fig. 1—10.
— *atlantica* Bovallius, ibid. p. 13, Pl. 2 fig. 11—18.
Scina crassicornis Tattersall, Amphip. Ireland 1906, p. 7.
* — — Stebbing, Biscayan Plankton 1904, p. 24 (*lit. and syn.*).
? *Clydonia longipes* Dana, Proc. American Acad. Science a. Arts, ser. 2, vol. 9, 1850, p. 19.
? *Tyro* — Bovallius, Monograph pt. 1, 1887, p. 15.

As regards the synonymy I have followed Stebbing. ♂ is used to denote ♂ other than adult: the adult ♂ (with ant. 2 bent at an angle) are expressly designated as such.

Atlantic:

St. 90. *47°47′ N, 8°00′ W.* 740—1600 m. 21(22)-6-1905. 300 m. w. (Y. 330) .120 min. 2^{15} am. 5 spec.: 1 ♂ 7 m., 2 ♀♀ with ova 11 and 14 mm. each, 2 other ♀♀ 10 and 13 mm.

St. 82. *51°00′ N, 11°43′ W.* 840—1350 m. 15-6-1905. (Y. 330). 1200 m. w. 120 min. 0^{45} pm. 1 ♂ 5 m., 2♀♀ 4—5 mm.

St. 88. *48°09′ N, 8°30′* W. 600—995 m. 20-6-1905. 300 m. w. 8^{45} pm. 120 min. 6 spec.: 5 ♀♀ (2 with ova) 14 mm., 1 ♀ 7 mm.

St. 52. *48°42′ N*, *12°20′ W.* 1860—1910 m. 21-5-1906. (Y. 330). 120 min. 300 m. w. 0^{25} am. 1 ♀ 12 mm.

?St. 66. *48°43′ N, 15°17′ W.* 6-6-1906. 400 m. w. (y. 330). 60 min. 1 spec.

?St. 74. *49°23′ N, 12°13′ W.* 10-6-1906. 1245—1298 m. (Y. 330) 2000 m. w. 1 ♂.

St. 176. *49°31′ N, 11°25′ W.* 1125 m. 31—8-1906. (Y. 330). 300 m. w. 9^{30} pm. 120 min. 5 spec.: 1 not adult ♂ 14 mm., 2 ♀♀ 16—17 mm., 2 ♀♀ 8—9 mm.

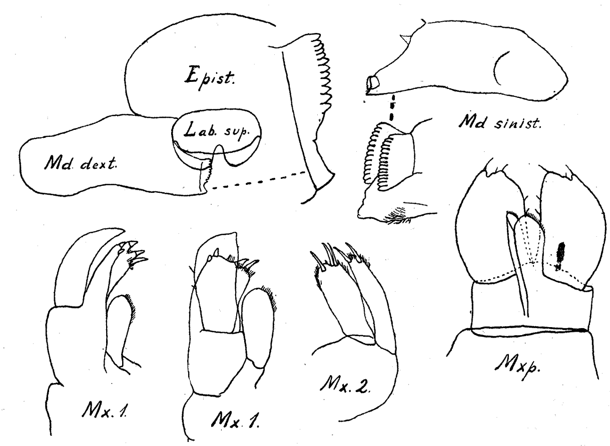

Fig. 6. Parascina Fowleri ♂.

St. 179. *47°20′ N, 12°23′ W.* 4000 m. 2-9-1906. (Y. 330). 300 m. w. 9^{30} pm. 120 min. 1 ♀ 19 mm.

St. 179. ibid. 600 m. w. (Y. 330). 120 min. 0^{00} am. 1 ♀ 14 mm.

St. 182. *50°00′ N, 12°05′ W.* 2200 m. 4-9-1906. 600 m. w. 6^{45} pm. 120 min. 1 ♀ 14 mm.

St. 65. *35°53′ N, 7°26′ W.* > 1300 m. 24-2-1909. 65 m. w. 6^{30} pm. 60 min. 3 ♂ 8—9 mm.

St. 65. ibid. 1600 m. w. 0^{30} pm. 120 min. 2 ♂ 8 mm.

St. 66. *36°16′ N, 6°52′ W.* 735 m. 25-2-1909. 25 m. w. 0^{05} am. 30 min. 1 ♀ 10 mm.

St. 71. *39°35′ N, 9°45′ W.* 1150 m. 4-3-1909. 1600 m. w. 4^{00} pm. 120 min. 1 adult ♂ 13 mm.

St. 89. *36°28′ N, 8°22′ W.* 1310 m. 18-6-1910. 65 m. w. 3^{00} am. 15 min. 16 spec.: 5 spec. 11—14 mm. (1 adult ♂, 4 ♀), 5 spec. 10 mm. (4 ♀, 1 ♂), 4 spec. 7 mm. (3♀, 1 ♂), 2 spec. 5 mm (1 ♂, 1 indet. sex).

St. 89. ibid. 1000 m. w. 4^{10} am. 30 min. 7 ♀ 9—13 mm.

St. 91. *35°53′ N, 7°26′ W.* 1225 m. 18-6-1910. 1600 m. w. 5^{25} pm. 60 min. 30 spec. 9—15 mm. (1 adult ♂ 11 mm., 29 ♀♀, of which 1 ♀ with ova 12 mm.), 13 spec. 5—8 mm. (6 ♂, 7 ♀).

St. 377. ("Florida"). *31°23′ N, 18°08′ W,* > 4300 m. 23-7-1911. 15 m. w. (S. 200). 8^{05} pm. 30 min. 2 spec. 9 mm., 7 spec. 6—7 mm., 14 spec. 4—6 mm. (1 adult ♂ 9 mm., 9 other ♂, 13 ♀).

St. 398. ("Ingolf"). *36°48′ N, 14°22′* W. > 2600 m. 26-10-1911. 56 m. w. (S. 150). 12^{40} am., 30 min. 4 spec. (3 ♂, 1 ♀) 5—7 mm.

St. 399. ("Ingolf"). *34°23′ N,* 15°*31′ W.* > 2600 m. 26-10-1911. Surface (S. 200). 9^{10} pm. 30 min. 10 spec. 7 mm., 12 spec. 5—6 mm., 37 spec. 3—4 mm. (36 ♂, 23 ♀).

St. 399. ibid. 56 m. w. (S. 150). 9^{10} pm. 30 min. 1 ♂ 7 mm., 2 spec. (♂, ♀) 6 mm., 1 ♀ 5 mm., 2 spec. (♂, ♀) 4 mm., 1 ♀ 3 mm.

St. 400. ("Ingolf"). *32°10′ N, 17°20′ W.* > 4500 m.

30-10-1911. Surface (S. 200). 9^{35} pm. 30 min. 1 ♂ 7 mm., 1 ♀ 5 mm., 1 ♀ 4 mm.

St. 400. ibid. 56 m. w. (S. 150). 9^{35} pm., 30 min. 1 ♂ 7 mm.

Mediterranean:

St. 10. *37°21′ N, 16°45′ E.* 2100 m. 15-12-1908. 25 m.w. 5^{00} am. 60 min. 2 ♀♀ 4—5 mm.

St. 10. ibid. 1200 m. w. 9^{30} am. 60 min. 2 ♀♀ 9 mm., 1 ♀ 6 mm.

St. 11. *36°57′ N, 18°16′ E.* 3700 m. 16-12-1908. 300 m. w. 7^{00} am. 120 min. 1 adult ♂ 9 mm.

St. 15. *40°04′ N, 19°06′ E.* 1000 m. 22-12-1908. 1400 m. w. 5^{20} am. 60 min. 1 ♀ 10 mm.

St. 21. *37°51′ N, 15°21′ E.* 500 m. 5-1-1909. 10 m. w. 11^{50} pm. 30 min. 1 spec. (sex indet.) 4 mm.

St. 23. *40°34′ N, 13°24′ E.* 1800 m. 15-1-1909. 25 m. w. 11^{50} pm. 30 min. 2 spec.: 1 adult ♂ 10 mm., 1 ♀ 10 mm.

St. 24. *40°14′ N, 12°23′ E.* 3700 m. 16-1-1909. 65 m. w. 7^{50} am. 30 min. 5 spec. 7—11 mm. [3 ♂ (1 adult), 1 ♀ with ova 11 mm., 1 ♀ without ova].

St. 24. ibid. 300 m. w. 9^{00} am. 60 min. 1 ♀ 11 mm.

St. 28. *40°53′ N, 13°43′ E.* 600 m. 19-1-1909. 200 m. w. 9^{05} pm. 30 min. 1 ♀ 10 mm.

St. 29. *40°47′ N, 12°55′ E.* 1550 m. 20-1-1909. 200 m. w. 7^{20} pm. 60 min. 2 ♀, 9—11 mm.

St. 30. *41°15′ N, 11°55′ E.* 1800 m. 21-1-1909. 65 m. w. 5^{30} am. 60 min. 2 ♀, 9 mm.

St. 30. ibid. 300 m. w. 7^{10} am. 60 min. 1 ♂ 9 mm.

St. 31. *41°44′ N, 10°52′ E.* 1420 m. 21-1-1909. 200 m. w. 3^{50} am. 30 min. 1 ♀ 9 mm.

St. 35. *43°36′ N, 7°36′ E.* 2000 m. 29-1-1909. (S. 100). 700 m. w. 11^{25} am. 120 min. 3 ♀: 12, 9 and 8 mm.

St. 35. ibid. 200 m. w. 6^{40} am. 60 min. 2 spec. (♂, ♀), 10 mm.

St. 35. ibid. 1600 m. w. 11^{25} am. 120 min. 1 ♀ 13 mm.

St. 36. *42°49′ N, 6°54′ E.* 2000 m. 30-1-1909. 300 m. w. 6^{50} am. 60 min. 1 ♂ 9 mm.

St. 40. *39°10′ N, 9°40′ E.* 235 m. 1-2-1909. 65 m. w. 9^{30} pm. 30 min. 1 ♀ 6 mm.

St. 45. *37°28′ N, 8°18′ E.* 2150 m. 7-2-1909. 65 m. w. 0^{15} am. 30 min. 1 ♂ 7 mm., 1 ♀ 8 mm.

St. 45. ibid. 300 m. w. 11^{25} pm. 30 min. 20 spec. 4-14 mm.: 2 adult ♂♂ 9 mm., 6 other ♂♂ 6—9 mm., 12 ♀♀ 4—14 mm.

St. 46. *37°17′ N, 6°00′ E.* 1930 m. 7-2-1909. 65 m. w. 8^{20} pm. 30 min. 6 spec., 8—10 mm. (2 ♂, 4 ♀).

St. 46. ibid. 300 m. w. 7^{30} pm. 30 min. 9 spec. 9—11 mm. (2 adult ♂, 7 ♀).

St. 46. ibid. 600 m. w. 6^{35} pm. 30 min. 6 spec. 8—11 mm. (2 ♂, 4 ♀).

St. 50. *37°02′ N, 1°17′ E,* 2000 m. 17-2-1909. 25 m. w. 1^{20} am. 30 min. 1 ♀ 14 mm., 1 ♂ 8 mm., 1♀ 8mm.

St. 50. ibid. 65 m. w. 2^{00} am. 30 min. 1 ♀ 13 mm., 1 ♀ 11 mm.

St. 51. *36°27′ N, 6°27′ E.* 2000 m. 18-2-1909. 300 m. w. 0^{50} am. 30 min. 1 ♀ 9 mm.

St. 53. *36°13′ N, 1°28′ W.* 2000 m. 18-2-1909. 2600 m. w. 5^{15} pm. 90 min. 1 ♀ 10 mm., 1 ♀ 9 mm.

St. 59. *36°02′ N, 4°24′ W.* > 1206 m. 21-2-1909. 500 m. w. 1^{40} pm. 30 min. 1 ♀ with ova 12 mm., 3 spec. 9—11 mm. (2 adult ♂ ♂, 1 younger ♂).

St. 59. ibid. 1200 m. w. 2^{30} am. 60 min. 2 ♀♀ 8—9 mm.

St. 61. *35°57′ N, 5°35′ W.* 740 m. 21-2-1909. 600 m. w. 3^{25} pm. 60 min. 1 ♀ 7 mm.

St. 106. *36°33′ N, 2°00′ W.* 1150 m. 25-6-1910. 65 m. w. 2^{30} am. 30 min. 1 spec. (sex indet.) 3 mm.

St. 107. *36°13′ N, 1°28′ W.* > 2000 m. 25-6-1910. 2000 m. w. 7^{30} am. 60 min. 1 ♀ with embryos 13 mm., 9 spec. (5 ♂, 4 ♀) 4—6 mm.

St. 108. *36°03′ N, 0°27′ W.* > 2435 m. 25-6-1910. 25 m. w. 11^{55} pm. 15 min. 1 spec. 4 mm.

St. 112. *36°56′ N, 2°15′ E.* 2700 m. 27-6-1910. 25 m.w. 1^{30} am. 15 min. 1 ♂ 8 mm., 1 ♂ 6 mm., 2 (♂, ♀) 4 mm.

St. 112. ibid. 65 m. w. 1^{05} am. 15 min. 2 ♀ 6 mm.

St. 112. ibid. 300 m. w. 0^{15} am. 30 min. 6 spec.: 1 ♀ 10 mm., 4 spec. (3 ♀, 1 ♂) 8 mm. each, 1 sex indet. 5 mm.

St. 113. *36°53′ N, 3°09′ E.* 815 m. 28-6-1910. 300 m. w. 3^{25} am. 30 min. 3 spec. (1 ♀, 2 ♂) 8—9 mm.

St. 115. *38°17′ N, 4°11′ E.* 2800 m. 29-6-1910. 25 m. w. 1^{40} am. 15 min. 33 spec. 4—8 mm. (11 ♂, 20 ♀, 2 sex indet.).

St. 115. ibid. 65 m. w. 1^{20} am. 15 min. 9 spec. (6 ♂, 2♀, 1 sex indet.) 3—8 mm.

St. 115. ibid. 300 m. w. 11^{20} pm. 30 min. 1 ♀ 11 mm., 6 spec. (2 ♂ [1 adult ♂], 4 ♀ [1 with ova]) 8—10 mm., 3 spec. (2 ♂, 1 ♀) 7 mm., 5 ♀ 4—6 mm.

St. 115. ibid. 2000 m. w. 0^{30} am. 60 min. 3 spec. (2 ♂, 1 ♀) 7-9 mm.

St. 116. *39°27′ N, 5°26′ E.* 2860 m. 30-6-1910. 25 m. w. 3^{00} am. 15 min. 42 spec.: 12 spec. 8—9 mm., 24 spec. 5—7 mm., 6 spec. 4 mm. (2 adult ♂ 8—9mm., 21 not adult ♂, 19 ♀).

St. 116. ibid. 300 m. w. 1^{40} am. 30 min. 1 ♀ 10 mm., 5 spec. (3 ♂, 2 ♀) 8 mm., 2 ♀ 5—6 mm.

St. 118. *41°00′ N, 6°43′ E.* > 2700 m. 1-7-1910. 25 m. w. 0^{20} am., 15 min. 1 spec. 11 mm., 70 spec. 6—9 mm., 28 spec. 4—5 mm., (7 adult ♂ 8—9 mm., 39 other ♂; 51 ♀ (2 with ova 7—8 mm.); 2 sex indet.).

St. 118. ibid. 30-6-1910. 65 m. w. 11^{35} pm. 30 min. 1 ♀ 13 mm., 4 spec. (1 ♂, 3♀ [2 with ova]) 8—9 mm., 2 spec. (1 ♂, 1 ♀) 6 mm.

St. 118. ibid. 300 m. w. 10^{55} pm. 30 min. 1 ♀ 12 mm., 4 spec. 7—8 mm., 3 spec. 5—6 mm. (upon the whole 4 ♂ (1 adult 8 mm.) and 4 ♀, of which 1 with ova 8 mm.).

St. 123. *44°14′ N, 8°55′ E.* > 600 m. 3-7-1910. 10 m. w. 2^{30} am. 15 min. 1 ♂ 8 mm.

St. 123. ibid. 25 m. w. 1^{50} am. 15 min. 1 ♂ adult 11 mm., 6 spec. (4 ♂, 2 ♀) 6—8 mm.

St. 125. *43°54′ N, 9°13′ E.* 1082 m. 9-7-1910. 25 m. w. 10^{30} pm. 30 min. 2 ♂, 5—7 mm.

St. 125. ibid. 300 m. w. 9^{45} pm. 30 min. 1 ♀ 9 mm.

St. 129. *40°05′ N, 11°31′ E.* 3420 m. 12-7-1910. 25 m. w. 3^{00} am. 30 min. 1 ♂ 5 mm.

St. 129. ibid. 300 m. w. 3^{40} am. 30 min. 1 ♀ 11 mm., 3 spec. (2 ♂, 1 ♀) 8 mm., 2 ♀ 6—7 mm.

St. 129. ibid. 600 m. w. 8^{00} pm. 30 min. 2 ♀ (1 with ova) 9 mm., 1 ♂ 8 mm., 2 ♂ 6 mm.

St. 129. ibid. 1000 m. w. 4^{20} am. 60 min. 3 spec. 7—8 (1 ♂, 2 ♀).

St. 129. ibid. 3500 m. w. (C. 200). 3^{00} pm. 120 min. 1 ♂ 15 mm., 1 ♀ 12 mm.

St. 130. *39°35′ N, 11°20′ E.* > 3000 m. 13-7-1910. 25 m. w. 0^{50} am. 30 min. 5 spec. (4 ♀, 1 ♂) 8—10 mm., 5 spec. (4 ♂, 1 ♀) 4-5 mm.).

St. 131. *38°36′ N, 11°00′ E.* 915 m. 13-7-1910. 1000 m. w. 10^{40} am. 60 min. 1 ♀ with ova 10 mm.

St. 132. *38°57′ N, 9°47′ E.* 1227 m. 14-7-1910. 300 m. w. 3^{45} am. 30 min. 1 ♂ 5 mm., 1 ♀ 9 mm.

St. 133. *38°18′ N, 9°59′ E.* 600 m. 14-7-1910. 25 m. w. 11^{00} pm. 30 min. 1 ♀ 5 mm.

St. 133. ibid. 300 m. w. 10^{15} pm. 30 min. 3 spec.: 2 ♀ 5—7 mm., 1 (♂?) 3 mm.

St. 138. *37°37′ N, 11°25′ E.* 820 m. 19-7-1910. 25 m. w. 9^{50} pm. 30 min. 1 spec. (sex indet.) 3 mm.

St. 138. ibid. 300 m. w. 9^{10} pm. 30 min. 1 ♀ 10 mm.

St. 138. ibid. 1000 m. w. 7^{40} pm. 60 min. 1 ♀ 7 mm.

St. 139. *37°57′ N, 11°54′ E.* 530 m. 20-7-1910. 300 m. w. 2^{25} am. 30 min. 1 ♂ 10 mm.

St. 143. *35°18′ N, 16°25′ E.* 1843 m. 23-7-1910. 25 m. w. 1^{20} am. 30 min. 4 spec. (3♀, 1 ♂) 9—10 mm., 2 ♂ 5—7 mm.

St. 144. ibid. *34°31′ N, 18°40′ E.* 3340 m. 24-7-1910. 25 m. w. 2^{00} am. 30 min. 16 spec. 5—8 mm. (2 adult ♂ 7—8 mm., 4 not adult ♂ 5—7 mm., 10 ♀♀).

St. 144. ibid. 300 m. w. 2^{45} am. 30 min. 1 ♀ 10 mm., 1 adult ♂ 9 mm., 1 ♀ 6 mm.

St. 145. *32°38′ N, 19°02′ E.* 1925 m. 25-7-1910. 25 m. w. 3^{30} am. 30 min. 1 ♂ 7 mm.

St. 145. ibid. 300 m. w. 4^{10} am. 30 min. 11 spec. 3-6 mm. (7 ♂, 4 ♀).

St. 152. *33°11′ N, 21°44′ E.* > 2200 m. 27-7-1910. 25 m. w. 10^{50} pm. 15 min. 1 adult ♂ 7—8 mm.

St. 156. *32°24′ N, 26°51′ E.* 3000 m. 30-7-1910. 25 m. w. 2^{15} am. 30 min. 28 spec. 3—8 mm. (3 adult ♂ 7—8 mm., 10 not adult ♂, 11♀, 1 sex indet.).

St. 156. ibid. 300 m. w. 3^{50} am. 30 min. 5 spec. 3—7 mm. (1 ♂ 7 mm., 4 ♀).

St. 156. ibid. 600 m. w. 3^{00} am. 30 min. 3 ♀ 7 mm.

St. 156. ibid. 1000 m. w. 0^{40} am. 60 min. 1 ♀ 8 mm.

St. 160. *35°59′ N, 28°14′ E.* 2980 m. 1-8-1910. 25 m. w. 2^{00} am. 30 min. 2 ♀ 7 mm., 5 spec. 3—5 mm (2 ♂, 2 ♀, 1 sex indet.).

St. 160. ibid. 4000 m. w. (C. 200). 3^{30} pm. 60 min. 1 ♀ 10 mm.

St. 161. *36°12′ N, 27°16′ E.* > 1000 m. 2-8-1910. 25 m. w. 3^{00} am. 30 min. 4 spec. 3—5 mm. (2 ♂, 1 ♀, 1 sex indet.).

St. 192. *38°07′ N, 15°35′ E.* 650 m. 20-8-1910. 25 m. w. 9^{40} pm. 15 min. 4 spec. 3—5 mm. (3 ♂, 1 ♀ [5 mm.]).

St. 192. ibid. 300 m. w. 10^{10} pm. 15 min. 1 ♀ 3 mm.

St. 192. ibid. 600 m. w. 10^{15} pm. 30 min. 2 spec.: 1 ♂ 5 mm., 1 sex indet.. 3 mm.

St. 193. *38°15′ N, 15°39′ E.* 140 m. 21-8-1910. 10 m. w. 0^{50} am. 30 min. 1 spec. 4 mm. (sex indet.).

St. 194. *38°33′ N, 15°29′ E.* 1140 m. 21-8-1910. 1200 m. w. 6^{00} am. 30 min. 1 ♂ 8 mm.

St. 196. *39°59′ N, 14°31′ E.* 680 m. 22-8-1910. 25 m. w. 2^{40} am. 30 min. 1 spec. 10 mm., 5 spec. 7—8 mm., 3 spec. 5 mm., 16 spec. 3—4 mm. (11 ♂, 8 ♀, 6 sex indet.).

St. 197. *40°34′ N, 13°36′ E.* 1040 m. 24-8-1910. 25 m. w. 7^{45} pm. 15 min. 2 ♂ 5 mm.

St. 197. ibid. 300 m. w. 7^{00} pm. 30 min. 2 spec. 4—5 mm. (1 ♀, 1 spec. indet.).

St. 199. *39°32′ N, 10°49′ E.* 2700 m. 25-8-1910. 25 m. w. 9^{00} pm. 15 min. 3 ♀ (2 with ova in the ovarium) 10 mm., 3 ♀ 8—9 mm., 2 ♂ 7 mm., 5 spec. (2 ♂, 3♀) 5 mm., 7 spec. (4 ♂, 3♀) 3—4 mm.

St. 199. ibid. 300 m. w. 9^{25} pm. 20 min. 1 adult ♂ 9 mm., 1 ♀ 5—6 mm., 1 ♀ 4 mm., 1 ♀ 3 mm.

St. 204. *38°52′ N, 7°43′ E.* > 1000 m. 27-8-1910. 25 m. w. 4^{00} am. 15 min. 7 spec. (3 adult ♂, 4 ♀) 9—10 mm., 2 spec. (♂, ♀) 6 mm., 1 sex indet. 4 mm.

St. 204. ibid. 65 m. w. 4^{30} am. 15 min. 2 ♀ 8—10 mm., 1 adult ♂ 9 mm., 2 ♂ 7—8mm., 2 spec. (1 ♂, 1 ♀) 4 mm.

St. 204. ibid. 300 m. w. 5^{00} am. 30 min. 2 spec. (♂,♀) 8 mm., 2 spec. (♂, ♀) 6 mm.

St. 204. ibid. 1000 m. w. 5^{55} am. 30 min. 4 spec. (3 ♀ [1 with ova 9 mm.], 1 ♂) 9—12 mm., 1 ♀ 5 mm.

St. 205. *39°16′ N, 5°52′ E.* Ca. 2860 m. 27-8-1910. 25 m. w. 7^{35} pm. 15 min. 3 spec. (1 ♂, 2 ♀) 7 mm., 27 spec. (2) 3—5 mm. (14 ♂, 11 ♀, 2 sex indet.).

St. 206. *39°32′ N, 5°15′ E.* 2782 m. 28-8-1910. 300 m. w. 1^{05} am. 15 min. 12 spec. 8—10 mm., 5 spec. 5—6 mm. (1 adult ♂ 9 mm., 5 not adult ♂, 2 ♀ with ova and embryos 8—9 mm., 9 other ♀).

St. 206. ibid. 1000 m. w. 1^{40} am. 45 min. 1 adult ♂ 8 mm., 2 ♀ 7 mm., 1 ♂ 4 mm.

St. 206. ibid. 2000 m. w. 3^{05} am. 45 min. 1 adult ♂ 10 mm., 2 spec. (♂, ♀) 7 mm., 2 spec. (♂, ♀) 5 mm.

St. 208. *40°18′ N, 3°20′ E.* 1600 m. 29-8-1910. 25 m. w. 1^{40} am. 15 min. 1 ♀ 7 mm., 1 ♂ 6 mm., 2 spec. (♂, ♀) 5 mm.

St. 209. *40°34′ N, 3°03′ E.* 2131 m. 29-8-1910. 1000 m. w. 6^{00} am. 45 min. 1 ♂ 9 mm., 1 ♂ 8 mm.

St. 209. ibid. 2000 m. w. 7^{25} am. 45 min. 2 ♂ 6—8 mm.

St. 210. *41°10′ N, 2°23′ E.* 780 m. 30-8-1910. 600 m. w. 3^{35} am. 30 min. 1 ♀ 12 mm., 1 adult ♂ 10 mm., 1 ♀ 7 mm.

St. 215. *39°14′ N, 0°52′ E.* 1050 m. 31-8-1910. 25 m. w. 9^{20} pm. 30 min. 8 spec. (3 ♂, 5 ♀) 7—8 mm.

St. 220. *36°25′ N, 0°42′ E.* 375 m. 4-9-1910. 25 m. w. 2^{15} am. 30 min. 2 ♂ 7 mm. 1 (sex indet.) 3 mm.

St. 222. *35°52′ N, 0°57′ E.* 1950 m. 4-9-1910. 300 m. w. 11^{20} pm. 15 min. 1 ♀ 15 mm.

St. 275. ("Pangan"). *39°05′ N, 14°50′ E.* > 1000 m. 3-4-1911. 94 m. w. (S. 200). 8^{30} pm. 30 min. 1 ♂ 7 mm.

St. 276. ("Pangan"). *36°30′ N, 19°20′ E.* > 3000 m. 4-4-1911. 132 m. w. (S. 200). 11^{20} pm. 35 min. 89 spec. 3—7 (8) mm. (2 adult ♂ 7—8 mm., 35 other ♂, 3 ♀ with ova 7—8 mm., 44 other ♀, 8 sex indet.).

St. 277. ("Pangan"). *33°20′ N, 27°30′ E.* > 3000 m. 6-4-1911. 132 m. w. (S. 200). 11^{00} pm. 35 min. 35 spec. 6—8 mm., 15 spec. 4—5 mm. (6 adult ♂ 6—8 mm., 6 other ♂, 25 ♀, 10 sex indet.).

St. 297. ("Pangan"). *33°10′ N, 25°35′ E.* > 3000 m. 25-6-1911. 28 m. w. (S. 200). 11^{30} pm. 30 min. 5 spec. 6—7 mm., 44 spec. 3—5 mm. (1 adult ♂ 7 mm., 25 other ♂, 20 ♀, 3 sex indet.).

St. 298. ("Pangan"). *37°20′ N, 21°10′ E.* > 2000 m. 26-6-1911. 38 m. w. (S. 200). 11^{30} pm. 30 min. 8 spec. 5—6 mm., 12 spec. 3—4 mm. (9 ♂, 9 ♀, 2 sex indet.).

St. 339. ("Pangan"). *40°30′ N, 3°10′ E.* > 2000 m. 20-8-1911. 28 m. w. (S. 200). 3^{00} am. 1 ♂ 5 mm., 2 ♀ 4—5 mm.

St. 340. ("Pangan"). *35°50′ N, 21°30′ E.* > 2000 m. 26-8-1911. 28 m. w. (S. 200). 9^{00} pm. 30 min. 1 adult ♂ 11 mm., 4 spec. (2 ♂, 2♀) 7—8 mm., 7 spec. (3 ♂, 4 ♀) 5—6 mm.

St. 340. ibid. 108 m. w. (S. 150). 9^{00} pm. 30 min. 16 ♂, 14 ♀ (2 adult ♂ 9 mm., 7 spec. 7—8 mm. (of which 1 ♀ with ova 7 mm.), 21 spec. 5—6 mm.

St. 341. ("Pangan"). *34°00′ N, 26°20′ E.* > 2000 m. 27-8-1911. 28 m. w. (S. 200). 11^{00} pm. 30 min. 3 spec. 5—7 mm. (2 ♂, 1 ♀).

St. 384. ("Pangan"). *32°50′ N, 24°10′ E.* > 3000 m. 7-11-1911. 130 m. w. (S. 150). 8^{30} pm. 30 min. 4 ♂ 5 mm.

St. 385. ("Pangan"). *35°10′ N, 18°10′ E.* > 3000 m. 9-11-1911. 130 m. w. (S. 150). 8^{30} pm. 30 min. 1 ♂ adult 9 mm., 19 other ♂ 2—7 mm., 1 ♀ with ova in the ovarium 8 mm., 5 other ♀ 4—8 mm.

St. 410. ("Pangan"). *37°12′ N, 1°18′ W.* > 1000 m. 29-12-1911. 112 m. w. (S. 150). 7^{00} pm. 30 min. 6 spec. 5 mm., 4 spec. 2—4 mm. (7 ♂, 2 ♀, 1 sex indet.).

St. 412. ("Pangan"). *34°33′ N, 24°15′ E.* > 2000 m. 7-1-1912. 112 m. w. (S. 150). 6^{30} pm. 30 min. 1 ♂ 6 mm., 1 ♀ 3 mm.

A. The Mediterranean.

The total material above quoted includes from the Mediterranean 412 ♂, 457 ♀, and some 70 specimens too small to be determined as to sex (< abt. 4 mm.), in all 939 spec. Of these, 640 were taken by the "Thor" in 1908—10.

The numbers of stations, hauls and specimens from the Mediterranean will be seen from the list given below; the collections from Dec. 1908—Sept. 1910 are from the "Thor", the later collections being made by other ships.

	No. of stations	No. of hauls	No. of specimens
Dec. 1908	3	4	7
Jan. 1909	9	13	23
Febr. —	8	13	59
June 1910	7	13	137
July —	15	31	236
Aug. —	15	26	174
Sept. —	2	2	4
April 1911	3	3	140
June —	2	2	69
Aug. —	3	4	48
Nov. —	2	2	30
Dec. —	1	1	10
Jan. 1912	1	1	2
Total...	71	115	939

Distribution. For statements in the literature regarding distribution see below.

The accompanying chart (Chart 2) shows all the localities noted in the above list; negative stations are here those where no specimens were taken, despite the fact that the depth was over 500 m. and night hauls made with up to 300 m. w. It is distinctly seen that the species is distributed throughout the whole of the Mediterranean outside the 500—1000 m.-lines, save in the Ægean and Sea of Marmora with the Dardanelles, this being perhaps due to the slighter depth. Furthermore, it does not appear to live in the Adriatic. Otherwise, the few negative stations marked on the chart are scattered about among the positive — at any rate as regards the western basin — in such a manner that the fact of the species not having been found there must appear due merely to accident.

The species is recorded from the Mediterranean at 71 stations; of these, the "Thor" has only found it at 59. On deducting from this the four lying at depths between 0—500 m., we have 55 st. remaining; to wit, 44 in the western and 11 in the eastern basin, but while the former contains 13 negative stations (reckoned in the manner above described) i. e. nearly 3½ times as many positive as negative, we find in the eastern likewise 13 negative st. here making more negative than positive. It is thus far more abundant in the western than in the eastern basin, which also applies to other species.

Worked out as for normal hauls (and only for depths to bottom over 500 m.) we find the species in the eastern basin represented by 104 spec. in 18 hauls, i. e. 5.8 per haul, whereas the western basin yielded 775 spec. in 63 hauls, or 12 spec. per haul, which is twice as much as the eastern figure per haul.

The eastern basin gave 18 positive night hauls out of 61 in all, i. e. 29.5%, the figures for the western being 63 out of 142 or 43%, which is a percentage 1½ times that for the eastern basin.

On arranging the stations and hauls ("Thor" 1908—10) according to depth of the sea, we find the following:

Depths of the stations made	No. of positive stations	Proportional frequency of positive stations
0—500 m.	4	6.8 %
501—1000 m.	12	20.3 -
1001—2000 -	23	39.0 -
2001—3000 -	15	25.4 -
3001—4000 -	5	8.5 -
Total...	59	

Depths of the stations made	No. of positive hauls	Percentage of positive hauls	Real no. of specimens	No. of specimens (normal-hauls)	Average no. pr. normal-haul
0—500 m.	4	7.0 %	6	6	1.5
501—1000 -	18	30.5 -	58	71	4.0
1001—2000 -	37	42.5 -	122	141	3.8
2001—3000 -	33	37.9 -	401	690	20.9
3001—4000 -	12	34.3 -	53	51	4.3
Total...	102		640		

The species has thus only quite exceptionally been taken over depths less than 501 m. (*viz.*; 140, 235, 375 and 500 m.); it lives almost exclusively outside the 500 m.-line,

It is worthy of note that while the greatest proportion of positive stations and hauls as compared with all positive hauls at all depths and also with the total number of hauls made by the "Thor" lie at 1001—2000 m., we nevertheless find that the greatest average

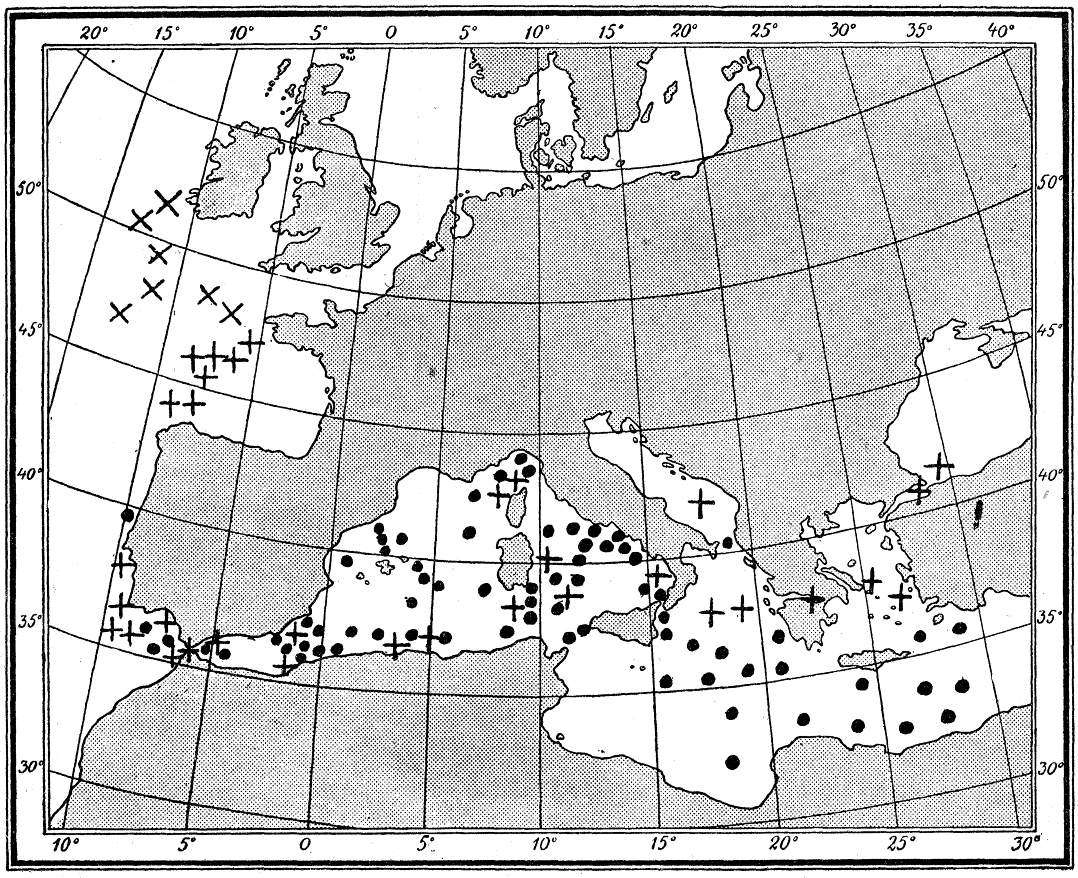

Chart 2. Scina crassicornis.
× Positive stations 1905—06, ● positive stations 1908 and later on (st. 377 and 398—400 lie outside the map to the west), + negative stations (night, > 500 m, 10 - 300 m. w.).
Some of the stations lie so close to each other that it was impossible to note them all.

number of specimens per haul, *viz.* 20.9, lies between 2001—3000 m., as against 3.8—4.3 at other depths, 501—4000 m.

The results obtained by other expeditions agree in this as in all other respects excellently well with those of the "Thor".

For the little hitherto known as to the biology of the species, reference may be made to Garbowski l. c.

Vertical occurrence. The night hauls made by the "Thor" in 1908—10 yielded in all 590 specimens distributed among 81 hauls; disregarding the 4 spec. taken at depths less than 501 m., we have for the daytime only 50 spec. in 17 hauls. Even though the "Thor" has but 65 day hauls at depths 501—4000 m. as against 203 night, the number of positive day hauls is nevertheless very small in comparison with that of positive hauls made at night, and the number of specimens is proportionately even smaller. The reason of this slight yield from the day hauls lies, I believe, in the fact that the animals have been able to escape the net as long as they could see it. The day hauls have, by the way, a length of line varying between 65—4000 m. w., but it is natural to suppose, when comparing with the night hauls, that the animals hardly go very deep down even during the day; as to what depth they prefer, however, the slight amount of material renders it impossible to say anything definite.

The night hauls are divided into winter (Dec.—Feb.) and summer (June—Sept.).

Night hauls, winter 1908—09 (depth > 500 m.).

m. w.	No. of hauls	Percentage of positive hauls	Real no. of spec.	No. of spec. (normal hauls)	Average no. pr. normal-haul
10—35	3	20 %	7	6	2
50—65	4	22.2 -	12	11	2.7
150—250....	3	60.0 -	4	3	1
300—400....	3	27.3 -	30	30	10
> 400	3	25.0 -	9	7	2.3
Total...	16		62	57	

Night hauls, summer 1910 (depth > 500 m.).

m. w.	No. of hauls	Percentage of positive hauls	Real no of spec.	No. of spec. (normal hauls)	Average no. pr. normal-haul
10—35	27	51.9	368	625	23.5
50—65	5	29.4	25	45	9
150—250....	0	0	0	0	0
300—400....	19	50.0	96	117	6.2
> 400	14	38.9	39	35	2.5
Total...	65		528	822	

Size of ♂ and ♀ and no. of specimens (1908—12).

mm.	January		February		April		June		July		August		September		November		December		Total	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
15	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	1	1
14	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	2
13	..	1	..	2	..	..	..	1	..	..	..	..	..	..	..	..	..	..	—	4
12	..	1	..	2	..	..	..	—	..	1	..	1	..	..	..	..	..	..	—	5
11	1	3	2	5	..	..	..	—	1	2	1	1	..	..	..	..	..	..	5	11
10	2	3	3	8	..	..	1	3	1	6	3	10	..	..	..	..	..	1	10	31
9	2	5	6	9	..	..	2	6	6	16	10	6	..	..	1	..	1	2	28	44
8	..	1	4	6	2	12	17	14	21	22	11	14	..	..	—	2	—	—	55	71
7	1	1	3	2	10	12	15	13	22	21	16	15	2	..	3	1	—	—	72	65
6	1	..	1	2	11	17	18	16	17	20	13	13	..	..	3	1	—	1	64	70
5	..	..	..	1	10	17	16	16	20	16	24	24	..	..	8	1	2	1	80	76
4	..	..	..	1	10	17	16	12	4	11	14	15	..	..	3	1	2	2	59	59
3	..	..	.	..	7	7	8	2	2	2	12	6	..	..	3	..	2	1	34	18
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	1	..	4	..
Total	7	15	19	40	50	82	93	83	105	117	104	105	2	1	24	6	8	8	412	457

It will be seen from the tables that the species was only exceptionally taken with a length of line greater than 400 m. w.; worked out for normal hauls, we find for the winter only 7 spec. as against 50 with 10—400 m. w., and in summer, only 35 as against 787. It is thus evident that the species keeps almost exclusively to a zone answering to 10—400 m. w. below the surface. In summer it is found for the most part quite near the surface, answering to 10—35 m. w., this length of line having yielded 23.5 spec. per normal haul, while at a depth of only 50—65 m. w. the figure is reduced to 9. That no specimen was ever taken with a length of line of 150—250 m. w. is due to the fact that only one night haul was ever made with this length, and then gave no result.

In winter, the species keeps much deeper down, answering to a depth of 300—400 m. w. (10 spec. per normal haul); the other depths gave far fewer spec. (1—2.7 per normal haul). The hauls made in winter gave a far poorer yield than those of the summer.

On attempting to arrange the animals in mature ♂, ♀ with ova (or embryos) and young specimens (2—4 mm) in order to see if any of these classes preferred a certain depth within the range where the species is found, it was seen that this is not the case; they all live regularly distributed throughout the range of depth concerned.

Propagation. The size of the specimens from the "Thor" varies between 2 and 15 mm. but there are very few over 10 mm. When the two sexes are taken separately, we find that they are almost equally nume-

Size of adult ♂ and ♀ with ova; no. of specimens.

mm.	January		February		April		June		July		August		September		November		December	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
13	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
12	..	..	..	1	..	..	..	—	..	..	..	..	..	..	..	..	..	..
11	..	1	..	..	..	..	..	—	1	..	1	..	..	..	..	..	..	..
10	2	..	4	..	..	..	..	1	—	1	3	2	..	..	..	..	..	..
9	..	..	2	..	..	..	4	1	5	1	6	2	..	..	1	..	1	.
8	..	..	..	..	3	2	1	1	7	1	1	1	..	..	..	1	..	..
7	..	..	..	..	3	1	1	..	3	1	..	1	..	..	.	..	..	..
6	..	..	..	..	2	—	—	..	—	—	..	—	..	..	..	..	..	..
Total	2	1	6	1	8	3	6	4	16	4	11	6	..	..	1	1	1	..

rous (412 ♂, 457 ♀) in contrast to what is known in the case of other species, where one sex often is markedly predominant.

The species does not seem to attain an age of more than one year. The sizes met with in the different months may be seen from the table above.

The ♂ can hardly be determined as to sex when less than 2 mm., and the ♀ when under 3 mm.; but, as a rule 4 mm. seems to be the lowest size at which the sex can be determined with certainty. The size most frequently met with in ♂ is 5—7 mm.; in ♀ 5—8 mm.; both sexes can reach the same size (15 mm.) but ♀ over 10 mm. are considerably more numerous (23 spec.) than the ♂ (6 spec.).

On considering only adult ♂ or ♀ with eggs or embryos, the size proportion will be the same; the adult males, with ant. 2 turned at an angle, are from 6—11mm mostly 7—10 mm., females with ova being 7—13 mm. mostly 7—10.

No mature specimens were taken in September; August on the other hand, yielded 11 adult males and 6 females with ova or embryos. Adult males were found in all months during which collections were made in the Mediterranean, save only September, and females with ova or embryos likewise in all months except Sept. and Dec. Both, however, were found in greatest numbers in April—August. This shows that the true spawning season lies in these months, but that the species may otherwise probably propagate all the year round. The fact that small specimens are numerous in these months and later, but not earlier, points in the same direction.

B. The Atlantic

(compared with the Mediterranean).

In the Atlantic, 74 males and 118 females were taken, besides one specimen of indeterminable sex (5 mm., June 1910), making 193 specimens in all. In the Mediterranean, there was very little difference between the numbers of male and female specimens; in the Atlantic, however, as we see, the latter amounted to about $1\frac{1}{2}$ times as many as the former.

The species was found during the months Feb.-Oct.; that it was not taken in Nov.-Dec. is due to the fact that some of the stations for these months do not lie in sufficiently deep water.

North of 40° N, it was taken at 7 stations, (8 hauls) with 23 specimens in all; S. of 40° N, at 9 stations, (13 hauls) with 170 spec. This corresponds with the fact that its northern limit lies off the W. coast of Ireland, where it is not so abundant as farther south (see later under distribution).

The depth was as a rule 1000—3000 m. or more, only two stations (2 hauls) lie in 500—1000 m., all the

	No. of stations	No. of hauls	No. of specimens	
June 1905	3	3	14	N. of 40°N.
May 1906	1	1	1	
August 1906	1	1	5	
September 1906	2	3	3	
February 1909	1	2	5	S. of 40°N.
March 1909	2	2	2	
June 1910	2	3	66	
July 1911	1	1	23	
October 1911	3	6	74	
In all...	16	21	193	

others at greater depths; most stations (8) and hauls (10) at 1000—2000 m.

The material is unfortunately not large enough to furnish definite biological results, and only a very small number of the specimens are from the actual collections of the "Thor" in 1908—10.

As regards distribution, it is characteristic that while found at 7 stations S.W. of Ireland and outside the Bay of Biscay, in 1905—06, the chart p. 23 from 1908—10 shows 7 negative stations in the Bay of Biscay and no positive stations within that area, the most northerly positive station from 1908—10 being close south of 40° N. In addition, the chart from Lisbon to the Straits of Gibraltar shows 7 negative, and only 4 positive stations. That it should thus have been taken so far north as abt. 51° in 1905—06, and in 1908—10 not north of 40°, must be due to the northgoing current mentioned in the introduction as having been noticed in 1905.

With regard to vertical occurrence, the area north of 40° N would seem to be comparable with the Mediterranean in winter, whereas that south of this latitude rather resembles the Mediterranean in summer. In none of the areas investigated by the "Thor" however, was the species found to be so abundant or so widely distributed as in the Mediterranean.

Propagation. The sizes of the Atlantic specimens lie between 3 and 19 mm.; the females attain the largest size (19 mm.), the largest male being only 14 mm. The majority of the females range from 4 to 14 mm., of the males from 3—7, the females being thus on the whole far larger than the males, and there is also a far greater difference in point of size between the sexes than in the Mediterranean. From the table showing sizes of the two sexes for each month it will be seen that the small specimens are most numerous in October, Size of ♂ and ♀ and no. of specimens.

mm.	February		March		May		June		July		August		September		October		Total	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
19	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—
17	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1
16	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1
15	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	4
14	..	..	..	..	..	..	..	10	..	..	1	..	..	2	..	..	1	12
13	..	..	1	..	..	..	1	8	..	..	..	..	..	..	..	..	2	8
12	..	..	..	..	..	1	—	9	..	..	..	..	..	..	..	..	—	10
11	..	..	..	..	..	..	1	7	..	..	..	..	..	..	..	..	1	7
10	..	..	..	..	..	..	1	10	..	..	..	1	..	..	..	..	1	11
9	1	..	..	..	..	..	—	5	1	1	..	1	..	..	..	..	2	7
8	4	..	..	..	..	..	1	2	—	—	..	1	..	..	..	..	5	3
7	..	..	..	..	..	..	4	6	—	3	..	..	..	..	12	5	16	14
6	..	..	..	..	..	..	2	2	3	4	..	..	..	..	9	11	14	17
5	..	..	..	..	..	..	3	2	3	3	..	..	..	..	8	6	14	11
4	..	..	..	..	..	..	..	1	3	2	..	..	..	..	8	7	11	10
3	..	..	..	..	..	..	..	—	—	..	..	..	..	..	7	1	7	1
Total	5	..	1	..	..	1	13	66	10	13	1	5	..	3	44	30	74	118

when specimens over 7 mm. are not found at all, while August and September yielded only large specimens (> 8—9 mm.). This agrees well with the finding of females with ova and adult males, which were only taken in March—June-July; from this it is evident that the species propagates in summer, after which the older individuals die off, the species here, as in the Mediterranean, only attaining an age of one year. There is this difference, however, as compared with the Mediterranean, that in the latter sea the species seems to propagate all the year round, though the summer is its true season.

Distribution.

1. Mediterranean. That the species should be so numerous and so widely distributed in the Mediterranean as apparent from the "Thor" collections is somewhat unexpected, as we have but little information on this point in the earlier literature; it has, however, previously been recorded both from the eastern and western parts of the Mediterranean. Marseilles 1000 m. (Chevreux, Mem. Soc. Zool. France 1895). Between Capo Corso and Monaco, Capri, 1500—2500 m., Æolian Islands (Vosseler in Lo Bianco 1901 and 1903—04). Garbowski notes it from 10 places in the Eastern Mediterranean, within an area between 31°30′N and 37°40½′N to 19°54′E and 28°40′E, depth (where recorded) 200—500 m below surface.

2. The Atlantic. The largest collection of material mentioned in the literature is doubtless that in the Copenhagen Zoological Museum, and utilised by Bovallius in his monograph (determined as *Tyro Sarsii*). Here the distribution is given as "The North, tropical and South Atlantic". As a matter of fact, the material comprises some 85 localities in the Atlantic and some 15 in the Indian Ocean (*vide infra*); from some localities several specimens were taken, but there are no records as to depth. The northern limit for this material is noted as 42°N, 44°W, 39°30′N, 50°W, 38°40′N, 63°W and 38°N, 68°W; the western localities are 33°40′N, 72°46′W, and 21°40′N, 76°58′W, so that the species goes right in to the Bahamas and into the Caribbean Sea. From the belt between abt. 10°N and the Equator only comparatively few samples were found, otherwise the material is more or less equally distributed throughout the area from the Equator to the northern limit above mentioned. South of the Equator, it is found almost exclusively in the western part of the Atlantic, from the coast of S. America to abt. 15°W; there are only a very few samples from more easterly localities; (8°S, 13°20′W; 11°50′S, 8°10′W — 5°10′S, 13°20′W; 20°14′S, 1°04′W; 33°S, 11°W; 33°30′S, 11°W). The southernmost limit for the specimens determined by Bovallius thus lies from 20°14′S, 1°4′W, 30°30′S, 22°30′W, 33°30′S, 11°W, to 29°S, 37°23′W. Save for the north-easterly corner of the area of distribution, off W. Ireland, this material thus gives — even better than any later expedition — the entire distribution of the species throughout the Atlantic; that it is not

found in the eastern part of the Atlantic south of the equator is perhaps due to the cold Benguela current.

Below will be found a summary of the information contained in the literature regarding its distribution in the Atlantic. The northern limit lies at W. Ireland, from where TATTERSALL (1906) mentions it as taken at 4 stations (5 hauls) 293—1200 fath., the specimens as a rule being found abt. 100 fathoms above bottom and only one at a time, which agrees with the results of the "Thor".

Bay of Biscay 0—25—50—75—100 fms (STEBBING, Biscayan Plankton 1904). W. of Azores 40°28¾′ N, 38°53′ W, surf., 10^{00} pm., and 40°46′¼ N, 40°09′ W, surf., 9^{30} pm. (CHEVREUX, Hirondelle). S. of Azores: 38° N, 29° W; 36°46′ N, 26°41′ W, 0—3250 m; 30°48′ N, 27°38½′ W; 30°37′ N, 27°13′ W; 30°41′ N, 17°46′ W, 0—2500 m.; 27°43′ N, 18°28′ W (CHEVREUX, Scinidæ 1905).

VOSSELER notes it (Plankton-Exp.) from 18 stat., 30 spec. in all: Sargasso Sea 31½° N, 40¾° W; Northern equatorial current 12°—28° N, 22°—40° W. Guinea current ca. 3°—9½° N, ca. 18½°—42° W, and South equatorial current ca. 1°—7½° N, 14°—35° W. — STEBBING mentions it (Amphip. trop. Atlant. 1895) from 7°11′ N, 15°54′ W, 100 fms, day, and 5° 88′(!) N, 14°20′ W, surf., night. — "Challenger"-Exp. took it 19°6′ S, 35°40′ W, and 26°15′ S—29°35′ S to 32°56′ W—28°9′ W, surf. night.

3. The Indian Ocean. Although BOVALLIUS in his monograph only mentions the species as from the Atlantic, he has for the purposes of his mentioned work borrowed specimens from the Copenhagen Zool. Museum taken at the following localities in the Indian Ocean, what he mentions without giving special localities, while on the other hand he acknowledges the loan of specimens not found in our Museum at all. 32°30′ S, 42° E; 21°30′ S, 57°40′ E; 22°40′ S, 57° 40′ E; 23°40′ S, 57°40′ E; 26°20′ S, 58° E; 27°40′ S, 58° 30′ E; 23°16′ S, 72° E; 22°44′ S, 86° E; 22°40′ S, 81° 50′ E; 23°30′ S, 81° E; 27°30′ S, 98° E; 10° S, 104° E; 24°50′ S, 103°0′ E; 13° S, 103°20′ E; 15°30′ S, 111°40′ E.

These localities thus indicate that the species has been found in the southern part of the Indian Ocean, (South of abt. 13°S) from east of Cape Colony right across to the waters between Java and Australia. Otherwise, the species is ,as far as I am aware, only recorded from the Indian Ocean (NW and NNW of Desroches 200—400 fath.) by A. O. WALKER (Transact. Linnean Soc. London, Zool. vol. 13 1909—10, p. 52) and BOVALLIUS (*Tyro atlantica*) in the Monograph p. 14 (without locality).

4. The Pacific. Quoted with a ? by STEBBING in the "Challenger" Exped. from 15°58′—14°7′S, 160°48′—153°43′E. If synonymous with *S. longipes* Dana, it was taken at 18°10′S, 126°W (DANA) and North Pacific (STREETS).

2. SCINA VOSSELERI Tattersall.

Scina Vosseleri Tattersall, Fisheries Ireland, Sci. Invest., 1905, pt. 4 (1906), Amphip., p. 7, Pl. 1.

St. 62. *50°25′ N, 12°44′ W.* 2480—2775 m. 5-6-1906. 1500 m. w. 2^{45} am. 1 ♂, 7 mm.

Distribution, W. of Porcupine Bank, 53°7′ N, 15°06′W, 860 fath., Petersen trawl at 750 fath. One male. — The ♀ is not known. This species seems to belong to deeper water layers than most other species of the genus.

3. SCINA MARGINATA Bovallius (Chart 3 [pars]).

Tyro marginata Bovallius, Bihang K. Svenska Vet. Akad. Handl., vol. 10, No. 14, 1885, p. 15.

— — — , Monograph pt. 1, 1887, p. 21, Pl. 3 fig. 18—33.

Fortunata lepisma ♀ Chun, Math. u. Naturwiss. Mitth. Akad. Berlin, vol. 45, 1889, p. 533 (343), Pl. 3 fig. 8.

Scina marginata Garbowski, Denkschr. K. Akad. Wien vol. 63, 1896, p. 100 (64), Pl. 2, Pl. 3 fig. 17—18.

— — Chevreux, Amphip. Hirondelle 1900, p. 122, Pl. 14, fig. 8 (colour. fig.), Pl. 15 fig. 1.

— — Stebbing, Biscayan Plankton 1904, p. 23, 25 (*lit. et syn.*).

Atlantic:

St. 399. ("Ingolf"). *34°23′ N, 15°31′ W.* > 2600 m. 26-10-1911. 56 m. w. (S. 150). 9^{10} pm. 30 min. 1 ♂.

Mediterranean:

St. 57. *36°40′ N, 3°30′ W.* 105 m. 20-2-1909. 200 m. w. 6^{30} am. 30 min. 1 ♀.

St. 132. *38°57′ N, 9°47′ E.* 1227 m. 14-7-1910. 600 m. w. 4^{50} am. 30 min. 1 ♀.

St. 145. *32°38′ N, 19°02′ E.* 1920 m. 25-7-1910. 300 m. w. 4^{10} am. 30 min. 1 ♂.

St. 161. *36°12′ N, 27°16′ E.* > 1000 m. 2-8-1910. 25 m. w. 3^{00} am. 30 min. 1 ♀ (2,5 mm.).

St. 181. *38°49′ N, 25°09′ E.* 255 m. 13-8-1910. 300 m. w. (Y). 1^{25} pm. 30 min. 1 ♀.

St. 197. *40°34′ N, 13°36′ E,* 1040 m. 24-8-1910. 25 m. w. 7^{45} pm. 15 min. 1 ♀.

St. 197. ibid. 300 m. w. 7^{00} pm. 30 min. 1 ♀.

St. 199. *39°32′ N, 10°49′ E,* Ca. 2700 m. 25-8-1910. 25 m. w. 9^{00} pm. 15 min. 1 ♀.

St. 199 ibid. 300 m. w. 9[25] pm. 20 min. 1 ♂, 1 ♀.
St. 276. ("Pangan"). *36°30′ N, 19°20′ E.* > 3000 m. 4-4-1911. 132 m. w. (S. 200). 11[20] pm. 35 min. 1 ♂.
St. 277. ("Pangan"). *33°20′ N, 27°30′ E.* > 3000 m. 6-4-1911. 132 m. w. (S. 200). 11[05] pm. 30 min. 2 ♀.
St. 297. ("Pangan"). *33°10′ N, 25°35′ E.* > 2000 m. 25-6-1911. 25 m. w. (S. 200). 11[30] pm. 30 min. 1 ♂.
St. 298. ("Pangan"). *37°20′ N, 21°10′ E.* > 2000 m. 26-6-1911. 38 m. w. (S. 200). 11[30] pm. 30 min. 2 ♀.
Almost all the specimens are 5 mm. in length.

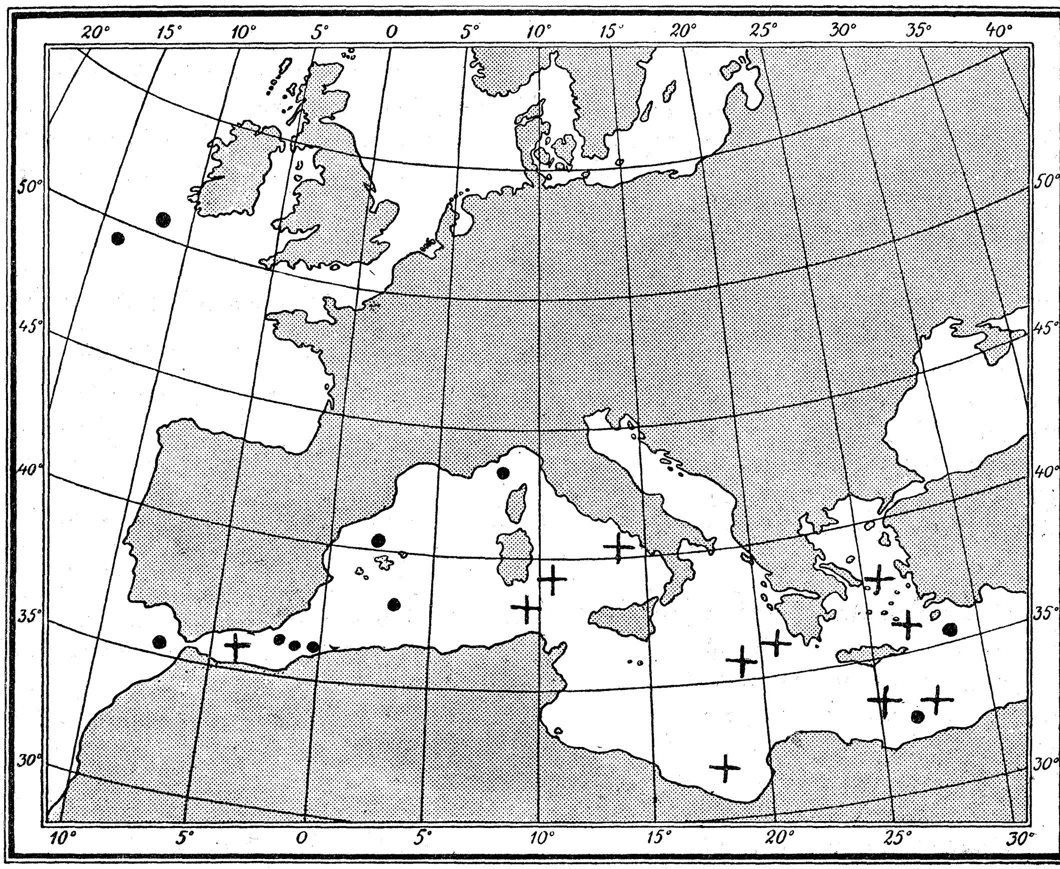

Chart 3. ● Scina borealis (St. 377, 398—99 lie outside the map to the west).
+ — marginata (St. 399 lies outside the map to the west).

The material includes only 16 specimens from the Mediterranean and 1 from the Atlantic. The following results are based exclusively on the material from the Mediterranean.

Depth of the stations:

m	No. of stations
0—250	1
251—500	1
501—1000.....	0
1001—2000.....	4
2001—3000.....	3
> 3000	2

The species is almost always found singly; only in 3 cases were two specimens taken together. It requires as a rule over 1000 m. of water, and is found at depths ranging to over 3000 m.; only exceptionally it has been taken in comparatively shallow water (105 and 255 m.).

Vertical occurrence. During the night, the species is found at depths answering to 25—300 (600) m. w.; the only two day hauls made were with 200 and 300 m. w.

Propagation. Nothing can be stated as to this, as none of the specimens had ova. Almost all are of equal size; abt. 5 mm., only one specimen (from St. 161, 2-8-1910) was but 2.5 mm. which seems to suggest that it had commenced life somewhat earlier in the year.

Distribution. The specimens from the "Thor" were taken sporadically in all parts of the Mediterranean, but only a single specimen from the Atlantic.

1. From the Mediterranean, the species is previously recorded as from Naples (Vosseler, Plankton Exped.), from close SW of Capri (Lo Bianco 1901—1902), Messina (Bovallius) and the eastern Mediterranean (Chun and Garbowski) but only in single specimens.

2. The Atlantic. Here it is distributed throughout the area outside the mouth of the Mediterranean in a range bounded by the Bay of Biscay, abt. 57° W and abt. 30°N. It is also known from a small area S. of the equator. A detailed list of the localities is as follows:

Length of wire	Positive hauls		No. of specimens	
m.	Night	Day	Night	Day
25	4	.	4	.
38	1	.	2	.
100—200.............	2	1	3	1
300..................	3	1	4	1
600..................	1	.	1	.

Bay of Biscay, 250—150 fms. 1 spec. (Stebbing, Biscayan Plankton 1904). Not found at W Ireland, its place here being taken by a related species, *S. sub-*

marginata Tatt.—47°38¼′N, 22°13¾′W, 1300 m., 0^{50} pm. (Chevreux, Hirondelle 1900). Abt. 38½° N, abt. 19°—20° W; 32°18′ N, 23°58′ W, 5422 m., 0—2000 m. w.; 31° 46′ N, 25°W, 5425 m., 0—3000 m.w.; 30°47′ N, 37°13′ W (Chevreux, Scinidæ 1905). Bay at Orotava, Tenerife (Chun). Florida current St. 47: ca. 40½° N, 57° W, 0—200 m., and Sargasso Sea ca. 30,8° N, 30,9° W, 0—200 m. (Vosseler: Plankton-Exped.).

S. of the Equator it has been taken in the S. equatorial current St. 194: 5,1° S, 14,1°W, 0—400 m., and St. 225: 2,4° S, 36,4° W, 200 m. (Vosseler, Plankton-Exped.).

Where the number of specimens is noted, this shows, as in the case of the material from the "Thor", that the species was found only in single specimens, at the outside two at a time.

4. SCINA PACIFICA Bovallius.

Tyro pacifica Bovallius, Syst. list Amphip. Hyper. 1887, p. 4.
— — — Monograph pt. 1, 1887, p. 25, Pl. 3 fig. 10—17.
Scina — Vosseler, Plankton-Exp. 1901, p. 113.
— — Tattersall, Amphip. Ireland 1906, p. 14.

St. 69. *36°13′ N, 9°44′ W.* > 3500 m. 28-2-1909. 300 m. w. 3^{05} pm. 1 ♀ with ova.
St. 277. ("Pangan") *33°20′ N, 27°30′ E.* > 3000 m. 6-4-1911. 132 m. w. 11^{5} pm. 1 ♂.

Distribution. 1. The species has never before been taken in the Mediterranean ("Pangan" St. 277 lies between the eastern point af Crete and the Nile Delta, i. e. in the eastern Mediterranean).

2. In the Atlantic, on the other hand, it has been found at several places from W. Ireland to a little south of the equator. Below will be found a list of all localities which I have been able to find in the literature.

2 places W. of Ireland, depth > 1000 fms., 400 and 730 fms. down (Tattersall 1906). 37°17′ N, 28°53′ W (Azores), depth 3410 m., 0—3000 m. (Chevreux, Scinidæ 1905). Sargasso Sea 30,9° N, 50,0° W, 0—400 m.; N.-equatorial current 18,9° N, 26,4° W, 0—400 m.; S.-equatorial current 0,1° N, 15,2° W, 0—400 m. (Vosseler, Plankton-Exped.). 4°26′ S, 10°18′ E, townet 235 fms., noon (Stebbing, Amphip. 1895).

3. As regards the Pacific, Bovallius' type specimen was taken here (Corinto, Nicaragua).

The species seems never to have been found in more than one specimen at a time.

5. SCINA SIMILIS Stebbing.

Scina similis Stebbing, New Amphip. Trop. Atlant.; Transact. Zool. Soc. London, vol. 13, pt. 10, 1895, p. 362, Pl. 54 fig. A.

St. 192. *38°07′ N, 15°35′ E.* 650 m. 20-8-1910. 600 m. w. 10^{15} pm. 1 ♂.

Up. 1 is a little too big; in other respects the (somewhat defective) specimen corresponds very well with Stebbing's description.

Distribution. 3°0′8″ N, 7°43′ W, taken at noon from a depth of 50 fathoms (Stebbing l. c.). ? Capri (Vosseler in Lo Bianco 1903).

6. SCINA RATTRAYI Stebbing. !

**Scina Rattrayi* Stebbing, New Amphip. Trop. Atlant.; Transact. Zool. Soc. London, vol. 13, pt. 10, 1895, p. 358, Pl. 53 fig. A.
— — Chevreux, Amphip. Hirondelle 1900, p. 123, Pl. 15 fig. 2.
— *Bovallii* Vosseler (*non* Chun), Plankton-Exp. 1901, p. 105, Pl. 9 fig. 8—17.
— *Rattrayi* Stebbing, Biscayan Plankton 1904, p. 23, 26 (*lit. et syn.*).
— — Tattersall, Fisheries Ireland, Amphip. 1905 (1906), p. 10 (distrib. at Ireland).

St. 82. *51°00′ N, 11°43′ W.* 840—1350 m. 15-6-1905. 1200 m. w. (Y 330) 0^{45} pm. 120 min. 5 ♀, 1 ♂.
St. 76. *49°27′ N, 13°33′ W.* > 2600 m. 11-6-1906. 2800 m. w. (D. 2). 9^{45} pm. 30 min. 2 ♀.

Distribution. 1. The "Thor" has strangely enough not found this species in the Mediterranean, though it is previously known from the eastern part of the western basin, *viz*; close south of Capri (Vosseler in Lo Bianco 1901, [1902]), Capri, between Capo Corso and Monaco, and the Æolian Islands (Vosseler in Lo Bianco 1903, [1904]).

2. In the Atlantic it is known from W. of Ireland to a little south of the equator; the following list of localities is, I hope, complete. At W. of Ireland it was taken at 14 stations (24 hauls), depth 411—2100 faths. net 200—1150 fathoms down, in so many specimens as to make, with *S. borealis*, the most frequently occurring species of the genus in these waters (Tattersall 1906). Walker likewise mentions it ("Oceana" 1903) from some localities W. of Ireland, at various depths, 500—1610 fathoms, but generally only a few specimens at a time. Bay of Biscay 75—0 m. 1 spec. (Stebbing, Biscayan Plankton 1904). 47°42¾′ N, 19°30¼′ W, 781 m., 4 spec. (Chevreux, Hirondelle 1900). Sargasso Sea 30,3° N, 37,9° W, 0—400 m.; N. eq. current 12,3° N, 22,3° W,

0—400 m.; Guinea current 7,9° N, 21,4° W, 0—400 m., and 5,9° N, 20,3° W, 0—400 m. (VOSSELER, Plankton-Exped. 1901). 1°55′ N, 5°55′ E, 9^{00} pm., net 360 fms. down, 1 spec. (STEBBING l. c. 1895). S. eq. current 1,5° S, 14,8° W, 0—400 m.; 2,6° S, 14,6° W, 0—400 m.; 4,1° S, 14.2° W, 0—400 m.; 5,1° S, 14,1° W, 0—400 m. (VOSSELER, Plankton-Exped.; the 8 haul of the Plankton-Exped. gave 18 spec. in all.) —

Save for the specimen mentioned by STEBBING, from the Bay of Biscay (75—0 m.) the species seems on the whole to live at a depth of abt. 400—abt. 2000 m. LO BIANCO states (Mitt. Zool. Stat. Neapel vol. 16. 1903—04, p. 197) that the species (in the Mediterranean) is found at a depth of 150—1500 m. below the surface.

7. SCINA LEPISMA Chun.

Fortunata lepisma ♂, Chun, Math. u. Naturw. Mitth. Akad. Berlin, vol. 45, 1889, p. 533 (343), Pl. 3 fig. 10.

Scina Bovallii Chun, Zool. Anzeiger, Jahrg. 12, 1889, No. 309, p. 308.

*— *lepisma* Stebbing, Biscayan Plankton 1904, p. 23, 27, Pl. 3 fig. B.

non *Scina Bovallii* Vosseler, Amphip. Plankton-Exp., 1901, p. 105.

St. 82. *51°00′ N, 11°43′ W.* 840—1350 m. 15-6-1905. 1200 m. w. (Y. 330). 0^{45} pm. 120 min. 1 ♂ (+ ? 1 defective spec.).

Distribution: Between Tenerife and Gran Canaria, 1600 m (CHUN). Bay of Biscay 300—0 fathoms down (STEBBING). 27°13′ N, 18°28′ W (Canaries) (CHEVREUX, Scinidæ 1905). — The ♀ is not known.

8. SCINA BOREALIS G. O. Sars (Chart 3 [pars], p. 28).

Clydonia borealis G. O. Sars, Christiania Vid.-Selsk. Forh. No. 18, 1882, p. 75, Pl. 3, fig. 1.

**Scina* — — Account vol. 1, Amphip., 1895, p. 20, Pl. 8.

— — Stebbing, Biscayan Plankton 1904, p. 23, 28 (*lit. et syn.*).

Atlantic.

St. 76. *49°27′ N, 13°33′ W.* > 2600 m. 11-6-1906. 2800 m. w. (D. 2). 9^{45} pm. 30 min. 1 ♀.

St. 82. *51°00′ N, 11°43′ W.* 840—1350 m. 15-6-1905. 1200 m. w. (Y. 330). 0^{45} pm. 120 min. 5 ♂, 6 ♀.

St. 82. ibid. 800—1200 m. w. 2 ♂ (one of them 3 mm.).

St. 91. *35°53′ N, 7°26′ W.* 1225 m. 18-6-1910. 1600 m. w. 5^{25} pm. 60 min. 3 ♀.

St. 377. ("Florida"). *31°23′ N, 18°08′ W.* > 4300 m. 23-7-1911. 15 m. w. (S. 200). 8^{05} pm. 30 min. 1 ♀, 2 ♂.

St. 398. ("Ingolf"). *36°48′ N, 14°22′ W.* > 2600 m. 26-10-1911. Surface (S. 200). 12^{40} am. 30 min. 2 ♂, 2 ♀.

St. 399. ("Ingolf"). *34°23′ N, 15°31′ W.* > 2600 m. 26-10-1911. Surface (S. 200). 9^{10} pm. 30 min. 6 ♂, 4 ♀ (6 of them 2—3 mm.).

St. 399. ibid. 56 m. w. (S. 150). 9^{10} pm. 5 spec. (2 ♂, 3 ♀).

Mediterranean.

St. 106. *36°33′ N, 2°00′ W.* 1150 m. 25-6-1910. 1200 m. w. 0^{20} am. 60 min. 1 ♂, 2 ♀ (1 of them with ova).

St. 107. *36°13′ N. 1°28′ W.* > 2000 m. 25-6-1910. 2000 m. w. 7^{30} am. 60 min. 3 ♂, 5 ♀.

St. 108. *36°03′ N, 0°27′ W.* > 2435 m. 26-6-1910. 2000 m. w. 0^{40} am. 60 min. 20 ♂, 19 ♀ (1 ♀ with ova; some specimens only 3 mm.).

St. 115. *38°17′ N, 4°11′ E.* 2800 m. 29-6-1910. 65 m. w. 1^{20} am. 15 min. 1 ♂.

St. 115. ibid. 2000 m. w. 0^{30} am. 60 min. 1 ♂, 1 ♀.

St. 122. *43°50′ N, 8°34′ E.* > 1500 m. 2-7-1910. 1200 m. w. 5^{30} pm. 60 min. 1 ♂.

St. 156. *32°31′ N, 26°51′ E.* > 3000 m. 30-7-1910. 600 m. w. 3^{00} pm. 30 min. 1 ♀.

St. 160. *35°59′ N, 28°14′ E.* > 1000 m. 1-8-1910. 1000 m. w. 3^{35} am. 60 min. 1 ♀.

St. 209. *40°34′ N, 3°03′ E.* > 2000 m. 29-8-1910. 2000 m. w. 7^{25} am. 45 min. 10 ♂, 10 ♀ (some of the spec. 6 mm.).

Nearly all spec. abt. 5 mm. (or a trifle less).

The "Thor"s material contains 115 specimens in all, 39 from the Atlantic and 76 from the Mediterranean. The sexes are as nearly as possible equally represented, with 56 males as against 59 females. Neither in the Mediterranean nor in the Atlantic was it taken at depths less than 1000 m. and it can be met with at depths down to over 4300 m. water.

Depth in meters	Number of stations	
	Mediterranean	Atlantic
0—1000..	0	0
1001—2000..	3	2
2001—3000..	4	3
> 3000..	1	1

Vertical occurrence.

In the Mediterranean, it was taken during the night in 5 hauls, 65—2000 m. w. with 46 spec. in all; as 43 of these were from the two hauls made with 2000 m. w. it is pretty certain that these really were taken at that depth and not higher up during the process of hauling in. During the daytime, it was taken in 4 hauls, 600—2000 m. w. with 30 specimens in all; in this case also by far the greater number (28) are from the greatest depth.

In the Atlantic, the case is somewhat different. Disregarding a single specimen taken during the night with 2800 m. w. and possibly picked up very much nearer the surface, we find it represented in 4 night hauls (21 spec.) from 10—56 m. w. and 3 day hauls (16 spec.) 1000—1600 m. w. It thus moves up by night quite to the surface (2 hauls, 14 spec.) but in the daytime does not seem to be found so deep as in the Mediterranean.

The species was strangely enough only taken during the months of June, July, August and October.

Propagation. Females with ova were only found in the Mediterranean; the dates are: 25—26 June (St. 106, 108; 1200—2000 m. w.). Some few specimens are small. At St. 82 in the Atlantic (15-6-1905) a male of 3 mm. was taken (800—1200 m. w.), and at St. 399 (Atlantic, 26-10-1911, surface) six of 2—3 mm., while some of the spec. from St. 108 (Mediterr., 26-6-1900, 2000 m. w.) were of 3 mm. The time of propagation thus seems to fall in summer, both for the Mediterranean and the Atlantic; this also agrees with the fact that the largest specimens (6 mm.) were taken about the end of August (29-8-1910, St. 209) and would then probably have been hatched during the previous summer. The mature individuals seem to keep to the greatest depths, (1200—2000 m. w.) while the young ones may go right up to the surface. The material is, however, too small to permit of our drawing definite conclusions.

Distribution. 1. In the Mediterranean, a number of specimens were taken by the "Thor" in the western basin, and at two places in the eastern basin (St. 156 and 160). It has formely been recorded by Chevreux (Scinidæ 1905) from some places in the western basin, *viz*; Toulon 1000 m., Monaco 615 m. and Calvi (Corsica) 2000 m. Capri (Lo Bianco 1903, 1904).

2. In the western part of the Atlantic it is only known from Bredefjord (S. Greenland) 450—350 m. (Nansen net) and 800 m. w. (ring trawl) (K. Stephensen, Medd. om Grønl. vol. 53, 1916).

In the Polar Sea it has strangely enough been found at three places north of Eastern Siberia (80°N, 134°E) at 300 m. depth (G. O. Sars, Crust., in Nansen, Norweg. Polar Exped. 1900).

In the Eastern Atlantic it is found, where the depth is sufficiently great, from Lofoten to the Canaries, The following list of localities is I hope, complete.

Norway from Lofoten (200—300 fms.) to Kristianiafjord (100—150 fms.) (Sars, Account). Faroe Channel, tow-net down to 300 fms. (Norman, Ann. Mag. Nat. Hist., ser. 7, vol. 5, 1900, p. 135). 11 stations (13 hauls) at W. Ireland, 375—1200 fms. net 350—1150 fms. down, many spec.: in these waters it is thus, together with *S. Rattrayi*, the commonest species of the genus (Tattersall 1906). Bay of Biscay 44°5′ N, 4°45′ W, 960 m. (Bonnier, "Caudan" 1896), 46°15′ N, 7°09′ W, 0—3000 m., 44°34′ N, 4°38½′ W, 1700 m., 43°34′ N, 7°14¼′ W, 0—1200 m. (Chevreux, Scinidæ 1905), and Bay of Biscay, loc. not stated, 1250—0 fms. and 750—500 fms. (Stebbing, Biscayan Plankton 1904). SE of Azores 38°08′ N, 28°28½′ W, 2815 m., 0—1500 m. 36°17′ N, 28°53′ W, 3410 m., 0—3000 m., and 36°46′ N, 26°41′ W, 3620 m., 0—3250 m. (Chevreux, Scinidæ 1905). E. of Azores ca. 38½° N, ca. 20° W (Chevreux l. c.). Atlantic coast of Morocco (Chevreux l. c.). 8 places off the Canaries and between these and the Azores: where depth of water is noted it is abt. 5400 m., the depth of hauls below surface ranging from 0—1000 m. to 0—5000 m. (Chevreux, Scinidæ 1905.).

It will thus be seen that the "Thor" stations 76 and 82 connect up the two previous finds at W. Ireland and the Bay of Biscay, and the "Thor" stations 91, 377, 398 and 399 make connection between the Mediterranean and the previously recorded occurrences over towards the Azores.. The "Thor" St. 91 lies as a matter of fact far up in the Bay of Cadiz.

3. In the Indian Ocean it has been taken at 25—1200 fathoms (A. O. Walker, Transactions Linnean Society, London, ser. 2, Zool. vol. 13, 1909—10 p. 53).

As will be seen from the above, the species is eurythermic to an extreme degree.

9. SCINA UNCIPES Stebbing.

**Scina uncipes* Stebbing, New Amphip. trop. Atlant.; Transact. Zool. Soc. London, vol. 13, pt. 10, 1895, p. 363, Pl. 54 fig. B.
— *spinosa* Vosseler, Plankton-Exp. 1901, p. 108, Pl. 10 fig. 11, 14 (*teste* Stebbing, Biscayan Plankton 1904, p. 23).
— *uncipes* Tattersall, Amphip. Ireland 1905 (1906), p. 11.

St. 82. *51°00′ N, 11°43′ W.* 840—1350 m. 15-6-1905. 1200 m. w. (Y. 330). 0^{45} pm. 120 min. 1 ♀.

Distribution: 7°44′ N. 17°25′ W, 50 fath., 6—7 pm (Stebbing l. c. 1895). W. of Porcupine Bank, 53° 7′ N, 15°6′ W, 860 fath., Petersen-trawl at 750 fath. (Tattersall l. c.). Southern equatorial current No. 181 (abt. 0° N, abt. 15° W) 500—700 m down (Vosseler l. c.).

10. SCINA CURVIDACTYLA Chevreux.

Scina curvidactyla Chevreux, Bull. Inst. Océanogr. Monaco, No. 291, 1914, p. 3, fig. 2.

St. 61. *35°57′ N, 5°35′ W.* (Gibraltar). 740 m. 21-2-1909. 600 m. w. 3^{35} pm. 60 min. 1 ♂.

Distribution: 49°19′ N, 13°11′ W, 0—3000 m.w.; 38°46′ N, 10°10′ W, 0—1550 m.w.; 37°46′10″ N, 0°05′ W (off Cartagena, Spain), 0—520 m. w.; 39°36′ N, 5°56′ E (between Minorca and Sardinia), 0—2800 m. w (CHEVREUX).

11. SCINA LATIPES n. sp. (Fig. 7)

St. 91. *36°53′ N, 7°26′ W.* 1225 m. 18-6-1910. 1600 m. w. 5^{25} pm. 1 ♂, 7 mm.

At this station, the "Thor" found a specimen of a very interesting new species. As to the antennæ there is nothing to remark beyond the fact that ant. 1 is not half as long as the body. In p. 1 the 6. joint terminates in a process like *Sc. marginata* and *Sc. incerta*, no such process however, being found on p. 2. P. 3—p. 4 are of the usual shape. P. 5 on the other hand is very charac-

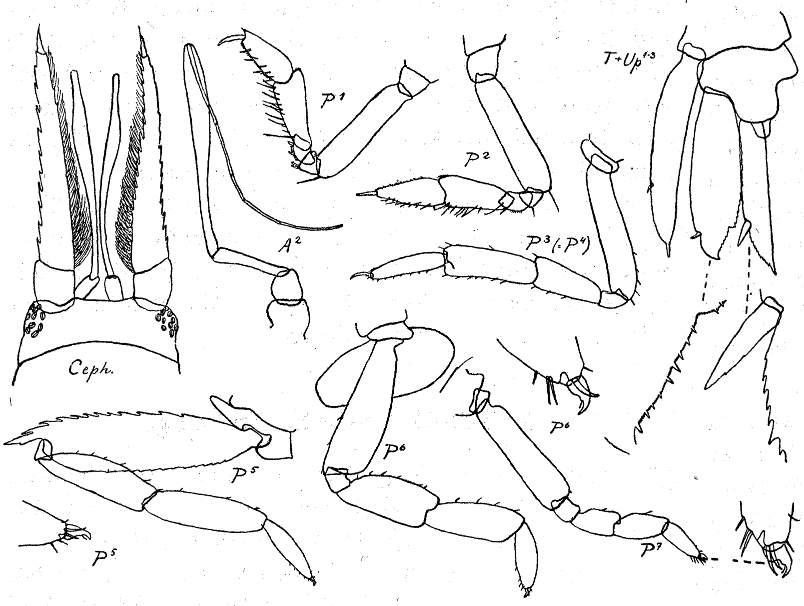

Fig. 7. *Scina latipes* ♂.

teristic in the enormous breadth of the 2. joint. This is of about the same length as the 4. and 5. joints together, and has throughout the whole of its upper margin, (except at the proximal end) large teeth, and smaller ones on the lower edge. The terminal tooth on the upper margin is bifid. The 4.—6. joints are roughly lancet-shaped. Also p. 6 is very broad. P. 7 resembles the corresponding leg in *Sc. marginata*, and is not much shorter than p. 6. Of the urop., up. 2 in particular is very broad. All are of about the same length. In up. 1, the extreme point is sharply marked off from the remainder, the outer ramus is, as in up. 3, attached at about the commencement of of the distal third, and is very small (in up. 3 somewhat larger). In up. 2 on the other hand, the outer ramus is attached at about the commencement of the distal fifth, and this up. is very broad, broader than in any other species. The telson is not particularly small, roughly trapezoid with rounded end.

The name *latipes* refers to the broad p. 5—p. 6 and up. 2.

Fam. Vibiliidæ Claus.

Vibiliidæ Claus, Grundzüge d. Zool., 2. Aufl. 1872, p. 236.

— Bovallius, Monograph pt. 1, 1887, p. 42 (*lit.*).

— Stebbing, Challenger-Amphip. 1888, p. 1277 (*lit.*).

* — Behning, Die systemat. Zusammensetzung u. geogr. Verbreitung d. Fam. Vibiliidæ; Zoologica, Heft 67, 1912, p. 211—25 (with *key to the species and genera, list of the lit. and 6 maps*).

The two genera of this family are both represented in the "Thor" material.

The genus *Vibilia* has 25 (26) species, of which 11 were taken by the "Thor", represented by 3454 specimens in all, *viz.:*

V. Jeangerardi (448 spec.), *V. gibbosa* (1 spec.), *V. robusta* (98 spec.), *V. Kröyeri* (98 spec.), *V. Stebbingi* (7 (8) spec.), *V. viatrix* (148 spec.), *V. propinqua* (525 spec.), *V. armata* (1819 spec.), *V. pyripes* (4 spec.), *V. grandicornis* (1 spec.) and *V. cultripes* (105 spec.).

None of the species are new to science.

It will be seen from the table that 4 are new to the Mediterranean, viz.: *V. Kröyeri*, *V. Stebbingi*, *V. viatrix* and *V. cultripes*. Four species previously found in the area investi-

	Mediterr.	Atlantic
V. Jeangerardi	×	×
- gibbosa	..	×
- robusta	..	×
- Kröyeri	n*)	n
- Stebbingi	n	×
- viatrix	n	×
- propinqua	×	×
- armata	×	×
- pyripes	..	×
- grandicornis	..	×
- cultripes	n	×
- dentata	..	(×)*)
- australis	..	(×)
- Chuni	(×)	(×)
- Bovallii	(×)	(×)

*) n indicates new for the area in question.
(×) — that the species was not taken by the "Thor".

gated by the "Thor" do not occur in the present material, *viz.*: *V. dentata* (Atlantic), *V. australis* (Atlantic), *V. Chuni* (Med. and Atl.) and *V. Bovallii* (Med. and Atl.). With regard to the two last, however, very few specimens of these are known at all.

As shown by the table above, there are no species endemic to the Mediterranean, whereas several species, though doubtless belonging to the upper water layers, were found in the Atlantic without penetrating into the Mediterranean. The species to which this applies however, are either only known at all in very few specimens, or have their principal area in the Atlantic situate south of the waters investigated by the "Thor", and must thus be regarded as accidental visitors in the Atlantic off the Straits of Gibraltar or even farther north.

Among the most interesting results of the expedition must be reckoned the fact that *V. Kröyeri* has now been shown to be quite common in the "Thor" area (previously known only from W. Greenland) and that *V. cultripes* has been found to form a constant, albeit small component in the Mediterranean stock.

In the case of several species, the "Thor" has advanced the northern limit considerably; for some even as far as north of Ireland, but these specimens are from 1905—06, when a strong Atlantic current had carried many southerly species northward (see introduction p. 5) and the species in question cannot thus be said to have their true habitat in these northern regions. A number of species have doubtless been carried north directly by the *Salpæ*.

For a rough general survey of what is known as to the geographical distribution of the species, reference may be made to Behning's 6 charts in the Zoologica (l. c.); unfortunately, nothing is stated as to other conditions (depth, etc.), and his two preliminary reports in Zool. Anzeiger (l. c.) state as a rule nothing whatever as the distribution, but merely mention that the species referred to were taken by this or that expedition, without further note as to locality.

The size of the "Thor" material is best seen by comparison with that from other expeditions.

The "Challenger"-Exp. had only 4 species (3 new); 34 spec. Chevreux ("Hirondelle" 1900) has also 4 species (2 new), with ca. 200 spec. The German Plankton-Exp. (Vosseler 1901) had 10 species (1 new); only 97 specimens in all. German Antarctic-Exp. (Behning, Zool. Anz. 1913, p. 529) had also 10 species (no. of specimens?). Swed. Antarct.-Exped. (Behning ibid. p. 530) only 1 species, and the "Albatros"-Exp. (Behning ibid. p. 530) 11 species (1 new) (no. of specimens?), while the Scottish-Norwegian "Michael Sars"-Exped. (Behning, ibid. p. 533) had 10 species (no. of specimens?). The nos. of individuals from these Exp. can hardly have been great, since they are not noted. The German "Valdivia"-Exp. (Behning, Zool. Anz. 1912, p. 5) had 12 species (3 new), in "eine recht ansehnliche Zahl": 213 specimens, of which *V. cultripes* make up 126.

It is throughout noticeable how small the figures are (where stated at all) in comparison with those of the "Thor". At any rate, we may safely say that the "Thor" material is several times greater than that of all other expeditions together.

All the species are oceanic, living at depths of over 1000 m. or at least over 500 m., and keep as a rule (during the night) to the upper water layers (10—300 m. w.).

Some few species are said to live symbiotically in *Salpæ*, but the "Thor" material furnishes no information as to this.

The only species of the genus *Vibilioides* is represented by a single specimen in the "Thor" material; it appears, in contrast to *Vibilia*, to keep to the very deep water layers, and this is probably the reason why it has not been found in the Mediterranean.

1. Genus VIBILIA M.-Edw.

Vibilia Milne-Edwards, Extrait de Recherches pour servir à l'Hist. Nat. des Crust.; Ann. Sci. Nat., vol. 20, 1830, p. 386.
— Bovallius, Monograph pt. 1, 1887, p. 43 (*lit.*).
— Stebbing, Challenger-Amphip. 1888, p. 1278 (*lit.*).
— Vosseler, Plankton-Exp. 1901, p. 118.
* — Behning, Vibiliidæ; Zoologica 1912, p. 212. (*key to the species*).

Neither eyes nor antennæ are in all species a reliable sex character, increasing as they do with age in both sexes; old ♀ may in several species have eyes nearly as large as ♂.

In some species, there is a great sexual difference in up. 3; this applies on the whole to those species where the sexual difference in eyes and antennæ is not very great.

That only so few ♀ with ova or embryos were found in the material is doubtless due to the fact that both ova and embryos very easily fall out of the marsupium even at a slight touch.

In this genus, the marsupial plates are very much more difficult to discern than in most other Hyperiidea, being small and set close to the ventral integument, so as to be almost hidden by the large branchiæ; and the difficulty of finding them is further increased by the fact that they are not furnished with marginal setæ. As the sexual determination of a so enormous quantity of individuals was thus a very delicate matter, it is possible that not all the specimens (especially the smallest) have been ascribed to their proper sex.

In p. 7, the 1. joint (the epimeral part) always seems to be at any rate partly fused together with its body segment; this is figured by Stebbing for the species described by him in the "Challenger" Exped., but as far as I have been able to see, not mentioned by any other writer.

1. VIBILIA JEANGERARDI Lucas (Chart 4, fig. 10 [pars], p. 39).

Vibilia Jeangerardi Lucas, Explor. scientifique de l'Algérie 1840—42, Zool.; Hist. Nat. des animaux articulés, 1845, p. 56, Pl. 5 fig. 4.

* — — Bovallius, Monograph pt. 1, 1887, p. 47 (*lit. et syn.*), Pl. 7 fig. 1—11.

* — — Chevreux, Amphip. Hirondelle 1900, p. 125, Pl. 15 fig. 3.

— — Behning, Vibiliidæ; Zoologica 1912, p. 212 (*lit. et syn.*), Pl. 1 (distrib.).

? — *speciosa* Costa, Rendiconto della Soc. Reale Borbonica, 1853, p. 178.

? — *mediterranea* Claus, Grundzüge d. Zool., 2. Aufl. 1872.

Mediterranean:

St. 24. *40°14′ N, 12°23′ E.* > 3700 m. 16-1-1909. 65 m. w. 7^{50} am. 30 min. 1 ♀.

St. 24. ibid. 1600 m. w. 17^{15} pm. 240 min. 5 ♀ (1 with embryos).

St. 24. ibid. 3000 m. w. (C. 130). 11^{30} pm. 60 min. 1 ♀ with embryos.

St. 25. *40°34′* N, *13°24′ E.* > 1800 m. 17-1-1909. 300 m.w. 5^{40} pm. 60 min 1 ♀.

St. 34. *42°27′ N. 8°16′ E.* > 2000 m. 23-1-1909. 25 m. w. 4^{35} am. 30 min. 1 ♀.

St. 36. *42°49′ N, 6°54′ E.* > 2000 m. 30-1-1909. 65 m. w. 5^{35} am. 60 min. 1 ♀.

St. 45. *37°28′ N, 8°18′ E.* 2150 m. 6-2-1909. 300 m. w. 11^{25} pm. 30 min. 1 ♀.

St. 47. *36°55′ N, 3°12′ E.* > 2000 m. 10-2-1909. 65 m. w. 10^{20} pm. 30 min. 1 ♀ with embryos.

St. 50. *37°02′ N, 1°17′ E.* 2000 m. 17-2-1909. 65 m. w. 2^{00} am. 30 min. 1 ♀.

St. 59. *36°02′ N, 4°24′ W.* 1260 m. 21-2-1909. 25 m. w. 0^{10} am. 60 min. 2 ♀.

St. 118. *41°00′ N, 6°43′ E.* > 2700 m. 1-7-1910. 25 m,w. 0^{20} am. 15 min. 1 ♀.

St. 163. *37°52′ N, 26°22′ E.* 1180 m. 3-8-1910. 1000 m. w. 0^{05} am. 30 min. 7 ♀.

St. 182. *38°13′ N, 24°48′ E.* 480 m. 13-8-1910. 10 m. w. 11^{00} pm. 15 min. 1 ♂, 4 ♀ (1 with ova).

St. 182. ibid. 600 m. w. 11^{40} pm. 30 min. 1 ♂.

St. 186. *37°57′ N, 19°51′ E.* > 3000 m. 17-8-1910. 10 m. w. 11^{30} pm. 15 min. 270 spec. (222 ♂, 48 ♀ [2 with ova]).

St. 186. ibid. 65 m. w. 12^{00} pm. 15 min. 9 ♂, 18 ♀ (3 with ova).

St. 186. ibid. 300 m. w. 8^{15} pm. 15 min. 33 spec.: 3 ♂, 30 ♀, (1 with embryos, 2 with ova).

St. 186. ibid. 1200 m. w. 0^{45} am. 30 min. 43 spec.: 9 ♂' 34 ♀(2 with ova).

St. 187. *37°54′ N, 18°02′ E.* 2700 m. 18-8-1910. 25 m. w. 7^{45} pm. 15 min. 3 ♂, 18 ♀ (3 with ova).

St. 187. ibid. 300 m. w. 0^{55} pm. 30 min. 1 ♂, 2 ♀.

St. 187. ibid. 1000 m. w. 6^{40} pm. 30 min. 2 ♀.

St. 189. *37°44′ N, 15°58′ E.* 1683 m. 19-8-1910. 300 m. w. 8^{55} am. 15 min 1 ♂.

St. 697. ("Pangan"). *36°05′ N, 4°40′ W.* 22-2-1913. 5^{00} am. 1 ♀.

Atlantic:

St. 5. *43°10′ N, 9°30′ W.* 180 m. 2-12-1908. 65 m. w. 9^{15} am. 30 min. 2 ♀.

St. 66. *36°16′ N, 6°52′ W.* 735 m. 25-2-1909. 25 m. w. 1^{05} am. 30 min. 2 ♂.

St. 66. ibid. 65 m. w. 1^{40} am. 60 min. 4 ♂, 3 ♀.

St. 66. ibid. 300 m. w. 2^{55} am. 120 min. 3 ♀ (1 with ova).

St. 68. *36°39′ N, 7°21′ W.* 550 m. 27-2-1909. 65 m. w. 7^{00} pm. 30 min. 2 ♂, 1 ♀.

St. 69. *36°13′ N, 9°44′ W.* > 3500 m. 1-3-1909. 65 m. w. 10^{45} pm. 30 min. 1 ♀.

This species, with its round telson and short dactyli, may easily be confused with *V. Kröyeri*; the dactyli are, however, somewhat longer, and in particular thinner than in the latter species, which is also (especially the ♂) distinguishable by the markedly prominent forehead at the base of the antennæ, and the peculiar shape of the long 1. pair of antennæ (some few ♂ of *V. Jeanger.*, however, also exhibited this prominent forehead). A good character is furnished by the urop. 3, where the inner ramus in *V. Jeang.* is of the same shape as in *V. propinqua* ♀, whereas in *V. Kröyeri* it is is quite different. For a comparison between the dactyli in p. 3—p. 6 of this species and *V. Kröyeri* see under the latter (p. 39).

Chevreux states (l. c.) that his specimens differ from those of Bovallius in having the 2. and 3. urosome segments fused, and by the fact that the dactylus in p. 7 is not "much longer than" the 6. joint, but only abt. $^2/_3$ the length of this. In order to investigate this point, I have taken some tubes from various localities, and clarified the specimens in glycerine; two of Bovallius' tubes were here included. The results were as follows:

	Dactylus in p. 7		Us. 2—3	
	shorter than 6. joint	as long as 6 joint	coalesced	free
"Thor" St. 5, 1908. 65 m.w. 2 spec..	0	2 spec.	×	0
— 66, 1909. 65 m.w. 7 spec..	3 spec.	4 —	×	0
— 186, 1910. 300 m.w. 33 spec.	13 —	20 —	×	0
43°10′ N, 34° W. 4 spec. } Bovallius	1 —	3 —	×	0
41° N, 31° W. 2 spec.. } determ.	1 —	1 —	×	0

From other localities also I have found specimens with the 7. joint in p. 7 shorter than the 6. *viz*; St. 187, 1910, 25 m. w. two ♀; St. 182, 1910, 600 m. w. 1 ♂; St. 66, 1909, 65 m. w. 2 ♀; St. 186, 1910, 10 m. w. most of the specimens; ibid. 300 m. w. 2 ♀. In the specimens where 7. joint is shortest, it is abt. $^2/_3$ the length of the 6.; but all intermediate sizes are found, up to a length equal to that of the 6. joint. In no case was the 7. joint longer than the 6.

In none of the specimens examined were 2. and 3. urosome segments entirely separated; here also however, there are transition forms. In some, there is only a notch in either side, others have on the ventral side (but not in the dorsal) remains of an articulate connection, a furrow extending from each of the notches in the margin; in a single specimen (♀ from St. 182, 1910, 10 m. w.) there is a furrow extending transversely right across the belly, just as in the genus *Lanceola*.

For difference of sex see Chevreux l. c.; in some of my ♂ however, the eyes are much larger even than shown by Chevreux. Up. 3 is alike in both sexes.

Some few specimens had retained pigment spots all over the body.

Most were 8—10 mm. some few even 11 mm. The spec. from St. 163, 1000 m. w. are only 5—7 mm.; from St. 187, 1910, 25 m. w. three ♀ are only 4—6 mm. while 3 ♀ with ova are 9—10 mm. but ♂ only abt. 8 mm.

A. The Mediterranean.

In the Mediterranean, the "Thor" found altogether 430 spec.: 250 ♂ and 180 ♀, from 15 st. in all (23 hauls).

The stations lie spread over the whole of the Mediterranean, from the western part to the eastern; two lie in the Ægean sea. The depth of the stations is 1000—4000 m.; only in a single instance is it less (480 m.).

The percentage of positive hauls was found to increase with increasing depth; there are proportionately most hauls at depths from 3001—4000 m. The number of specimens for normal hauls increases even more; from 4.3 at 2001—3000 to 103.8 at 3001—4000 m.

Chevreux writes (l. c. p. 126) that it is common in winter in the bay at Villefranche and Antibes (E. and W. of Nice) which agrees with the collections of the "Thor", as, though found throughout the whole of the Mediterranean, it was only found by the "Thor" in the western basin during Jan.—Feb. (+ 1 stat. 1st July) while in the eastern basin it was taken in August. This will be seen from the chart (chart 4).

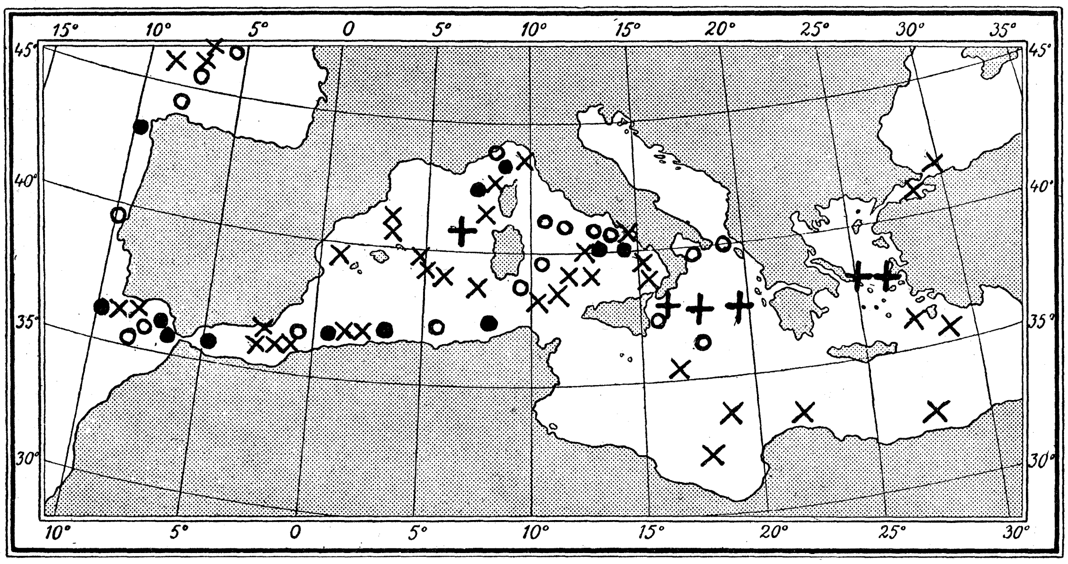

Chart 4. Vibilia Jeangerardi.

● Winter, positive stations. ○ Winter, negative st. (night, 0—300 m. w, $>$ 1000 m)
+ Summer, — — × Summer, — - (— , — , —)

Vertical occurrence. There is an enormous difference between the number of individuals in summer (night: 10 hauls, 410 spec.) and in winter (night: 8 hauls, 13 spec.). In summer it is most numerous at a depth corresponding to 10 m.w.; deeper than 300 m. w. it is doubtless only accidentally found, and it would seem that at any rate most of the specimens taken with a greater length of line were in reality picked up at a very slight distance from the surface. As shown by the list of stations, the species was, in all cases where the length of line exceeded 65 m., also taken nearer the surface, the only exception being St. 163 (1910) and St. 189 (1910) though the young fish trawl (Y. 200) was used at both during the night with 25 m. w. out, but with negative result; this must doubtless be due to accident. In winter, on the other hand, it is apparently more evenly distributed throughout depths answering to 10—300 m. w., but the value per normal haul is here only 1.

During the day, a very few specimens were taken with 65—300 m. w.

Propagation. The species propagates both in winter and summer; at any rate, ♀ with embryos were found in Jan.—Feb. and ♀ with ova and embryos in August.

B. Atlantic.

The material from here is so small (18 spec.) that it cannot afford certain biological results; it would nevertheless seem to fit in very well with the results from the Mediterranean, save in the following points. The depth is in most cases much less, (180—735 m.); only in a single instance was it over 1000 m. *viz.*: 3500 m. In addition, the animals seem to keep somewhat farther down, most of them having been taken with 65 m. w. The only ♀ with ova was taken on the 25th Feb. but as this was from south of 40° N, (*viz.*: 36°16′ N) it probably indicates that the species also propagates in winter.

This species is said to be always found — at any rate in the Mediterranean — in *Salpa maxima* (CHEVREUX l. c. 1900); but the material from the "Thor" furnishes unfortunately no information as to this.

Distribution.

1. Mediterranean. The "Thor" collections show that the species is more or less common in all parts of the Mediterranean, but in winter it is found only in the western basin, in summer only in the eastern. As far as I have been able to see, it is previously known only from the western basin. LUCAS' type specimen was from Bona (Algéria); CHEVREUX also (l. c. p. 126) records it from Algéria. MARION (Ann. Sci. Nat., ser. 5, vol. 17, 1874, p. 5) and CHÉVREUX (l. c.) note it from the Bay at Marseilles. CHUN (Bibl. Zoologica, vol. 1, 1888 p. 28) mentions a specimen from the Bay of Naples taken 11. Oct., night, 600 m down, but it is not mentioned in Lo BIANCO's lists from the same place.

2. Atlantic. According to the chart in BEHNING's Monograph in Zoologica, the species is distributed in the Atlantic from abt. 50° to abt. 25°N, abt. 15° to 60°W besides being found close to the equator 0° to 30°W. The species is not, however, evenly distributed throughout this area.

BOVALLIUS has borrowed a not inconsiderable quantity of material from the Zool. Museum in Copenhagen, for the purposes of his Monograph, but states nothing in detail as to localities. They are as a matter of fact as follows: 52°47′N, 13°10′W; 46°N, 10°W; 43°10′N, 34° W, in *Salpæ*; 41° N, 31°W; 40°30′N, 34°30′W; 35°N, 31° W, in *Salpæ*; 0°4′S, 25°E (? perhaps 25°W).

The two first of BOVALLIUS' localities are interesting, inasmuch as they extend the northern limit of the species off the Irish coast a considerable distance farther north. Otherwise, it is comparatively rare on the west coasts of Europe; in the eastern part of the Atlantic it keeps farther south. The "Thor" found it only once N of 40°N (St. 5, 1908, 43°10′N,) and it is not mentioned at all either by TATTERSALL (1906) from Ireland or by STEBBING (1904) from the Bay of Biscay. All the other specimens taken by the "Thor" in the Atlantic are from Bay of Cadiz. I have not been able to discover any other records of its being found on the Atlantic coast of Europe.

The principal area of the species in the Atlantic appears to be the Gulf Stream, especially between the Azores and Newfoundland, nearly all the records in literature being from here. In the material from the Scottish-Norwegian expedition with the "Michael Sars" in 1910 between Europe and Newfoundland, it appears, together with *V. propinqua*, as the most frequently occurring species of the genus. (BEHNING, Zool. Anzeiger vol. 41, 1913, p. 533). CHEVREUX mentions (Hirondelle 1900) some localities from the same area, *viz*; 45° $38^3/_4$′ N, 23°$26^1/_4$′ W, surf., 9^{40}—10^{10} pm.; 43°47′N, 20°51′ W, surf., day; 40°$28^3/_4$′N, 38°53′W, surf., 10—10^{30} pm.; 40°$39^1/_3$′N, 39°$18^3/_4$′W, surf.; 40°$46^1/_2$′ N, 40°9′W, surf., 9^{30}—10^{00} pm.; 36°6′ N, 28°29′ W, surf.; 39°34′ N, 33° $34^1/_2$′W, surf., 2^{55}—3^{35} am; S. of the Azores.

Some few of BOVALLIUS' above mentioned localities also lie within this range. DOROTHY STEWART mentions (Ann. Mag. Nat. Hist. ser. 8, vol. 12, 1913) a specimen from Madeira. VOSSELER has it from the boundary region between the Gulf Stream and the Sargasso Sea, 31,2° N, 56,7°W, surf. The few stations from the region near the equator lying in the southerly equatorial current, are 0°4′, 25° E (? should be W) (BOVALLIUS determin.) and 6,9° S, 25,4° W, 0—4000 m. (VOSSELER, Plankton-Exp.).

3. The Indian Ocean. Among the specimens determined by BOVALLIUS belonging to our Zool. Museum is a tube from 15°48′S, 56°36′E (east of the north end Madagascar). —

These are probably the only localities mentioned in the literature; the species seems everythere to be taken near the surface.

2. VIBILIA GIBBOSA Bovall. (fig. 8).

Vibilia gibbosa Bovallius, Syst. list Amphip. Hyper., 1887, p. 7.
— — — Monograph pt. 1, 1887, p. 53, Pl. 8, fig. 9—17.
— — Vosseler, Plankton-Exp. 1901, p. 119, Pl. 10 fig. 16—19, Pl. 11 fig. 1—5.
— — Behning, Zool. Anzeiger vol. 41, No. 12, 1913, p. 529, 1 textfig.

Vibilia gibbosa Behning, Zoologica 1912, p. 213, 215, Pl. 5 (distrib.).

St. 240. *44°34′ N, 8°16′ W.* 2500 m. 15-9-1910. 1000 m. w. 9^{40} pm. 30 min. 1 ♀, 7 mm.

The present specimen fits in very well with Vosseler's description; it is not tuberculous dorsally, as stated by Bovallius, but smooth, like the other species.

As no good illustration of up. 3 exists, and as this limb has good specific characters, I give here a figure of the same (from a ♀, the only specimen available). It resembles the same limb in *V. robusta*, the peduncle not being very much longer than the inner ramus, but this is only regularly dentate with fine teeth for about the distal third of the inner margin, not throughout almost the whole inner margin, and there are no large teeth in between, nor does it end in so sharp a point. The outer ramus is dentate along nearly the whole inner margin, and is only abt. $^4/_5$ as long as the inner ramus; the peduncle is smooth on both edges. The telson far more rounded, and also slightly larger than shown in Bovallius' figure.

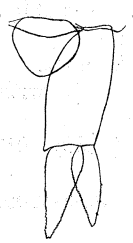

Fig. 8. Vibilia gibbosa ♀, up. 3 and telson.

Distribution. The chart in Behning's monograph shows the distribution of the species as a number of localities in the Atlantic between 30°N and 20°S.

An accurate list of localities would be as follows; The "Thor" station lies far to the north of the previous northern limit for the species. Vosseler (Plankton Exp.) has 20 spec. in all; he mentions it from the Sargasso Sea close to the Bahamas, 34,7° N, 62,4° W, 0 m. All Vosseler's other localities are at or south of the equator, as follows: Guinea current 2,9°N, 18,4°W, 0—400 m. Southern equatorial current 2,6°S, 14,6°W, 0—400 m. 5,1°S, 14,1°W, 0 m., and 5,3°S, 27,6°W, 0—400 m. and northern equatorial current 12° N, 40,3°W, 0—500 m. Bovallius' type specimen — doubtless the only one — was from 17°30′S, 2°30′W. Behning records it (Zool. Anzeiger vol. 41, 1913 p. 529, 533) as taken in three specimens by the German South Pole Exped. and "nur ganz einzeln vertreten" by the American "Albatross" Exped., but does not state the localities.

The species thus appears to be comparatively rare, as there are hardly 30 specimens known altogether. It seems on the whole not to live very far beneath the surface, but the depth to bottom is apparently very great, at least 2500 m.

3. VIBILIA ROBUSTA Bovallius (fig. 9).

Vibilia robusta Bovallius, Syst. list Amphip. Hyper. 1887, p. 7.

Vibilia robusta Bovallius, Monograph pt. 1, 1887, p. 54, Pl. 7 fig. 12—34.

— — Behning, Zoologica 1912, p. 213, 215, Pl. 5 (distrib.).

St. 80. *46°17′ N, 7°31′ W.* > 4000 m. 13-6-1910. 65 m. w. 10^{00} pm. 30 min. 1 ♀ with ova, 18—19 mm.

St. 80. ibid. 300 m. w. 10^{45} pm. 30 min. 60 spec. 11—20 mm. (24 ♂ 11—19 mm. 8 ♀ with ova 18—20 mm., 28 ♀ without ova 11—19 mm.).

St. 382. ("Florida"). *34°21′ N, 16°24′ W.* 23-10-1911. 22 m. w. (S. 100), 6^{35} pm. 30 min. 1 spec. 10 mm.

Behning (l. c.) gives the size as 11 mm.; Vosseler (Plankton-Exp.) as 15 mm.; Bovallius as 10—20 mm.; the spec. from the "Thor" are from 10—20 mm.; only

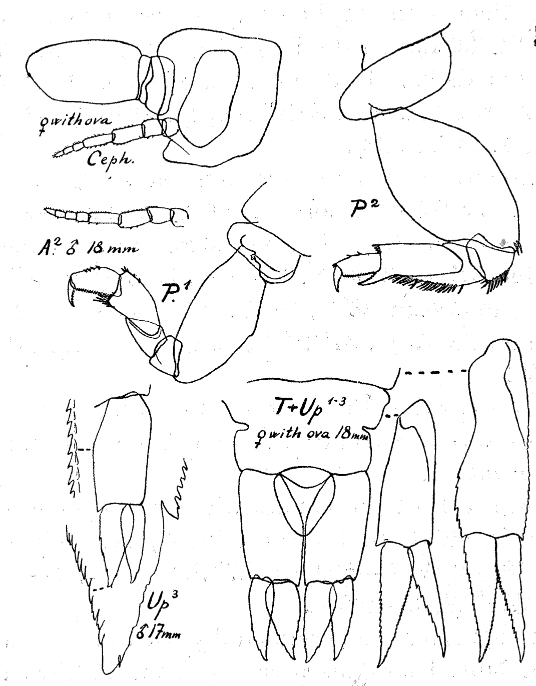

Fig. 9. Vibilia robusta.

a very few between 10—15, by far the greater part being between 16—19 mm.

The eyes are in the large ♀ nearly as large as in the ♂, so they cannot be used as sex characters.

Ant. 2 should, according to Bovallius, have 7 joints in the ♂, and 5 in the ♀. This is not correct. Of the 24 ♂ from St. 24, 300 m. w. the 21 had (5) 6—7 joints, while 3 large spec. (18—19 mm.) had 8, there being four small joints in the flagellum. Of the 8 ♀ from St. 80, 300 m. w. with ova, four had 7 joints, and four 8. Of the 28 ♀ from St. 80, 300 m. w. without ova, the 5 largest (18—19 mm.) had eight joints.

In p. 2 the 2. joint is very broad and ovate, far broader than in p. 1; as Bovallius does not show this particularly well in his habitus figure (Pl. 7 fig. 12). I give fig. of these limbs.

Bovallius states that the peduncle in up. 2 is finely serrate on the inner margin; this I have not been able to find in my specimens, where it is smooth.

In up. 3, the peduncle of the ♂ seems to be somewhat narrower than in the ♀, but the character is hardly any real sexual difference. There is no difference between the rami of the two sexes.

Distribution. 1. Atlantic. (The species is not found in the Mediterranean). Behning's chart (Pl. 5) in his Monograph shows the distribution as a locality near N.E. Brasil abt. 2° S, 38°W, and West Africa abt. 30° S, abt. 10° W. As a matter of fact, however, the area is much larger.

The "Thor" finds bring the species much nearer Europe than hitherto known, as also much farther north. St. 80 lies in the Bay of Biscay, St. 382 W of the Bay of Cadiz. It is not mentioned in Behning's list from the "Michael Sars" Exped. 1910 (Zool. Anz. vol. 41, 1913, p. 533).

Bovallius states the distribution as "The North Atlantic, the tropic Atlantic". Those of his specimens which are in the Copenh. Zool. Mus. are from the following localities: 43°30′ N, 32°40′W, in *Salpæ*; 39°40′N, 34°30′W, in *Salpæ*; 38°N, 35°W, from the stomach of a *Delphinus*; 28°37′ N, 37°23′W, Sargasso sea; 28°13′N, 28°30′W.

These show that the species is found in the Sargasso sea and the Gulf Stream; it was not known at all north of the Equator.

From south of the equator, Vosseler mentions it (7 spec. in all) from the southern equatorial current, *viz*: 0,3° S, 15° W, 0—500 m; 5.7° S, 26,5° W, 0—400 m; 7,8° S. 17,3° W, 0—400 m.

The specimens determined by Bovallius in the Copenh. Mus. from this area are from 16°20′S, 5°W, in *Salpæ*; 29°0′S, 11°30′E, in *Salpæ*, and 29°12′S, 10°44′E. Behning mentions it (Zool. Anz. vol. 41, 1913, p. 530) without loc. from the German Antarctic Exp.

2. Indian Ocean. Bovallius has determined a tube from 32°0′—33°30′S, 44°10′—32°30′E (S of Madagascar), and Walker records it (Transact. Linn. Soc. London, Zool., vol. 13, 1909—10, p. 53) from the Indian Ocean, 250—600 fms. —

With regard to the biology of the species, nothing can be stated save that some of the spec. determined by Bovallius were found in *Salpæ*. It appears to belong to the upper water layers, answering to 10—300 m. w.

4. VIBILIA KRÖYERI Bovall. (fig. 10 [pars], 11, chart 5 [pars]).

Vibilia Kröyeri Bovallius, Syst. list Amphip. Hyper. 1887, p. 8.

Vibilia Kröyeri Bovallius, Monograph pt. 1, 1887, p. 58, Pl. 8 fig. 18—25.

— *Kroeyeri* Behning, Zoologica 1912, p. 213, 216, 224.

Mediterranean.

St. 47. *36°55′ N, 3°13′ E.* > 2000 m. 10-1-1909. 65 m. w. 10^{20} pm. 30 min. 2 ♂, 8 ♀.

Atlantic.

St. 81. *51°32′ N, 12°03′ W.* 960—1420 m. 13(14)-6-1905. 300 m. w. 7^{35} am. 120 min. 1 ♂.

St. 82. *51°00′ N, 11°43′ W.* 1020—1370 m. 14-6-1905. 300 m. w. 1^{35} am. 120 min. (Y. 330). 8 ♂, 8 ♀.

St. 82. ibid. 300 & 600 m. w. 2 ♂, 4 ♀, 1 sex indet.

St. 82. ibid. 800 m. w. 3^{45} pm. 120 min. 3 ♀ (1 with ova). (Y. 330).

St. 82. ibid. 1200 m. w. (840—1350 m.) (Y. 330) 0^{45} pm. 120 min. 11 ♂, 4 ♀.

St. 166. *58°53′ N, 10°15′ W.* Ca. 1850 m. 30-8-1905. 65 m. w. 2 ♂, 1 ♀, 1 sex indet.

St. 167. *57°46′ N, 9°55′ W.* 625—1425 m. 31-8-1905. 300 m. w. 1 ♂.

St. 167. ibid. 1-9-1905. 1500 m. w. 2 ♂, 1 ♀.

St. 63. *35°50′ N, 6°03′ W.* 490 m 22-2-1909. 25 m. w. 0^{05} am. 30 min. 1 ♂, 1 ♀ with ova 6 mm.

? St. 65. *35°53′ N, 7°26′ W.* 1300 m. 24-2-1909. 65 m. w. 6^{30} am. 60 min. 1 ♀

St. 66. *36°16′ N, 6°52′ W.* > 735 m. 25-2-1909. 300 m. w. 2^{55} pm. 120 min. 3 spec.: 2 ♀ with ova, 1 (♀ without ova ?).

St. 66. ibid. 600 m. w. 5^{15} am. 120 min. 1 ♂, 1 ♀.

St. 66. ibid. 1200 m. w. 8^{00} am. 120 min. 1 ♀.

St. 68. *36°39′ N, 7°21′ W.* 550 m. 27-2-1909. 65 m. w. 7^{00} pm. 30 min. 1 ♂, 1 ♀.

St. 69. *36°13′ N, 9°48′ W.* > 3500 m. 28-2-1909. 25 m. w. 0^{30} am. 30 min. 2 ♂.

St. 69. ibid. 65 m. w. 10^{45} pm. 30 min. 2 ♂, 1 ♀.

St. 69. ibid. 300 m. w. 11^{40} pm. 30 min. 1 ♀.

St. 69. ibid. 3000 m. w. (C. 200) 6^{30} pm. 60 min. 1 ♂.

St. 71. *39°35′ N, 9°45′ W.* 1150 m. 4-3-1909. 65 m. w. 10^{50} pm. 60 min. 2 ♂, 3 ♀.

St. 240. *44°34′ N, 8°16′ W.* 2500 m. 15-9-1910. 25 m. w. 8^{30} pm. 15 min. 3 ♂.

St. 240. ibid. 1000 m. w. 9^{40} pm. 30 min. 1 ♂, 1 ♀.

St. 242. *46°19′ N, 6°48′ W.* 4941 m. 16-9-1910. 65 m. w. 10^{55} pm. 30 min. 4 ♂.

St. 242. ibid. 4350 m. w. (C. 200). 7^{00} pm. 60 min. 7 ♂, 3 ♀.

? St. 243. *46°43′ N, 6°28′ W.* 2375 m. 17-9-1910. 65 m. w. 4^{00} am. 30 min. 1 ♀.

St. 377. ("Florida"). *31°23′ N, 18°08′ W.* > 4300 m. 23-7-1911. 15 m. w. 1 ♀ (S. 200). 8^{05} pm. 30 min. 1 ♂.

The "Thor" material contains a large number of specimens of a *Vibilia* which I have determined with some hesitation as *V. Kröyeri* Bovall. Despite certain deviations, I consider it fairly certain that they actually do belong to this species.

What first drew my attention particularly to this species was the prominent forehead (especially so in ♂) together with the long 1. pair of antennæ; these characters are, as far as I have been able to see, not found together in any other species. On the other hand, in all my specimens, (as far as can be seen) the 2. and 3. urosome segments are fused, not separate as shown by BOVALLIUS.

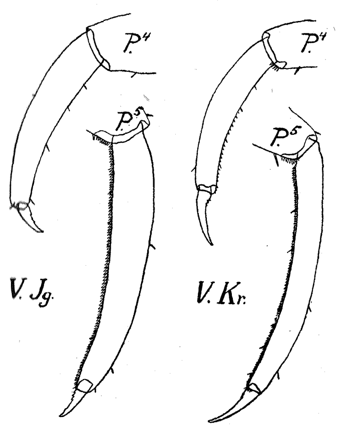

Fig. 10. Vibilia Jeangerardi (V. Jg.) og V. Kröyeri (V. Kr.), p. 4—p. 5.

Ant. 1 is in the ♀ far more elliptical than in the ♂, where upper and lower margin are practically parallel. 2. ant. has in the ♂ 8 joints, in the ♀ 6. The pereiopoda are somewhat more slender than shown by BOVALLIUS, but the urosome agrees well enough, save for the fusion above mentioned, and the telson is on the whole more rounded off at the hinder end, not drawn out as shown by BOVALLIUS in his figure. The inner ramus in up. 3 is somewhat constricted towards the point, and the whole of the urosome part is alike in ♀ and ♂. The species closely resembles *V. propinqua* (see p. 44—45).

If my determination is correct, BOVALLIUS' description does not agree with my specimens in regard to p. 3—p. 6, these being in mine far more slender than described

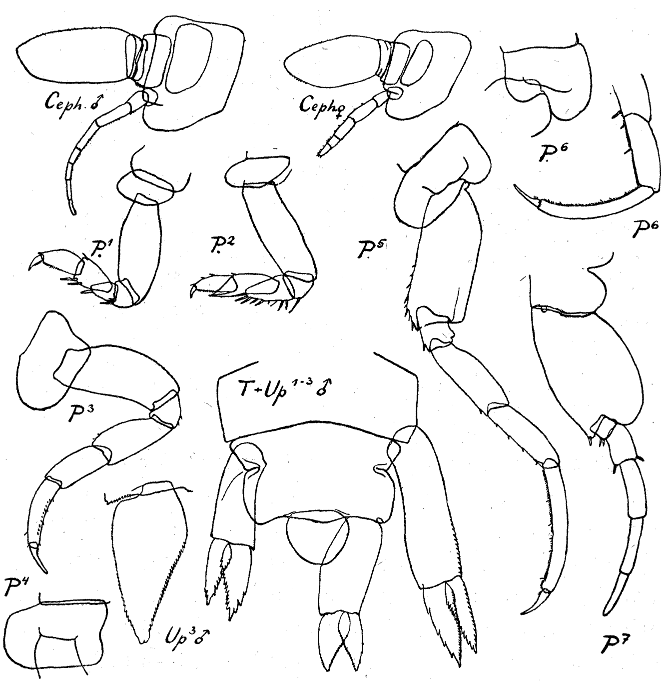

Fig. 11. Vibilia Kröyeri.

by BOVALLIUS. According to this writer, the dactylus in p. 3—p. 4 should be less than half as long as the 6. joint; in my specimens the proportion is abt. $^1/_3$. In p. 5—p. 6 the dactylus (according to BOVALLIUS) is abt. $^1/_3$ as long as the 6. joint; in my specimens abt. $^1/_5$, i. e. nearly half as long as it should be according to him. Dactylus is $1\frac{1}{2}$ to twice as long as the breadth of the 6. joint in the corresponding leg at its broadest part. This is a good character for distinguishing the species from *V. Jeangerardi*, where the dactylus is not only shorter, but the 6. joint also broader, so that the dactylus is found to be not longer than the 6. joint is broad.

BOVALLIUS states that his type spec. should be found in the Copenh. Zool. Mus.; but as a matter of fact they are not, so that comparison is out of the question.

The size is only abt. 7 mm. whereas BOVALLIUS gives 13 mm.

It is remarkable that a species so widely distributed as this should never have been mentioned by any previous writer from this area.

The "Thor" found altogether 98 spec., *viz.*; 53 ♂, 44 ♀ and one sex indeterm.

Atlantic. This species is more or less evenly distributed throughout the entire area investigated by the "Thor" in the Atlantic, always provided the depth is sufficient. As will be seen from the table, it keeps as a rule to waters with depth to bottom over 1000 m., but may also be found in shallower water, *viz.* 490 m., 550 and over 735 m.

Depths in m	No. of stations
450—1000	3
1001—2000	4
2001—3000	2
3001—4000	1
>4000	2

Vertical occurrence. There does not appear to be any difference between the most frequent vertical depths north and south of 40°N; in both areas it seems at night to prefer a depth answering to 15(25)—65 m. w., only a few having been taken with a greater length of line, and these are doubtless in reality from water layers above the depth thus indicated. In the daytime it does not appear to go nearer the surface than answering to 300 (65?) m. w.

Propagation. ♀ with ova were found in Feb. (abt. 36° N) and June (51° N); it would thus seem to propagate in the south during winter, to the north in summer, but in this respect also the material is not large enough to furnish definite conclusions.

Distribution. The "Thor" found it in all parts of the area investigated, where sufficient depth was available, even N of Ireland; 4 stat. lie in the Bay of Cadiz. The only stat. in the Mediterranean lies N of Algeria.

The species was previously known only from Greenland (BOVALLIUS' type spec.; BOVALL. Monogr. p. 59). The type spec. is said to belong to the Copenh. Zool.

Mus. but is not there. In Arctic and Antarctic Hyperids ("Vega" Exped. vol. 4, Stockholm 1887, p. 555) BOVALLIUS also gives the locality as Greenland, and Copenh. Zool. Mus. as possessing the type; but on p. 576 in the same work he records it, strangely enough, from "Davis Strait and Baffins Bay, Europ. Arctic Ocean, Northern West

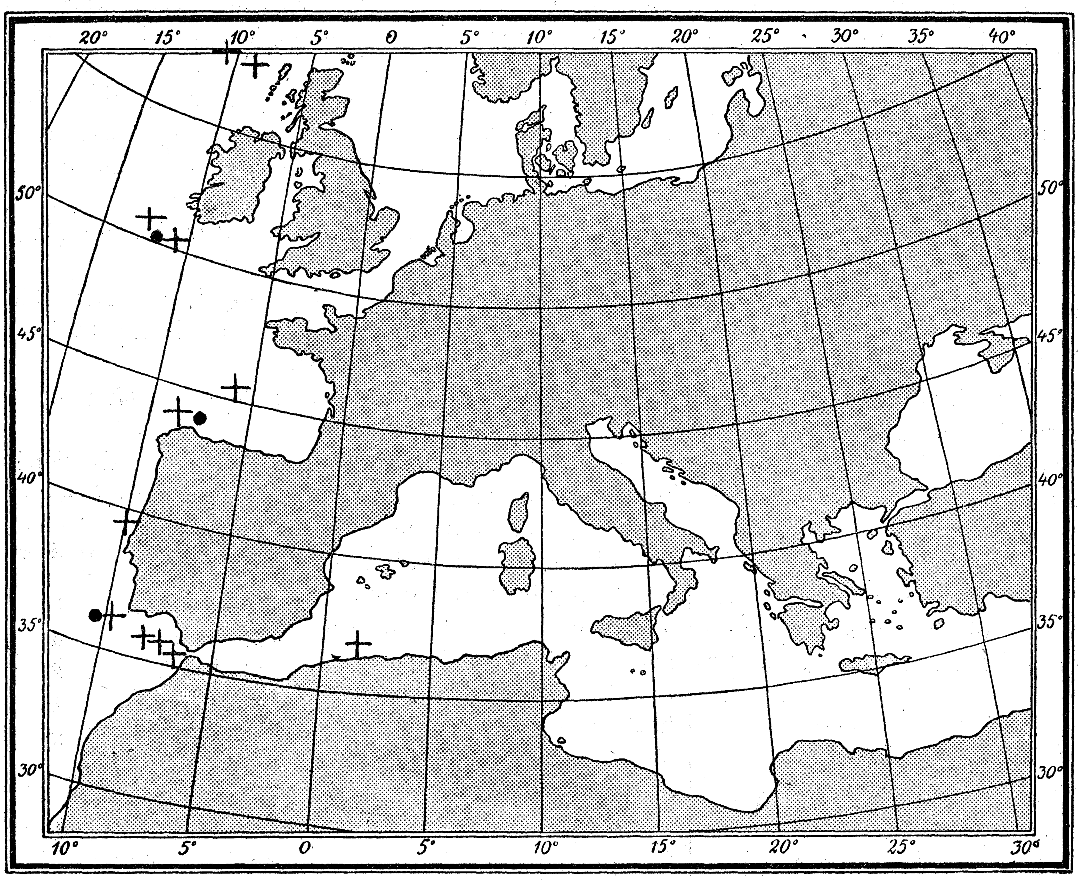

Chart 5. + Vibilia Kröyeri (St. 377 lies outside the map to the south-west).
● — pyripes (- 399 - — - - - - —).

Atlantic", which is undoubtedly altogether erroneous. BEHNING, in his Monograph, reproduces this list (p. 225) which is doubtless not based on any sound foundation.

5. VIBILIA STEBBINGI Behning (fig. 12).

Vibilia Stebbingi Behning, Zool. Anzeiger vol. 41, No. 1, 1912, p. 5, fig. 1—3.
— — — Zoologica 1912, p. 213, 217, Pl. 2 (distrib.).

Mediterranean.

St. 21. *37°51′ N, 15°21′ E.* > 500 m. 5-1-1909. 10 m. w. 11^{50} pm. 2 ♂, 4 mm.

St. 340. ("Pangan"). *35°50′ N, 21°30′ E.* > 2000 m. 26-8-1911. 9^{00} pm. 108 m. w. 1 (♂ jun. ?) 4 mm.

Atlantic.

St. 377. ("Florida"). *31°23′ N, 18°08′ W.* > 4300 m. 23-7-1911. 15 m. w. 8^{05} pm. 1 ♂ 4 mm.

St. 398. ("Ingolf"). *36°48′ N, 14°22′ W.* > 2600 m. 26-10-1911. 1^{10} am. surf. 1 ♂ 4,5 mm.

St. 399. ("Ingolf"). *34°23′ N, 15°31′ W.* > 2600 m. 26-10-1911. 9^{40} pm. surf. 1 ♂ 4,5 mm., 1 ♀ 3,5 mm. (1 ♂ (?) 5 mm.; determination not sure).

As pointed out by BEHNING, this species is closely related to *V. viatrix*, but the two species may nevertheless be distinguished by a number of good characters, of which some are noted by BEHNING.

The sexual difference in ant. 2 is the usual one, but I have no doubt that BEHNING's fig. 1 (the whole animal) represents a ♂, not a ♀, as the eye is too large, and ant. 2 too long, having also 7 (not 6) joints. Otherwise I can on the whole agree with BEHNING's description, save as regards what he states in Zoologica (l. c.) as to the telson. In Zool. Anz. he states that "Telson ist dreieckig, rundlich" which agrees with my specimens; according to Zoologica, on the other hand, the telson is "mehr dreieckig" (i. e. than in *V. viatrix*), "ziemlich in die Länge gezogen" which is not in accordance with my specimens, the telson being in reality shorter in *V. Stebbingi* than in *V. viatrix.*

For the rest, I may refer to BEHNING for difference between the two species, but would here point out some new characters not previously observed: In p. 7, the 2. joint is in *V. Stebbingi* much more slender than in *V. viatrix*, and considerably prolonged in the distal end, both as regards the posterior and anterior corners. On the inner side of the outer ramus in up. 1—up. 2, there are large teeth on the distal half, quite small ones in the proximal half, whereas in *V. viatrix*, in up. 1, all the mentioned teeth are of equal size, and there are only very few of the small ones on up. 2.

As far as I have been able to see, up. 3 is exactly the same in both sexes.

The "Thor"-Exped. found 7 (8) specimens in all.

Biology. The depth to bottom is as a rule over 2000 m. (only at the one station in the Mediterranean was it over 500m.). Generally speaking, the specimens

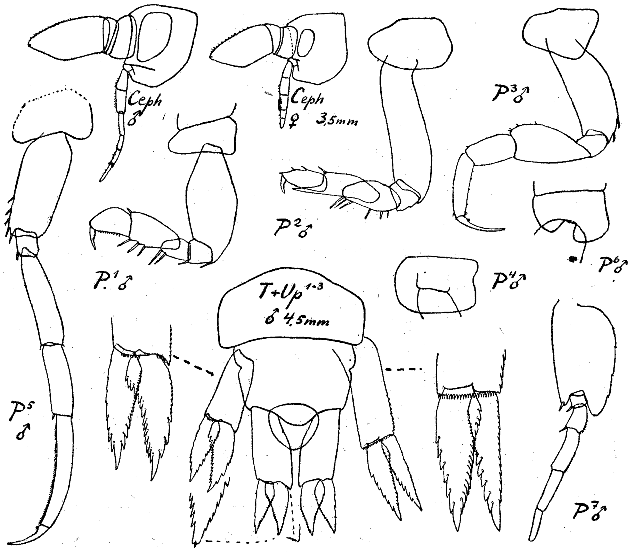

Fig. 12. Vibilia Stebbingi.

were taken very near the surface, the greatest length of line being 108 m.w., otherwise only 10—15 m.w., and it is thus a typical surface species.

Distribution. 1. Mediterranean. The species was found by the "Thor" at two places in the Mediterranean, *viz.*; at Messina and south of Greece; the species is new to the Mediterranean.

2. Atlantic. The chart (Pl. 2) in BEHNING's monograph shows the area of distribution in the Atlantic as divided into two parts, i. e. on the one hand abt. 28°—35° N, abt. 15°—45° W, and on the other, the eastern half of the Atlantic Ocean, from a little north of the Equator to abt. 30° S. The spec. from the "Thor" were taken in the northern part of the area mentioned, *viz*; between Gibraltar and Madeira. The only exact localities I have been able to find are the following from the "Valdivia" Exped. (BEHNING, Zool. Anz. vol. 41, 1912, p. 6, only 6 spec. in all): 0°9′ S, 8°30′ W; 0°20′ N, 6°45′ W; 1°51′ N, 0°31′ E; 2°37′ N, 3°38′ E. It has further been taken (locality not stated) by the German Antarctic Exped. (no statement as to numbers), the American "Albatross" Exped. ("mehr oder weniger häufig") and the "Michael Sars" Exped. ("nur durch einige wenige Ex. vertreten") (BEHNING, Zool. Anz. vol. 41, 1913, p. 523, 533.).

3. In the Pacific it has been taken abt. 0°—20° S., 80°—120° W (BEHNING's chart).

6. VIBILIA VIATRIX Bovallius (fig. 13).

Vibilia viatrix Bovallius, Syst. list Amphip. Hyper. 1887, p. 8.
— — — Monograph pt. 1, 1887, p. 63, Pl. 9 fig. 1—13.
— *viator* Stebbing, Challenger Amphip. 1888, p. 1286, Pl. 148B fig. E.
— *viatrix* Behning, Zoologica 1912, p. 213, 217 (*lit. et syn.*), Pl. 2 (distrib.).
— *californica* Holmes, Proc. U. S. Nat. Mus., vol. 35, 1908, p. 490, textfig. 1—2.
— *Hirondellei* Chevreux, Amphip. Hirondelle 1900, p. 126, Pl. 15 fig. 4.

Mediterranean.

St. 31. *41°44′ N, 10°52′ E.* 1420 m. 22-1-1909. 600 m. w. 3^{05} am, 30 min. 1 ♂.
St. 31. ibid. 200 m. w. 3^{15} am. 30 min. 1 ♂, 1 ♀.
St. 39. *39°41′ N, 10°02′ E.* 1750 m. 1-2-1909. 25 m. w. 5^{00} am. 60 min. 1 ♂.
St. 118. *41°00′ N, 6°43′ E.* > 2700 m. 1-7-1910. 25 m. w. 0^{20} am. 15 min. 1 ♂.
St. 123. *44°14′ N, 8°55′ E.* > 600 m. 3-7-1910. 10 m. w. 2^{30} am. 15 min. 1 ♂.
St. 123. ibid. 65 m. w. 0^{55} am. 30 min. 1 ♀.
St. 186. *37°57′ N, 19°51′ E.* > 3000 m. 17-8-1910. 10 m. w. 11^{30} pm. 15 min. 1 ♀.
St. 192. *38°07′ N, 15°35′ E.* 652 m. 20-8-1910. 25 m. w. 9^{40} pm. 15 min. 1 ♀.

Atlantic.

St. 69. *36°13′ N, 9°44′ W.* > 3500 m. 1-3-1909. 25 m.w. 0^{30} am. 30 min. 1 ♀ with ova.
St. 69. ibid. 65 m. w. 10^{45} pm. 30 min. 3 spec. (1 ♀, 2 spec. jun.).
St. 69. ibid. 300 m. w. 11^{40} pm. 30 min. 2 ♂.
St. 69. ibid. 3000 m. w. (C. 200). 6^{30} pm. 60 min. 2 spec. (1 ♂, 1 ♀ with a few ova 8 mm.).
St. 71. *39°35′ N, 9°45′ W.* 1150 m. 4-3-1909. 65 m. w. 10^{50} pm. 60 min. 3 ♀, 1 ♂.
St. 264. ("Ingolf"). *38°14′ N, 24°35′ W.* > 3200 m. 19-3-1911. 25 m. w. (S. 150). 7^{30} pm. 30 min. 1 ♂.
St. 265. ("Ingolf"). *39°22′ N, 22°49′ W.* > 5200 m. 20-3-1911. 47 m. w. (S. 100). 7^{30} pm. 30 min. 1 ♀.
St. 266. ("Ingolf"). *40°47′ N, 21°10′ W.* > 4300 m. 20-3-1911. 47 m. w. (S. 100). 7^{30} pm. 30 min. 2 ♀.
St. 376. ("Florida"). *34°41′ N, 16°14′ W.* > 3500 m. 22-7-1911. 15 m. w. (S. 200). 8^{45} pm. 30 min. 2 ♂.
St. 376. ibid. 30 m. w. (S. 100). 8^{40} pm. 30 min. 1 ♀.
St. 377. ("Florida"). *31°23′ N, 18°08′ W.* > 4300 m. 23-7-1911. 15 m. w. (S. 200). 8^{05} pm. 30 min. 22 ♂, 13 ♀.
St. 382. ("Florida"). *34°21′ N, 16°24′ W.* 23-10-1911. 22 m. w. (S. 100). 1100 m. 6^{35} pm. 30 min. 5 ♂.
St. 389. ("Florida"). *37°16′ N, 14°09 W.* > 4000 m. 23-10-1911. 30 m. w. (S. 100). 6^{35} pm. 30 min. 1 ♂.
St. 399. ("Ingolf"). *34°23′ N, 15°31′ W.* > 2600 m. 26-10-1911. Surface (S. 200). 9^{40} pm. 30 min. 30 ♂, 32 ♀. (1 with embryos 5,5—6 mm. 2 with ova).
St. 400. ("Ingolf"). *32°10′ N, 17°20′ W.* > 4500 m. 30-10-1911. Surface (S. 200). 10^{05} pm. 30 min. 12 ♂, 6 ♀.

BEHNING's list of synonyms in Zoologica — reproduced above — is, as far as I can see, correct.

I can also on the whole entirely agree with the corrections made by VOSSELER (Plankton-Exped.) and

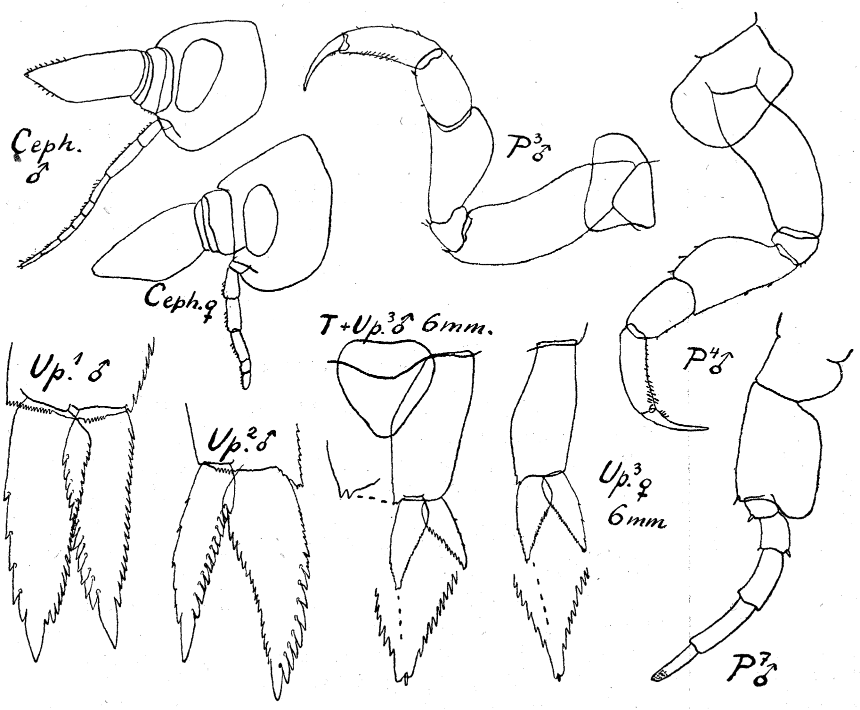

Fig. 13. Vibilia viatrix. The cephalon of ♀ is from a spec. with embryos, 8.5 mm in length.

CHEVREUX (l. c.) in BOVALLIUS' original description, which is not correct in all details. BOVALLIUS states that some of his original specimens belong to the Copenhagen Zoological Museum, but this must be a mistake; at any rate they are not to be found there now.

The size is as a rule 6—7 mm., but there are also some few specimens of 4—5 mm. ♀ with ova (from St. 169, 1909, 25 m. w.) is 8.5 mm., but at St. 399, (1911, surf.) two ♀ with ova were taken, measuring 5—6 mm., and one with embryos of 6 mm.

The eye in the ♂ is slightly larger than in the ♀ and is broader at the top than below (CHEVREUX' figure is hardly correct). In the ♂, ant. 1 is more pointed and more slender than in the ♀; ant. 2 can, in ♂, have up to 9 joints, and may be over 1½ times as long as ant. 1. In the ♀, ant. 2 is about as long as ant. 1, and has 6—7 joints, (all spec. with ova or embryos had only 6 joints). I append a figure of p. 3—p. 4 showing the heavy 4 joint.

In up. 3, there is but slight difference between the sexes. In both there are some few (2 to abt. 5) teeth on the inner distal corner of the peduncle. The peduncle itself seems to be slightly heavier in the ♂ than in ♀. The inner ramus is somewhat narrower and longer in ♂ than in ♀; in both sexes it terminates with 2 small rounded teeth with a spine between.

For difference as compared with *V. Stebbingi* see under the latter (p. 40).

"Thor" found in all 148 spec. (84 ♂, 62 ♀, 2 spec. juv.).

Biology. A. Mediterranean. The species was taken for the most part in the eastern half of the western basin, but there are also spec. from the Straits of Messina and W. of the Ionian Islands. It was not previously known at all from the Mediterranean. Depth varies considerably, from over 600 to over 3000 m. It was mostly taken near the surface; 10—25 (65) m. w.; only at St. 31 was it found with 200 and 600 m. w. On the whole, only single specimens (at the outside 2) were taken at each haul, and all at night.

Depth in metres, Atlantic	No. of stat.
1000—2000.........	2
2001—3000.........	1
3001—4000.........	3
> 4000.........	5
total...	11

B. Atlantic. All stations lie S. of 40° N (except St. 266, which lies just north of this limit).

The depth is very great, never less than 1000 m., but at nearly half the st. over 4000.

Vertical occurrence. There are no positive day hauls. The species keeps principally to the surface and

Night hauls:

m. w.	No. of hauls	No. of spec. (normal hauls)	Average no. pr. normal h.
10—35...............	9	126	14
47—65...............	4	8	2
300—3000............	2	3	1.5

decrease markedly downwards; already at 47—65 m. w. we find only 2 spec. per normal haul. The two deepest hauls (300 and 3000 m. w.) should doubtless be disregarded, the specimens in question having undoubtedly been taken higher up (at the same station, fishing was also carried on with 25 and 65 m. w.).

Propagation. ♀ with ova or embryos were taken 1. March and 26. Oct. —

Distribution. According to BEHNING's chart in his Monograph, the species is found both in the Atlanti at Gibraltar, in the Indian Ocean and in the Pacific.

1. Mediterranean. See above under biology. Where BEHNING has found his record of the find at the straits of Gibraltar I cannot see (the "Michael Sars"-Exped. ?).

2. Atlantic. According to BEHNING's chart, the species is distributed between 45° N and 35° S; an accurate list of localities would be as follows: Near the coast of Europe the species has never been taken save by the "Thor" at St. 71 (a little north of Lisbon) and St. 69 (SW of Cape St. Vincent). All the other specimens taken by the "Thor" are from the waters between the Bay of Cadiz and the Azores. The waters round the Azores (to abt. 46° E) seem, as a matter of fact, to be the principal area of distribution of this species; but this impression may possibly be due to the fact that the grounds in question have been particularly well investigated. CHEVREUX quotes (Hirondelle 1900) a considerable number of finds from this area (45°38¾′ N, 23°26¼′ W, 9^{40}—10^{10} pm., surf., 11 spec; 44°29′ N, 46°48′¼ W, surf., 16 spec.; 43°47′ N, 20°51′ W, day, surf., abt. 100 spec.; 40°46½′ N, 40°09′ W, 9^{30}—10^{00} pm. surf., 5 spec.; 40°28¾′ N, 38°53′ W, 10—10^{30} pm., surf., 4 spec.; a number of spec. from the Azores.)

BEHNING records it (Zool. Anz. vol. 41, 1913, p. 533) as taken by the "Michael Sars" Exped. but without locality. VOSSELER mentions, in the Plankton Exped., only 16 spec.; N. of the equator he notes it only from the northern equatorial current, 25,1° N, 31,5° W, 0—400 m. and from the Guinea current 2,9° N, 18,4° W, 0 and 0—200 m. There is thus a very broad zone N of the equator, where the species has not been found. South of the equator, the German Plankton Exped. found it at 3 places in the southern equatorial current *viz*; 0,4° S, 42,4° W, 0—400 m. 7½° S, 20,3° W, 0—400 m., and 7,8° S, 17,3° W, 0—400 m. — Two spec. were taken off Bahia 15°14½′ S, 33°11½′ W, (D. STEWART, Ann. Mag. Nat. Hist. ser. 8, vol. 12, 1913, p. 247). According to BEHNING's chart, it has only been taken south of the mentioned localities west of the southern point of Africa, abt. 35° S, abt. 5° E.

3. The Indian Ocean. The only locality in the literature would seem to be Cape York (Torres Strait) right over against the Pacific, 1 spec. ("Challenger" Exped.). It is marked, however, in BEHNING's chart from a number of places between 5° N and 5° S, 60°—80° E.

4. The Pacific. Point Loma, California, 67—116 fath. (HOLMES l. c.); but BEHNING's chart notes it from several places 0°—28° S, 90°—130° W. —

In addition to these precisely indicated localities, the species is stated as having been taken by the "Valdivia" Exped. (BEHNING, Zool. Anz. vol. 41, 1912, p. 5), the German Antarctic Exped. and the "Albatross" Exped. (BEHNING ibid. p. 529, 533); the exact localities are not stated, but apparently include several of those noted on BEHNING's chart in Zoologica.

7. VIBILIA PROPINQUA Stebbing (fig. 14).

**Vibilia propinqua* Stebbing, Challenger Amphip. 1888, p. 1279, Pl. 147.
— — Stebbing, Biscayan Plankton 1904, p. 31.
— — Vosseler, Plankton-Exped. 1901, p. 124.
— — Behning, Zoologica 1912, p. 213, 218, Pl. 1 (distrib.).
— sp. 1 Stebbing, Challenger Amphip. 1888, p. 1285, P. 148 B, fig. C, D.
? — *Milnei* Stebbing, Challenger Amphip. 1888, p. 1284, Pl. 148 A.

Mediterranean.

St. 10. *37°21′ N, 16°45′ E.* > 2100 m. 15-12-1908. 600 m. w. 3^{45} pm. 60 min. 3 spec. jun.

St. 15. *40°04′ N, 19°06′ E.* 1000 m. 22-12-1908. 1400 m. w. 5^{00} am. (8^{00} am. ?). 60 min. 2 ♀.

St. 24. *40°14′ N, 12°29′ E.* > 3700 m. 16-1-1909. 1600 m. w. 11^{15} pm. 240 min. 1 ♀.

St. 25. *40°34′ N, 13°24′ E.* > 1800 m. 17-1-1909. 300 m. w. 5^{40} pm. 60 min. 3 ♂, 2 ♀.

St. 31. *41°44′ N, 10°52′ E.* 1420 m. 22-1-1909. 65 m. w. 4^{30} am. 30 min. 2 ♂.

St. 31. ibid. 200 m. w. 3^{15} am. 30 min. 2 ♂, 2 ♀.

St. 31. ibid. 600 m. w. 3^{05} am. 30 min. 1 ♂.

St. 46. *37°17′ N, 6°0′ E.* 1930 m. 7-2-1909. 300 m. w. 7^{30} pm. 30 min. 1 ♂.

St. 45. *37°28′ N, 8°0′ E.* 2150 m. 6-2-1909. 300 m. w. 11^{25} pm. 30 min. 2 ♂.

St. 47. *36°55′ N, 3°12′ E.* > 2000 m. 10-2-1909. 300 m. w. 11^{05} pm. 30 min. 1 ♂.

St. 50. *37°06′ N, 1°17′ E.* 2000 m. 17-2-1909. 25 m. w. 1^{20} am. 30 min. 1 (♂ jun. ?).

St. 123. *44°14′ N, 8°55′ E.* > 600 m. 3-7-1910. 65 m. w. 0^{55} am. 30 min. 1 ♂.

St. 123. ibid. 300 m. w. 0^{05} am. 30 min. 2 ♂.

St. 129. *40°05′ N, 11°31′ E.* 3420 m. 12-7-1910. 300 m. w. 3^{40} am. 30 min. 2 ♂.

St. 129. ibid. 3500 m. w. (C. 200) 3^{00} pm. 120 min. 1 ♂, 3 ♀.

St. 144. *34°31′ N, 18°40′ E.* 3340 m. 24-7-1910. 4000 m. w. (C. 200). 6^{20} am. 60 min. 1 ♀.

St. 160. *35°59′ N, 28°14′ E.* > 1000 m. 1-8-1910. 25 m. w. 2^{00} am. 30 min. 5 ♀.

St. 160. ibid. 300 m. w. 2^{45} am. 30 min. 1 ♂, 1 ♀.

St. 163. *37°52′ N, 26°22′ E.* 1180 m. 3-8-1910. 300 m. w. 1^{05} am. 15 min. 1 ♀.

St. 192. *38°07′ N, 15°35′ E.* 652 m. 20-8-1910. 300 m. w. 10^{10} pm. 15 min. 1 ♂.

St. 199. *39°32′ N, 10°49′ E.* 2700 m. 25-8-1910. 300 m. w. 9^{25} pm. 20 min. 2 ♂, 2 ♀.

St. 204. *31°52′ N, 7°43′ E.* > 1000 m. 27-8-1910. 300 m. w. 5^{00} am. 30 min. 1 ♂.

St. 206. *39°32′ N, 5°13′ E.* 2782 m. 28-8-1910. 25 m. w. 0^{30} am. 15 min. 1 ♀.

St. 340. ("Pangan"). *35°50' N, 21°30' E.* > 2000 m. 26-8-1911. 28 m. w. (S. 200). 9^{00} pm. 30 min. 1 ♀.

Atlantic.

St. 81. *51°32' N, 12°03' W.* 1080—1330 m. 14-6-1905. 200 m. w. (Y. 330). 2^{20} am. 120 min. 3 ♂., 2 ♀.

St. 81. ibid. 960—1420 m. 300 m. w. (Y. 330). 7^{35} am. 120 min. 10 ♂, 3 ♀.

St. 82. *51°00' N, 11°43' W.* 1020—1370 m. 14-6-1905. 300 m. w. 1^{35} am. 120 min. (Y. 330). 6 ♂, 5 ♀. (1 with ova).

St. 82. ibid. 300 & 600 m. w. 4 ♂ (3 juv.)

St. 82.i bid. 800 m. w. (Y. 330). 3^{45} pm. 120 min. 2 ♂ (1 juv.), 1 ♀.

St. 82. ibid. 1200 m. w. 840—1350 m. (Y. 330). 0^{45} pm. 120 min. 33 ♂, 40 ♀ (1 with ova).

St. 88. *48°09' N, 8°30' W.* 600—995 m. 20-6-1905. 300 m. w. 11^{45} pm. 240 min. 7 ♂ (1 juv.), 2 ♀ (1 with embryos).

St. 90. *47°47' N, 8°00' W.* 740—1600 m. 21(22)-6-1905. (Y. 330). 300 m. w. 2^{15} am. 120 min. 2 ♂.

St. 165. *60°00' N, 10°35' W.* 1050 m. 29-8-1905. 300 m. w. 8^{00} pm. 60 min. 1 ♂, 1 ♀.

St. 166. *58°53' N. 10°15' W.* Ca. 1850 m. 30-8-1905. 65 m. w. 30 min. day time. 1 ♂, 1 ♀.

St. 167. *57°46' N, 9°55' W.* 1000—1280 m. 1-9-1905. 300 m. w. 3 ♂.

St. 167. ibid. 1500 m. w. 2 ♂, 2 ♀.

St. 168. *58°42' N, 6°13' W.* 110 m. 2-9-1905. 65 m. w. 6^{00} am. 30 min. 1 ♀.

St. 36. *44°21' N, 2°37' W.* 1125 m. 10-5-1906. 1250 m. w. (Y. 330). 5^{55} am. 120 min. 3 ♀.

St. 43. *43°37' N, 2°08' W.* 1030—1650 m. 16-5-1906. 250 m. w. (Y. 330). 2^{45} am. 120 min. 1 ♀.

St. 76. *49°27' N, 13 °33'W.* > 2600 m. 11-6-1906. 2800 m. w. (D. 2). 3^{00} pm. 120 min. 1 ♀.

St. 4. *45°20' N, 7°42' W.* > 4000 m. 1—12—1908. 1500 m. w. (C. 130). 11^{45} am. 30 min. 1 ♂, 1 ♀.

St. 71. *39°35' N, 9°45'W.* 1150 m. 4-3-1909. 65 m. w. 10^{50} pm. 60 min. 1 ♀.

St. 71. ibid. 300 m. w. 8^{40} pm. 120 min. 1 ♀.

St. 74. *44°21' N, 7°55' W.* 2000 m. 8-3-1909. 300 m. w. 10^{50} pm. 60 min. 1 ♂.

St. 75. *45°37' N, 7°03' W.* 4000 m. 9-3-1909. 65 m. w. 9^{00} pm. 60 min. 1 ♂.

St. 240. *44°34' N, 8°16' W.* 2500 m. 15-9-1910. 25 m.w. 8^{30} pm. 15 min. 1 ♀.

St. 240. ibid. 300 m. w. 9^{00} pm. 15 min. 11 ♂, 15 ♀.

St. 240. ibid. 1000 m. w. 9^{40} pm. 30 min. 10 ♂, 15 ♀.

St. 242. *46°19' N, 6°48' W.* 4941 m. 16-9-1910. 65 m.w. 10^{55} pm. 30 min. 1 ♂, 1 (♂ juv. ?), 1 ♀, 11 mm.

St. 242. ibid. 4350 m. w. (C. 200). 7^{00} pm. 60 min. 83 ♂, 189 ♀. (13 with ova, 1 with embryos).

St. 243. *46°43' N, 6°28' W.* 2375 m. 17-9-1910. 65 m. w. 4^{00} am. 30 min. 1 ♂, 2 ♀.

St. 269. ("Ingolf"). *46°44' N, 11°20' W.* > 4700 m. 24-3-1911. 47 m. w. (S. 100). 7^{30} pm. 30 min. 1 ♀.

St. 377. ("Florida"). *31°23' N, 18°08' W.* > 4300 m. 23-7-1911. 15 m. w. (S. 200). 8^{05} pm. 30 min. 1♀.

St. 399. ("Ingolf"). *34°23' N, 15°31' W.* > 2600 m. 26-10-1911. Surf. (S. 200). 9^{40} pm. 30 min. 1♀.

The ♀ agrees with Stebbing, Challenger Pl. 147, differing however, in the following characters. Ant. 2 appears as a rule to have 6 joints, though there are but 5 in the largest ♀ (13 mm. St. 25, 1910, 1250 m. w.); p.3—p.4 are slightly heavier. In p.5, the 2. joint is broader, and the 6. joint has teeth along the whole fore margin. In p. 7 the 2. joint is broader, and 7. joint shorter (only abt. $^3/_5$ of the 6.). In up. 3 the inner ramus is less broad towards the point than in the smaller spec.; it is slightly longer than the outer ramus.

There is no doubt that *Vibilia* sp. Stebbing ("Challenger" p. 1285, Pl. 148 B, fig. C. D.) is a ♂ of this species. It is extremely easily recognisable by the very long, knifeshaped and almost uniformly broad inner

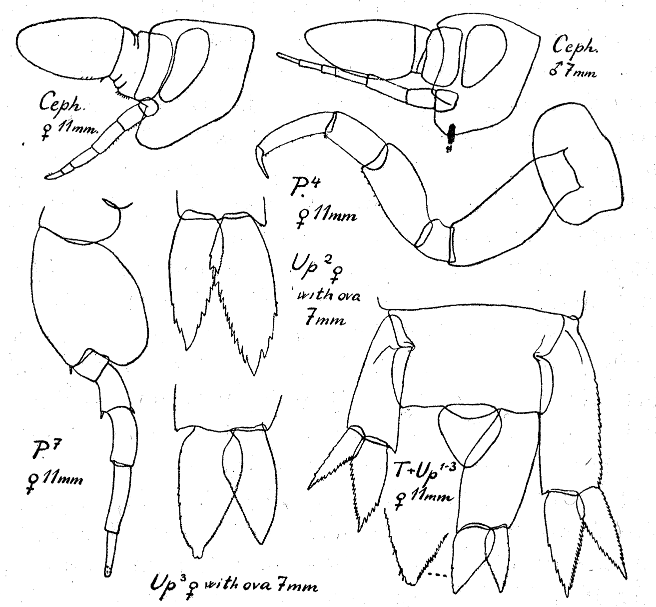

Fig. 14. Vibilia propinqua.

ramus of up. 3, which is nearly 1½ times as long as the outer ramus. Ant. 2 has 7 joints.

Most of the specimens are only 7—8 mm. (Behning says 11 mm); there are however, some few larger specimens *viz.*; from St. 36, 1906, 1250 m. w. 3 ♀ (13, 10, 10 mm.); St. 43, 1906, 1250 m. w. 1 ♀ 11 mm.; St. 240, 1910, 1 ♀ 10 mm.; St. 242, 1910, 65 m. w. 1 ♀ 11 mm.; St. 243, 1910, 65 m. w. 1 ♀ 9 mm.

The ♂ is only 7 mm. and there are even some few of only 6 mm. (St. 82, 1905, 300 & 600 m. w.; ibid. 800 m. w.; St. 88, 1905, 300 m. w.; (?) St. 50, 1909, 25 m. w.); though up. 3 in these is of nearly the same shape as in the grown ♂ the ant. 2 is as short as in the ♀.

In this species, the interlocking process on the pleopoda is comparatively large.

The species is closely related to *V. Kröyeri*, but distinguished by the following characters: "forehead" not particularly domed, and 4. joint in ant. 1 not longer than the cephalon. Telson far more pointed posteriorly, and in up. 3 of the ♀, the inner ramus is more or less symmetrical, and on the outer margin slightly convex, not slightly concave. The ♂ is easily recognisable by the long inner ramus of up. 3, whereas in *V. Kröyeri*, this is of the same shape as in the ♀.

There are 525 spec. in all, 206 ♂, and 314 ♀ and 5 sex indet. (Atlant. 183 ♂, 292 ♀, 1 sex indet.; Mediterr. 23 ♂, 22 ♀ and 4 sex indet.).

A. The Mediterranean.

As far as can be seen from the literature, this species has not previously been taken in the Mediterranean save for a single find close inside Gibraltar (Behning's chart) but the "Thor" found it at 19 stat. right in to the coast of Asia Minor. As only 49 spec. were found, it cannot be said to be of frequently occurrence.

Depths of the stations	No. of stations
600—1000 m	3
1001—2000 -	7
2001—3000 -	6
3001—4000 -	3
total ...	19

Only 3 stations lie at depths to bottom between 500—1000 m. (600, 652 and 1000 m.) the remainder were at greater depths, up to > 3700 m. Most of the stat. were 1000—3000 m.

Night hauls, > 1000 m.

m. w.	No. of positive hauls	No. of specimens (normal hauls)	Average no. pr. normal haul	Total no. of hauls	Percentage of positive hauls
10—28..	4	9	2.3	49	8.1 %
65..	1	2	2	27	3.7 -
200—300.	10	25	2.5	36	27.6 -
600—400.	2	2	1	37	5.4 -
total...	17	38			

Vertical occurrrence. During the night, 20 hauls were made, (17 at depths to bottom over 1000 m.), but only 43 (38) spec. in all calculated according to normal hauls. Lengths of line between 10 and 300 m. w. give nearly equal number of spec. per normal haul, 2—2.5, and it was only exceptionally found deeper, but lengths of line from 200—300 m. w. give the highest percentage for positive hauls, *viz*; 27.6 and as against 3.7 and 8.1 for the higher water layers; the species lives thus on the whole at a depth answering to 200—300 m. w.

During the day it was found in 4 hauls, 300—4000 m. w., being altogether lacking, however, in hauls with lengths of line between 700—3400 m. w.; there is thus reason to believe that the two hauls with 3500 and 4000 m. w. took their specimens while hauling in. These hauls are however, too few to furnish accurate results.

Propagation. ♀ with ova were on no occasion found, but specimens too small for sex determination were taken on the 15. Dec. and 17. Feb., so it would seem as if the eggs were produced in summer or early autumn.

B. The Atlantic.

The material. The species is represented in the "Thor" material by 476 specimens, from 30 hauls, 21 stat. in the Atlantic. Most of the stations lie in the Bay of Biscay, where the species goes right up into the Bay, at Biarritz and San Sebastian, but four stations are far away to the north, N and NW of Scotland, in the Færoe Shetland channel. 1 lies close N of Lisbon and 2 between the Bay of Cadiz and the Azores. The species was previously known from W Ireland (see below, under distribution) but the "Thor" has shifted the northern limit from at 55° N to abt. 60° N. It would nevertheless seem that the species does not constantly inhabit these northern waters, but is only an occasional visitor there, its presence then being due to ocean currents. All the positive stations of the "Thor" N of 50° N are from 1905, and this is doubtless connected with the north-going current noted in the introduction (p. 5) and elsewhere. Tattersall also, (Amphip. Ireland 1906, p. 4) cites this among other species as doubtless carried to the W. Ireland waters by this current in question. The depth to bottom is as a rule > 1000—4000 m,. mostly 1000—2000 m., i. e. much the same as in the Mediterranean: only in two cases was it less than 1000 m. (110 and 600—995 m.).

	No. of stations	No. of hauls	No. of specimens
June 1905	4	8	120
Aug. —	2	2	4
Sept. —	2	3	8
May 1906	2	2	4
June —	1	1	1
Dec. 1908	1	1	2
March 1909	3	4	4
Sept. 1910	3	6	330
March 1911	1	1	1
July —	1	1	1
Oct. —	1	1	1
total ...	21	30	476

Vertical occurrence. The species was taken during the night with 15—4350 m. w., during the day with 65—2800 m. w. There can however, hardly be any doubt that the deepest night haul should be disregarded, (4350 m. w.); the species was taken at the same station with 65 m. w.; otherwise, the net was not drawn at this station save at the surface itself, where the species is not found; the specimens doubtless originate in reality from much higher levels.

Most of the night hauls were made with 200—300 m. w., but the great majority of specimens were taken with more than 300 m.w. Unfortunately, however, the material has the disadvantage of including proportionately many stations from 1905—06, and in these years, not all the material was preserved, as the "Thor" was then chiefly engaged upon fishery investigations, and was not particularly interested in other forms than fish. The results as regards this species in the Atlantic should therefore be treated with great caution.

Depths of the stations	No. of stations
100—500 m.	1
501—1000 -	1
1001—2000 -	10
2001—3000 -	4
> 3000 -	5
total . . .	21

Propagation. ♀ with ova and embryos were found in June 1905 and Sept. 1910.

Distribution.

According to BEHNING's chart (Pl. 1) this species is distributed in the Atlantic between abt. 50° N—35° S; Indian Ocean 7° N—35° S, and eastern Pacific 5° S—25° S. This area doubtless includes a number of the localities from the material determined by BEHNING from the "Michael Sars" Exped., the German Antartic Exped., the "Albatross" Exped., and the "Valdivia" Exped. (Zool. Anz. vol. 41, 1913, p. 533, 550; ibid. 1912, p. 5).

1. Mediterranean. *Vide supra.*

2. Atlantic. TATTERSALL (Ireland 1906) records it from six stations (9 hauls) from W Ireland 1905, 78 to over 1000 faths., net 0—750 faths. down, 1—2 spec. in each haul, but one haul with 41 spec. TATTERSALL points out, however, that the occurrence of the species in these northerly waters, where it has never been found before, (which also applies to several other species) is doubtless due to a sudden inflow of southern Atlantic water in 1905; it is interesting that the most northerly station of the "Thor", which advanced the northern limit of the species as far as 60° N, 10°35′ W (Færoe-Shetland Channel) should also fall in this year. The species can thus hardly be said to live in Irish waters, but is only an occasional visitor there. — In the Bay of Biscay it has been taken at 25—0 faths. 1 spec. (STEBBING, Biscayan Plankton 1904).

As far as I can see, these finds are, together with the "Thor" material, the only ones made on the coasts of Europe, except for the fact that BEHNING notes it on his chart a little outside Lisbon, and apparently also in the Straits of Gibraltar, but the chart here is not quite clear.

The species is not mentioned by CHEVREUX (Hirondelle 1900) from the waters about the Azores. BEHNING's chart shows it from the coast of Morocco abt. 30° N, and at the Cape Verde Islands, but the true area of distribution of the species in the Atlantic N of the equator seems to be the Gulf Stream.

The German Plankton Exped. found 24 spec. in all (22 ♀, 2 ♂) at the following places: Sargasso sea 31,7° N, 42,7° W, 0—400 m., 3 spec.; Guinea current 2,9° N, 18,4° W, 0 m., 10 spec., and 9,4° S, 41,9° W, 0—400 m., 1 spec.; S. equat.current 1,1° N, 16,4° W, 0—400 m., 1 spec.; 2,8° S, 35,2° W, 0—500 m., 1 spec.; 5,1° S, 14,1° W, 0—400 m., 2 spec., and 6,8° S, 14,2° W, 0—400 m., 6 spec.

Farther south in the Atlantic we find the following records: off Bahia 13°59′ S, 34°35′W, 2 spec. (STEWART, Ann. Mag. Nat. Hist., ser. 8, vol. 12, 1913, p. 246). Between Bahia and Tristan da Cunha 29°35′ S, 28°9′ W, 1 ♂, surf. (*V. Milnei*) and 37°29′ S, 27°31′ W, surf., 6 spec. (*V.* sp. "Challenger" p. 1285) (STEBBING, "Challenger").

3. Indian Ocean. 7° N—35° S. (BEHNING). 54° S, 170°49′ E to 69° S, 174° E (WALKER 1907).

4. Western Pacific at Volcano Island S. of Japan 25°30′ N, 138° S, surf., 4 spec. (STEBBING, "Challenger"). According to BEHNING's chart, it was taken in the eastern part, 5°—25° S, 80°—120° W.

8. VIBILIA ARMATA Bovall. (fig. 15—16, chart 6).

Vibilia armata Bovallius, Syst. list Amphip. Hyper. 1887, p. 10.
— *gracilis* Bovallius, Syst. list Amphip. Hyper. 1887, p. 9.
— *gracilenta* Bovallius, Syst. list Amphip. Hyper. 1887, p. 9.
— *armata* Bovallius, Monograph pt. 1, 1887, p. 69, Pl. 10 fig. 15—22.
— *gracilis* Bovallius, Monograph pt. 1, 1887, p. 65, Pl. 9 fig. 14—28.
— *gracilenta* Bovallius, Monograph pt. 1, 1887, p. 67, Pl. 10 fig. 1—14.
— *erratica* Chevreux, Bull. Soc. Zool. France, vol. 17, 1892, p. 32, 3 figs.
— *armata* Behning, Zoologica 1912, p. 213, 220 (*lit. et syn.*), Pl. 4 (distrib.).

Mediterranean.

St. 14. *41°24′ N, 17°45′ E.* 1125 m. 21-12-1908. 1000 m. w. 8^{20} am. 90 min. 1 ♂.

St. 15. *40°04′ N, 19°06′ E.* 1000 m. 22-12-1908. 1400 m. w. 60 min. 5^{20} am.? (8^{00} am.?) 1 ♂.

St. 21. *37°51′ N, 15°21′ E.* > 500 m. 5-1-1909. 10 m. w. 11^{50} pm. 30 min. 1 (♀ jun. ?).

St. 22. *38°50′ N, 15°18′ E.* > 750 m. 7-1-1909. 25 m. w. 30 min. 8^{00} pm. 1 ♀

St. 24. *40°14′ N, 12°23′ E.* > 3700 m. 16-1-1909. 3000 m. w. (C. 130). 11^{30} am. 60 min. 2 ♀.

St. 25. *40°34′ N, 13°24′ E.* > 1800 m. 17-1-1909. 300 m. w. 5^{40} pm. 60 min. 1 ♂.

St. 28. *40°53′ N, 13°43′ E.* 600 m. 19-1-1909. 100 m. w. 10^{00} pm. 60 min. 1 ♂, 1 ♀.
St. 31. *41°44′ N, 10°52′ E.* 1420 m. 22-1-1909. 200 m.w. 3^{15} am. 30 min. 1 ♀.
St. 31. ibid. 600 m. w. 3^{05} am. 30 min. 1 ♂, 1 ♀.
St. 34. *43°27′ N, 8°16′* E. > 2000 m. 23-1-1909. 25 m. w. 4^{35} am. 30 min. 1 ♂, 1 ♀.
St. 34. ibid. 65 m. w. 5^{30} am. 30 min. 3 ♂, 2 ♀.
St. 34. ibid. 200 m. w. 6^{35} am. 30 min. 1 ♂, 2 ♀.
St. 35. *43°36′ N, 7°36′ E.* 2000 m. 28-9-1909. 25 m. w. 9^{10} pm. 60 min. 21 ♂, 31 ♀.
St. 35. ibid. 200 m. w. 6^{40} pm. 60 min. 7 ♂, 12 ♀. (2 with embryos).
St. 35. ibid. 300 m. w. 9^{40} pm. 120 min. 2 ♂, 1 ♀.
St. 36. *42°49′ N, 6°54′ E.* 2000 m. 30-1-1909. 65 m. w. 5^{35} am. 60 min. 1 ♀ with embryos.
St. 40. *39°10′ N, 9°40′ E.* 235 m. 1-2-1909. 65 m. w. 9^{30} pm. 30 min. 2 ♀.
St. 42. *38°58′ N, 9°37′ E.* 1120 m. 2-2-1909. 300 m. w. 9^{40} pm. 30 min. 1 ♀) with ova ?).
St. 45. *37°28′ N, 8°18′ E.* 2150 m. 6-2-1909. 65 m. w. 0^{15} am. 30 min. 1 ♂, 2 ♀.
St. 45. ibid. 300 m. w. 11^{25} pm. 30 min. 1 ♀.
St. 46. *37°17′ N, 6°00′ E.* 1930 m. 7-2-1909. 65 m. w. 8^{20} pm. 30 min. 9 ♂, 7 ♀ (1 with ova, 1 with embryos).
St. 46. ibid. 300 m. w. 7^{30} am. 30 min. 3 ♀.
St. 46. ibid. 600 m.w. 6^{35} pm. 30 min. 1 ♂, 3♀. (1 with ova).
St. 47. *36°55′ N. 3°12′ E.* > 2000 m. 10-2-1909. 65 m. w. 10^{20} pm. 30 min. 34 ♂, 23 ♀, 4 spec. juv.
St. 47. ibid. 300 m. w. 1^{25} pm. 30 min. 1 ♂, 1 ♀, 1 juv.
St. 50. *37°02′ N, 1°17′ E.* > 2000 m. 17-1-1909. 25 m.w. 1^{20} am. 30 min. 3 ♂, 5 ♀.
St. 50. ibid. 65 m. w. 2^{00} am. 30 min. 1 ♀ with embryos.
St. 51. *36°27′ N, 6°27′ E.* 2000 m. 18-2-1909. 200 m. w. 0^{50} am. 30 min. 1 ♂.
St. 53. *36°13′ N, 1°28′ W.* 2000 m. 18-2-1909. 2600 m.w. 5^{15} pm. 90 min. 2 ♂, 2 ♀.
St. 57. *36°45′ N, 3°30′ W.* 105 m. 20-2-1909. 25 m. w. 5^{45} am. 30 min. 1 ♀.
St. 59. *36°02′ N. 4°24′ W.* > 1206 m. 21-2-1909. 500 m. w. 1^{40} am. 30 min. 1 ♂.
St. 61. *35°57′ N, 5°35′ W.* 740 m. 21-2-1909. 600 m.w. 3^{35} pm. 60 min. 1 ♀.
St. 106. *36°33′ N, 2°00′ W.* 1150 m. 25-6-1910. 300 m.w. 1^{45} am. 30 min. 1 ♀.
St. 106. ibid. 1200 m. w. 0^{20} am. 60 min. 4 ♂, 19 ♀.
St. 107. *36°13′ N, 1°28′ W.* > 2000 m. 25-6-1910. 2000 m. w. 7^{30} am. 60 min. 10 ♂, 7 ♀.
St. 108. *36°03′ N, 0°27′ W.* > 2435 m. 25-6-1910. 25 m. w. 11^{45} pm. 15 min. 1 ♂, 1 ♀.
i St. 108. ibid. 300 m. w. 10^{30} pm. 30 min. 23 ♂, 23 ♀ (1 w th ova).
St. 108. ibid. 2000 m. w. 0^{40} am. 60 min. 4 ♂, 10 ♀.
St. 112. *36°56′ N, 2°15′ E.* 2700 m. 27-6-1910. 25 m. w. 1^{30} am. 15 min. 2 ♂, 8 ♀.
St. 112. ibid. 65 m. w. 1^{05} am. 15 min. 1 ♂, 1 ♀.
St. 112. ibid. 300 m. w. 0^{15} am. 30 min. 16 ♂, 28 ♀ (1 with embryos).
St. 113. *36°53′ N, 3°09′ E.* 815 m. 28-6-1910. 300 m. w. 3^{25} am. 30 min. 22 ♂, 44 ♀.
St. 115. *38°17′ N, 4°11′ E.* 2800 m. 29-6-1910. 25 m. w. 1^{40} am. 15 min. 15 ♂, 13 ♀.
St. 115. ibid. 65 m. w. 1^{20} am. 15 min. 1 ♂, 3 ♀, 4juv.
St. 115. ibid. 300 m. w. 11^{20} pm. 30 min. 7 ♂, 6 ♀.
St. 115. ibid. 2000 m. w. 0^{30} am. 60 min. 6 ♂, 8 ♀.
St. 116. *39°27′ N, 5°26′ E.* 2860 m. 30-6-1910. 25 m. w. 3^{00} am. 15 min. 33 ♂, 39 ♀. (1 with embryos).
St. 116. ibid. 65 m. w. 2^{20} am. 30 min. 5 ♂, 1 ♀, 3 juv.
St. 116. ibid. 300 m.w. 1^{40} am. 30 min. 14 ♂, 19 ♀, 2 indet.
St. 118. *41°00′ N, 6°43′ E.* > 2700 m. 1-7-1910. 25 m.w. 0^{20} am. 15 min. 20 ♂, 22 ♀.
St. 118. ibid. 65 m. w. 11^{35} pm. 30 min. 44 ♂, 54 ♀.
St. 118. ibid. 300 m. w. 10^{55} pm. 30 min. 5 ♂, 16 ♀.
St. 120. *42°31′ N, 7°41′ E.* Ca. 2700 m. 1-7-1910. 300 m. w. 8^{50} pm. 30 min. 7 ♂, 4 ♀.
St. 122. *43°50′ N, 8°34′ E.* > 1500 m. 2-7-1910. 1200 m. w. 5^{30} am. 60 min. 4 ♂, 1 ♀.
St. 123. *44°14′ N, 8°55′ E.* > 600 m. 3-7-1910. 10 m. w. 2^{30} am. 15 min. 1 ♂.
St. 123. ibid. 25 m. w. 1^{50} am. 15 min. 6 ♀.
St. 123. ibid. 65 m.w. 0^{55} am. 30 min. 25 ♂, 7 ♀ (1 with ova).
St. 123. ibid. 300 m. w. 0^{05} am. 30 min. 1 ♀.
St. 125. *43°54′ N, 9°13′ E.* 1082 m. 9-7-1910. 25 m. w. 10^{30} pm. 30 min. 129 ♂, 107 ♀.
St. 125. ibid. 300 m. w. 9^{45} pm. 30 min. 7 ♂, 1 ♀.
St. 126. *42°43′ N, 9°50′ E.* 600—620 m. 10-7-1910. 300 m. w. 9^{30} pm. 30 min. 4 ♂, 1 ♀.
St. 129. *40°05′ N, 11°31′ E.* 3420 m. 12-7-1910. 600 m.w. 8^{00} pm. 30 min. 4 ♂, 1 ♀.
St. 129. ibid. 1000 m. w. 4^{20} am. 60 min. 2♂, 2 ♀.
St. 130. *39°35′ N, 11°20′ E.* > 3000 m. 13-7-1910. 25 m. w. 0^{50} am. 30 min. 1 ♂.
St. 133. *38°18′ N, 9°59′ E.* 600 m. 14-7-1910. 25 m. w. 11^{00} pm. 30 min. 2 ♂.
St. 133. ibid. 300 m. w. 10^{15} pm. 30 min. 1 ♂, 6 ♀.
St. 137. *37°17′ N, 10°56′ E.* 175—195 m. 19-7-1910. 250 m. w. 9^{05} am. 30 min. 2 ♂.
St. 138. *37°37′ N, 11°25′ E.* 820 m. 19-7-1910. 25 m. w. 9^{50} pm. 30 min. 1 ♂, 2 ♀, 1 juv.
St. 138. ibid. 300 m. w. 9^{10} pm. 30 min. 5 ♂, 4 ♀.
St. 139. *37°57′ N, 11°54′ E.* 680 m. 20-7-1910. 25 m. w. 1^{40} am. 30 min. 1 ♂, 4 ♀, 1 juv. (♂?).
St. 139. ibid. 530 m. 300 m.w. 2^{35} am. 30 min. 2 ♂, 4 ♀.
St. 139. ibid. 800 m. w. 3^{40} am. 60 min. 1 ♀.
St. 143. *35°18′ N, 16°25′ E.* 1842 m. 23-7-1910. 300 m. w. 0^{30} am. 30 min. 1 ♀.
St. 145. *32°38′ N, 19°02′ E.* 1925 m. 25-7-1910. 25 m.w. 3^{30} am. 30 min. 3 ♂, 1 ♀.
St. 147. *31°35′ N, 19°02′ E.* 993 m. 25-7-1910. 26 m. w. 11^{35} pm. 30 min. 2 ♂.
St. 156. *32°24′ N, 26°51′ E.* 3000 m. 30-7-1910. 25 m. w. 2^{05} am. 30 min. 3 ♂, 5 ♀.
St. 156. ibid. 600 m. w. 3^{00} am. 30 min. 1 ♂.
St. 156. ibid. 1000 m. w. 0^{40} am. 60 min. 1 ♂ juv.
St. 186. *37°57′ N, 19°51′ E.* > 3000 m. 17-8-1910. 300 m. w. 8^{15} pm. 15 min. 1 ♀ with ova.
St. 192. *38°07′ N, 15°35′ E.* 652 m. 20-8-1910. 25 m. w. 9^{10} pm. 15 min. 1 ♀.
St. 194. *38°33′ N, 15°29′ E.* 1140 m. 21-8-1910. 1200 m. w. 6^{00} am. 30 min. 1 ♂.
St. 196. *39°59′ N, 14°31′ E.* 660 m. 22-8-1910. 25 m. w. 2^{40} am. 30 min. 16 ♂, 13 ♀.
St. 199. *39°33′ N, 10°49′ E.* Ca. 2700 m. 25-8-1910. 25 m. w. 9^{00} pm. 15 min. 1 ♀.
St. 199. ibid. 300 m. w. 9^{25} pm. 20 min. 3 ♂, 2 ♀.
St. 199. ibid. 1000 m. w. 10^{10} pm. 30 min. 2 ♂.
St. 200. *39°18′ N, 10°11′ E.* 940 m. 26-8-1910. 25 m.w. 3^{45} am. 30 min. 6 ♂, 11 ♀.

St. 204. *38°52′ N, 7°43′ E.* > 1000 m. 27-8-1910. 25 m.w. 4^{00} am. 15 min. 12 ♂, 9 ♀.
St. 204. ibid. 65 m. w. 4^{30} am. 15 min. 5 ♂.
St. 204. ibid. 300 m. w. 5^{00} am. 30 min. 1 ♂.
St. 206. *39°32′ N, 5°15′ E.* 2782 m. 28-8-1910. 25 m. w. 0^{30} am. 15 min. 3 ♂, 11 ♀.
St. 206. ibid. 300 m. w. 1^{05} am. 15 min. 5 ♂, 9 ♀, 1 spec. (defective).
St. 206. ibid. 1000 m. w. 1^{40} am. 45 min. 6 ♂, 8 ♀.
St. 206. ibid. 2000 m. w. 3^{05} am. 45 min. 2 ♂, 3 ♀.
St. 207. *40°34′ N, 3°03′ E.* 2131 m. 29-8-1910. 1000 m. w. 6^{00} am. 45 min. 7 ♂, 27 ♀.
St. 208. *40°18′ N, 3°20′ E.* 1600 m. 29-8-1910. 25 m. w. 1^{40} am. 15 min. 3 ♂, 10 ♀ (1 with ova).
St. 209. *40°34′ N, 3°03′ E.* 2131 m. 29-8-1910. 2000 m. w. 7^{25} am. 45 min. 2 ♂, 1 ♀.
St. 210. *41°10′ N, 2°23′ E.* 775 m. 30-8-1910. 600 m. w. 3^{35} am. 30 min. 21 ♂, 47 ♀.
St. 215. *39°14′ N, 0°52′ E.* 1050 m. 31-8-1910. 25 m. w. 9^{20} pm. 30 min. 1 ♀.
St. 218. *36°54′ N, 2°57′ E.* 2147 m. 2-9-1910. 300 m. w. 2^{45} pm. 30 min. 1 ♂, 1 ♀.
St. 220. *36°25′ N, 0°42′ E.* 375 m. 4-9-1910. 25 m. w. 2^{15} am. 30 min. 21 ♂, 38 ♀.
St. 222. *36°53′ N, 0°57′ W.* 1950 m. 4-9-1910. 25 m. w. 10^{50} pm. 15 min. 1 ♂, 1 ♀.
St. 222. ibid. 300 m. w. 11^{20} pm. 30 min. 9 ♂, 10 ♀ (2 with ova).
St. 224. *36°33′ N, 2°00′ W.* > 950 m. 5-9-1910. 300 m. w. 7^{20} pm. 15 min. 10 ♂, 10 ♀.
St. 277. ("Pangan"). > 3000 m. *33°20′ N, 27°30′ E.* 6-4-1911. 132 m. w. (S. 200). 11^{35} pm. 30 min. 4 ♂, 3 ♀.
St. 298. ("Pangan"). *34°20′ N, 21°10′ E.* > 2000 m. 26-6-1911. 38 m. w. (S. 200). 12^{00} pm. 30 min. 1 spec. juv.
St. 339. ("Pangan". *40°30′ N, 3°10′ E.* > 2000 m. 20-8-1911. 28 m. w. (S. 200). 3^{00} am. 30 min. 2 ♂ (?), 1 ♀.
St. 384. ("Pangan"). *32°50′ N, 27°10′ E.* > 3000 m. 7-11-1911. 122 m. w. (S. 150). 9^{00} pm. 30 min. 2 ♀, 1 juv.
St. 385. ("Pangan"). *35°10′ N, 18°10′ E.* > 3000 m. 9-11-1911. 122 m. w. (S. 150). 9^{00} pm. 30 min. 1 ♂, 3 ♀.

Atlantic.

St. 62. *50°25′ N, 12°44′ W.* 2480—2775 m. 5-6-1906. 1500 m. w. (Y. 330). 2^{45} am. 120 min. 1 ♀.
St. 72. *48°41′ N, 11°30′ W.* 2660 m. 3-6-1906. 200 m.w. (Y. 330). 10^{15} pm. 60 min. 1 ♀.
St. 82. *51°00′ N, 11°43′ W.* 1120—1370 m. 14-6-1905. 300 m. w. (Y. 330). 1^{35} am. 120 min. 1 ♀.
St. 82. ibid. 840—1400 m. 800 m. w. (Y. 330). 120 min. 3^{45} pm. 2 ♂, 4 ♀.
St. 82. ibid. 840—1350 m. 1200 m. w. (Y. 330). 120 min. 0^{45} pm. 47 ♂, 103 ♀ (4 with ova or embryos 7—10 mm.).
St. 88. *48°09′ N, 8°30′ W.* 600—995 m. 20-6-1905. 300 m. w. 8^{45} pm. 120 min. 8 ♂, 14 ♀.
St. 90. *47°47′ N, 8°00′ W.* 740—1600 m. 21(22)-6-1905. 300 m. w. (Y. 330). 2^{15} am. 120 min. 2 ♀.
St. 167. *57°46′ N, 9°55′ W.* 1000—1280 m. 1-9-1905. 1500 m. w. 1 ♂.
St. 4. *45°20′ N, 7°42′ W.* > 4000 m. 1-12-1908. 1500 m. w. (C. 130). 11^{45} am. 30 min. 8 ♂, 11 ♀.
St. 5. *43°10′ N, 9°30′ W.* 180 m. 2-12-1908. 65 m. w. 9^{15} am. 30 min. 1 ♂.
St. 66. *36°16′ N, 6°52′ W.* > 735 m. 25-2-1909. 600 m.w. 5^{15} am. 120 min. 1 ♂ with embryos.
St. 66. ibid. 1200 m. w. 8^{00} am. 120 min. 2 ♀.
St. 69. *36°13′ N, 9°44′ W.* > 3500 m. 1-3-1909. 25 m. w. 0^{30} am. 30 min. 1 spec. juv.
St. 69. ibid. 28-2-1909. 300 m.w. 11^{40} pm. 30 min. 1♂, 1♀.
St. 74. *44°21′ N, 7°55′ W.* 2000 m. 8-3-1909. 300 m. w. 10^{50} pm. 60 min. 3 ♂, 1 ♀.
St. 74. ibid. 600 m. w. 0^{10} am. 60 min. 3 ♂.
St. 75. *45°37′ N, 7°03′ W.* 4000 m. 9-3-1909. 300 m. w. 7^{45} pm. 60 min. 23 ♂, 17 ♀.
St. 80. *46°17′ N, 7°31′ W.* > 4000 m. 13-6-1910. 65 m. w. 10^{00} pm. 30 min. 1 ♀.
St. 89. *36°28′ N, 8°22′ W.* 1310 m. 18-6-1910. 300 m. w. 3^{25} am. 30 min. 1♂.
St. 89 ibid. 1000 m. w. 4^{10} am. 30 min. 2 ♂, 3 ♀.
St. 91. *35°53′ N, 7°26′ W.* 1225 m. 18-6-1910. 1600 m. w. 5^{25} pm. 60 min. 9 ♂, 2 ♀, 1 spec. 3,5 mm.
St. 95. *35°57′ N, 6°00′ W.* 275 m. 23-6-1910. 300 m. w. 5^{10} am. 30 min. 1 ♀.
St. 96. *35°48′ N, 5°58′ W.* 190 m. 23-6-1910. 65 m. w. 9^{30} am. 30 min. 2 ♀.
St. 240. *44°34′ N, 8°16′ W.* 2500 m. 15-9-1910. 300 m. w. 9^{00} pm. 15 min. 3 ♂.
St. 240. ibid. 1000 m. w. 9^{40} pm. 30 min. 1 ♂.
St. 242. *46°19′ N, 6°48′ W.* 4941 m. 16-9-1910. 65 m.w. 10^{55} pm. 30 min. 1 ♂, 5 ♀ (1 with ova).
St. 242. ibid. 4350 m.w. (C. 200). 7^{00} pm. 60 min. 2 ♂, 5 ♀.
St. 398. ("Ingolf"). *36°48′ N, 14°22′ W.* 26-10-1911. Surface (S. 150), 1^{10} am. 30 min. 1 spec. juv.
St. 399. ("Ingolf"). *34°23′ N, 15°31′ W.* 26-10-1911. 56 m. w. (S. 150). 9^{40} pm. 30 min. 1 ♀.

There are, strangely enough, no complete drawings of this well-known and widely distributed species, and

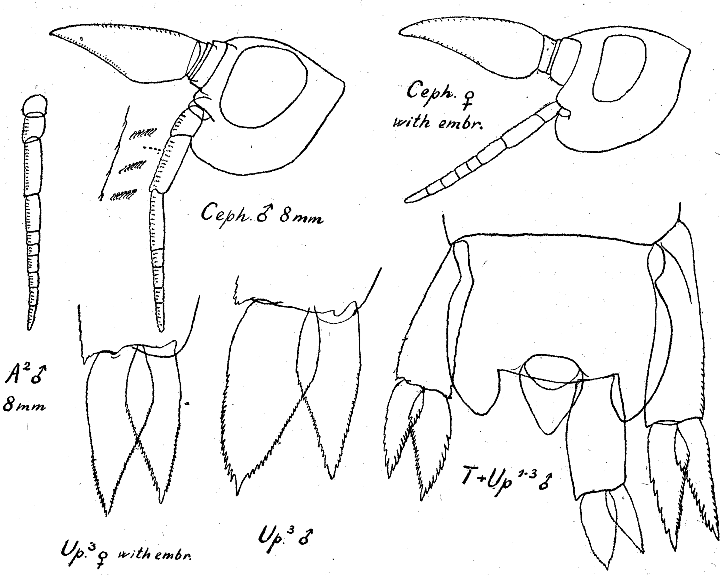

Fig. 15. Vibilia armata.

I have therefore found it advisable to illustrate all the limbs here, referring for the rest to the description by Bovallius and Chevreux.

The eyes may in the ♂ be extremely large, so much so indeed as to swell the entire upper part of the head into a marked dome. The ♂ which I have drawn does not exhibit this character in any striking degree. The

♀ may have 9, and the ♂ 10 joints in ant. 2 — Behning gives (l. c. 1912) 6—8 and 7—9 respectively. Ant. 1 on the other hand is as usual nearly the same in both sexes. As the eyes in the ♀ may reach a considerable size, and as ant. 2 in the ♂ is not much longer than in the ♀, these parts do not present good indications of sex. The best sex character (always excepting of course the presence or absence of marsupial plates) is the inner ramus of up. 3; this is evenly pointed and fairly slender in the ♀, while in the ♂ it is much broader and especially on the inner margin slightly convex, the sharp terminal spine being distinctly marked off.

With regard to the shape of p. 1—p. 4 I have nothing to remark, save that the spinous armature is stronger than shown by Bovallius (in p. 2 the distal part of my figure is turned so that it is seen more from the edge than from the flat, whereby it is rendered comparatively narrow). In p. 5 the 2. joint is a good deal broader than in p. 6, but, as shown in my fig., the arrangement of spines on the 4.—5. joint strongest in p. 6, whereas the 6.—7. joints are alike. In p. 7, the 4.—5. joints are comparatively broad, and the 5.—6. joints have at the anterior distal end a process, though not so large as in *V. cultripes*. The 7. joint is only half as large as the 6.

The size is noted by Behning as abt. 8 mm. Most of the specimens from the "Thor" are (6) 7—9 (10) mm and there is no difference in this respect between ♂ and ♀. Most of the ♀ with ova or embryos were 8—9 mm. Some few specimens were only 3.3—5 mm. Some of the small specimens were possibly not correctly determined as to sex, as the sexual characters are generally not distinctly developed in individuals less than 5—6 mm.

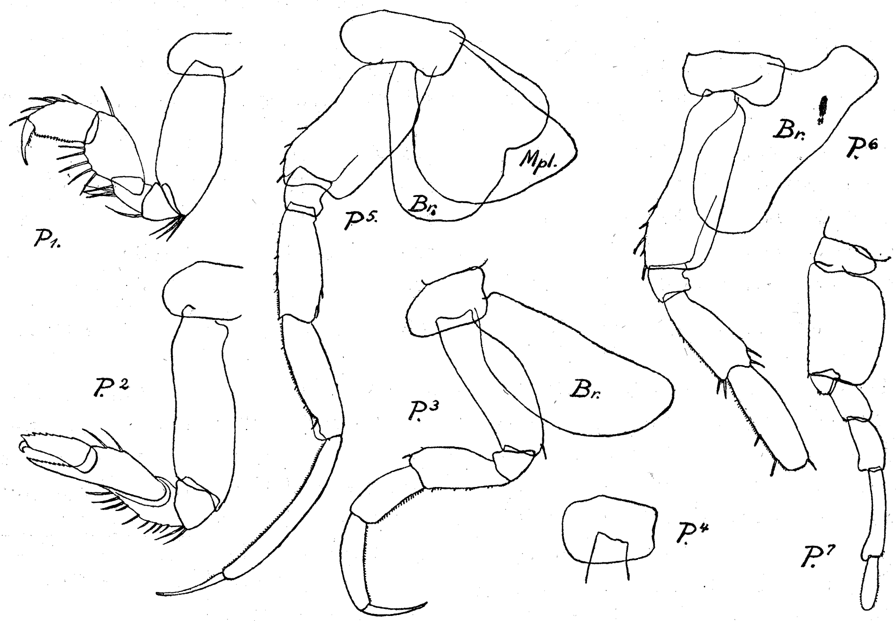

Fig. 16. Vibilia armata ♀. Br. = the branchial vesicle. Mpl. = the marsupial plate. (In p. 6 the 6.—7. joints are not drawn).

A. Mediterranean.

Material and Distribution. The material collected by the "Thor" and "Pangan" in the Mediterranean comprises 67 stat., 108 hauls, and 1520 specimens (683 ♂, 814 ♀, 23 juv.).

It is found in water with depth to bottom between 500 and over 3000 m.; only 4 stat. lie at lesser depths, *viz*; 105 m. (St. 57, 1909), 175—195 m. (St. 137, 1910), 235 m. (St. 40, 1909) and 375 m. (St. 220, 1910).

It seems to prefer a depth to bottom between 1001 and 3000 m.; these giving not only the greatest number of positive hauls (72 out of 108) but also comparatively greatest number of specimens per normal haul (14.5—19.7). True, there is also a large average number of specimens from the shallowest waters (less than 500 m.); but as there are only 4 hauls (out of a total 108) this slight depth must be counted as exceptional.

The species was found at 67 stations, but disregarding the four at depths to bottom less than 500, and the 5 not made by the "Thor" itself (i. e. those of the "Pangan"), we have then 58 stations at which it was taken by the "Thor" with depth to bottom over 500 m. Of these, only 9 lie in the eastern basin, the western basin having 49. Of negative stations, on the other hand (depth to bottom over 500 m., night hauls 10—2000 m. w.) there are in the eastern basin with the Darda-

	No. of stations	No. of hauls	No. of specimens
Dec. 1908	2	2	2
Jan. 1909	9	14	103
Feb. —	11	16	110
June 1910	7	17	406
July —	16	29	530
Aug. —	13	20	251
Sept. —	4	5	100
April 1911	1	1	7
June —	1	1	1
Aug. —	1	1	3
Nov. —	2	2	7
total...	67	108	1520

nelles, the Sea of Marmora and the Black Sea 16, where as the western basin has but 12. The western basin has thus 4 times as many positive as negative station, whereas the eastern has twice as many negative as positive.

Depths of the stations	No. of stations
0—500 m......	4
501—1000 -	16
1001—2000 -	20
2001—3000 -	20
> 3000 -	7
total ...	67

On examining the distribution of the negative stations as compared with the positive, it will be seen that in the western basin, the negatives lie fairly evenly spread out among the positive, so that the negative results must apparently be due to accidental causes. In the eastern basin on the other hand, we find that the species was not taken within the Ægean Islands, and the actual finds in the remaining portion of the basin are scattered widely over a large area. It does, however, go up into the Adriatic. For further details as to the difference between the two basins see under vertical occurrence.

Depths of the stations	No. of hauls	No. of specimens	No. of spec. (normal hauls)	Average no. pr. norm. h.
0—500 m .	4	64	64	16
501—1000 - ..	24	290	263	11
1001—2000 - ..	30	460	445	14.8
2001—3000 - ..	42	679	828	19.7
> 3000 - ..	8	27	23	2.9
total...	108	1520	1623	

Vertical occurrence. During the day, 35 specimens were taken, in 9 hauls, with 200—2600 m. w.

Night hauls on the other hand, (88 in all) yielded 1427 specimens. (10—2000 m. w.).

The following table includes only the hauls made from the "Thor" itself, and only with depths to bottom over 500 m.

Night hauls, "Thor", > 500 m:

m. w.	No. of hauls	No. of specimens	No. of spec. (normal hauls)	Average no. pr. norm. h.
10—35.....	30	654	840	28
50—100....	13	213	227	17.5
130—250....	3	21	12	4
300—400....	24	340	373	15.5
500—800....	7	82	82	11.7
1000—1200...	8	84	53	6.6
1400— ...	3	33	11	3.7
total...	88	1427	1598	

From this it will be seen that the number of individuals per normal haul diminishes gradually downwards, (save for the 3 hauls with 130—250 m. w. which gave but a small yield). And on looking through the lists of localities, it will be found that with lengths of line over 300 m. w. it was only taken either in quite small numbers per haul or elsewhere more were taken, the hauls were made at stations where the species was also brought up with a lesser length of line, so that we may take it for granted that the specimens were first caught while hauling in. The only real exception is St. 210 (1910), 600 m. w. where 68 specimens were taken; at this place, a haul was made at 2.45 am. with 25 m. w. but gave negative result.

The results of positive hauls with more or less than 300 m. w. appear when compared as follows:

m. w.	Posit. night hauls	Total no. of night hauls	Percentage of positive hauls
10—300..........	70	157	44.5 %
> 300..........	18	46	39.1 —
total ...	88	203	

There is thus but very slight difference between the percentages for positive hauls in the two levels.

A greater difference is apparent when we compare the average numbers of specimens per normal haul:

m. w.	Posit. night hauls	No. of spec. (normal hauls)	Average no. pr. normal haul
10—300..........	70	1452	20.7
> 300..........	18	146	8.1
total...	88	1598	

We can at any rate take it for granted that the species is only exceptionally found at depths beyond what corresponds to 300 m. w., as on omitting the single haul which gave a big yield with lengths of line over 300 m. w. (600 m. w. 68 spec,) we have 17 hauls (over 300 m. w.) yielding but 78 specimens, or only 4.6 spec. per haul, as against 20.7 per haul with from 10—300 m. w.

Night hauls, > 500 m. (W.B. = Western Basin, E.B. = Eastern Basin):

m. w.	No. of posit. hauls		Total no. of hauls		Percentage of positive hauls	
	W. B.	E. B.	W. B.	E. B.	W. B.	E. B.
10—300..	63	7	112	45	56.3 %	15.5 %
> 300..	16	2	30	16	53.3 —	12.5 —
total..	79	9	112	61	55.7 —	14.7 —

When the positive hauls are taken separately from the eastern and western basin it may be seen that the western basin has about 4 times as many positive hauls percent as the eastern; the figures are respectively 55.7 % and 14.7 %.

The average figures for number of specimens per haul show an even more marked difference as between the two basins, being in the ratio of 8—9 to 1.

The species does not appear to show any difference in the depth preferred in the two basins.

The general result then is as follows: the species is common throughout the whole of the western basin at depths over 500 m., whereas in the eastern, it is comparatively rare.

It will be seen from the table below, that at depths where the species is more particularly found, (10—300 m. w.) each normal haul yielded 25.2 specimens in summer as against 7.9 in winter.

Propagation. The number of males taken was 683, that of the females 814, and there is thus no very great difference in frequency between the two sexes. The grown animals vary in size between very narrow limits (6) 7—9 (10) mm. so that nothing can be arrived at from this with regard to age or growth.

Females with ova or embryos were taken in Jan, Feb., June—Sept. and both in the eastern and western basin. The species thus propagates all the year round. Young specimens, too small for sex determination, were also found at all seasons (Dec., Feb. June, July, Nov.).

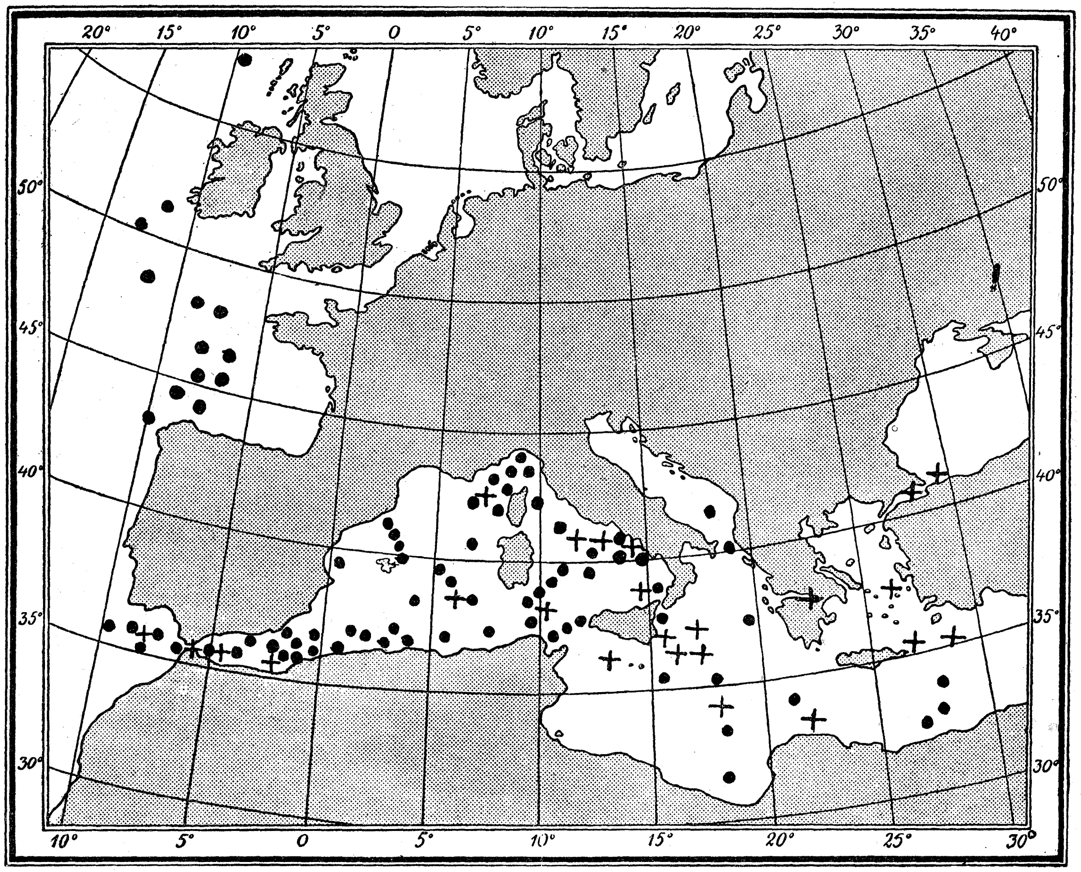

Chart 6. Vibilia armata. ● Positive stations (st. 398—399 lie outside the map to the west). + negative st. (night, 10—2000 m. w., > 500 m). Some of the stations lie so close to each other that it was impossible to note them all.

m. w.	No. of posit. hauls		No. of spec. (normal hauls)		Average no. pr. normal haul	
	W. B.	E. B.	W. B.	E. B.	W. B.	E. B.
10—300..	63	7	1432	20	22.7	2.8
> 300..	16	2	144	2	9	1
total ..	79	9	1576	22	19.9	2.3

Night, > 500 m, 10—300 m. w.:

	No. of pos. hauls	No. of spec.	No. of spec. (normal hauls)	Average no. pr. normal haul
Winter.....	18	186	142	7.9
Summer....	52	1042	1309	25.2

B. The Atlantic.

In the Atlantic, the species was taken at 21 stat., 29 hauls, with 299 spec. The most northerly station, (St. 167, 1905) lies at 57°46′ N, 9°55′W, which advances the northern limit of occurrence for the species a considerable distance to the northward (Behning, in 1912, gave the northern limit as at SW Ireland, abt. 53° N). It is characteristic, however, that this northerly find was made in 1905, when the strong Atlantic current carried so many southerly forms farther north.

The depth to bottom is as in the Mediterranean, 500— over 4000 m.; only 3 stations are at depths less than 500 m., (*viz*; 180, 190 and 275 m.). In that part of the Atlantic which was investigated by the "Thor" in 1908—10, there is but one negative station, and this lies surrounded by the positive stations, so that the non-occurrence of the species at the former is doubtless merely accidental. It would therefore seem to be of as frequent occurrence in these parts of the Atlantic as in the western Mediterranean.

Vertical occurrence. In contrast to the Mediterranean, the species seems in the Atlantic to be most numerous at depths beyond that answering to 300 m. w. such depths giving not only the greatest percentage

Night hauls, > 500 m:

m. w.	No. of posit. hauls	Total no. of hauls of the "Thor"	Percentage of posit. hauls	No. of specimens (norm. hauls)	Average no. of spec. (norm. hauls)
25.....	1	15	6.7 %	1	1
65.....	2	16	12.5 —	7	3.5
300....	4	12	33.3 —	10	2.5
> 300 .	6	13	46.2 —	33	5.5
total..	13	56			

of positive hauls, but also the greatest number of specimens per normal haul. In this respects, there appears to be but little difference between the area north of 40° N and that south of the same, but the material is to small to permit of any definite assertion.

Propagation. Females with ova or embryos were found in Feb., June, Sept. and young specimens in March, June and Oct. so that the species seems here, as in the Mediterranean, to propagate all the year round.

Distribution.

According to BEHNING's chart (Pl. 4) the distribution can roughly be stated as follows: Mediterranean as far as Corsica, Atlantic abt. 53° N — abt. 43° S, Indian Ocean abt. 13° N — abt. 30 °S, Eastern Pacific abt. 35° N — abt. 25° S.

1. The Mediterranean. For the results of the "Thor" investigations *vide supra*. LO BIANCO records it for 1903—04 as belonging to the scotoplankton (over 300 m. below the surface): this is thus not correct, when we compare it with the finds of the "Thor" in the Mediterranean, but better agrees with the facts as noted in the Atlantic. — Despite the fact, as shown by the "Thor" investigations, that the species must be reckoned as one of the character forms for the Mediterranean, it is strangely enough only previously known in this sea from the Bay of Garoupe (Cape d'Antibes, W of Nice) (*V. erratica*, CHEVREUX l. c. 1892) and from Capri (VOSSELER, LO BIANCO). According to CHEVREUX, (1892) it should, in contrast to *V. Jeangerardi*, always live freely, not in *Salpæ*, but the "Thor" material affords no information on this head.

2. Atlantic. SW of Ireland, abt. 51°—53° N, 30—750 faths. (WALKER, "Oceana" 1903; TATTERSALL 1906) Bay of Biscay, 50—0 faths. (STEBBING, Biscayan Plankton 1904). These are all the localities I have been able to find for the Atlantic coasts of Europe; BEHNING, however, notes it on his chart at many places between Portugal-Azores-Newfoundland; a great number of the localities there indicated are doubtless from the Norwegian "Michael Sars" Exped. The German Plankton Exped. found it in the Florida current (St. 46), 41.6° N, 56.3° W, surf.; N. eq. current (St. 135) 18.9° N, 26.4° W, 0—400 m., (St. 146) 12.3° N, 22.3° W, 0—400 m., Guinea current (St. 173) 2.9° N, 18.4° W, 0—400 m., and S. eq. current (St. 177) 1.7° N, 17.3° W, 0—500 m., (St. 180) 1.1° N, 16.4° W, 0—400 m., (St. 184) 0.3° S, 15° W, 0—500 m.; 17 specimens in all.

A number of the localities marked by BEHNING on his chart for the southern Atlantic (abt. 5° N. — abt. 10° S, and W of the southern point of Africa) are probably from the Swedish and German Antarctic Expeditions. BOVALLIUS records it (Monograph) without precise locality from the Atlantic and tropical parts of the Atlantic, and S. Atlantic; his type-specimen of *V. gracilenta* is said to be in the Copenhagen Zoological Museum, but is not there. Strangely enough, it is not mentioned by CHEVREUX in the "Hirondelle" Exped. of 1900. BEHNING notes it without precise locality from the German "Valdivia" Exped. (126 spec. from 32 stat.); he does not even mention, however, in what seas the stations in question lie.

3. Indian Ocean. BEHNING's chart shows a number of finds about the equator, and a single one midway between Madagascar and Australia; some of these are doubtless from the "Valdivia" Exped.

4. Tropical Pacific. Without locality (BOVALLIUS, Monogr.). Eastern part, abt. 30° N, — abt. 25° S. (BEHNING's chart, "Albatross" Exped.?).

9. VIBILIA PYRIPES Bovall. (fig. 17, chart 5 [pars], p. 40).

Vibilia pyripes Bovallius, Syst. list Amphip. Hyper. 1887, p. 10.
— — Bovallius, Monograph pt. 1, 1887, p. 71, Pl. 10 fig. 23—30.
— — Behning, Zoologica 1912, p. 213, 221 (*lit.*), Pl. 6 (distrib.).

St. 82. *51°03′ N, 11°43′ W.* 840—1350 m. 15-6-1905. 1200 m. w. 3^{45} pm. 1 ♂, 6,5 mm.

St. 69. *36°13′ N, 9°48′ W.* > 3500 m. 28-2-1909. 65 m. w. 10^{45} pm. 1 ♂(?), 6 mm.

St. 74. *44°21′ N, 7°55′ W.* 2000 m. 8-3-1909. 300 m. w. 10^{50} pm. 1 ♀, 7 mm.

St. 399 ("Ingolf"). *34°23′ N, 15°31′ W.* > 2600 m. 26-10-1911. Surface. 9^{40} pm. 1 ♂, 6 mm.

Ant. 2 is in the male nearly 1½ times as long as ant. 2, i. e. longer in proportion than in the female. In up. 3 there is no difference between the sexes.

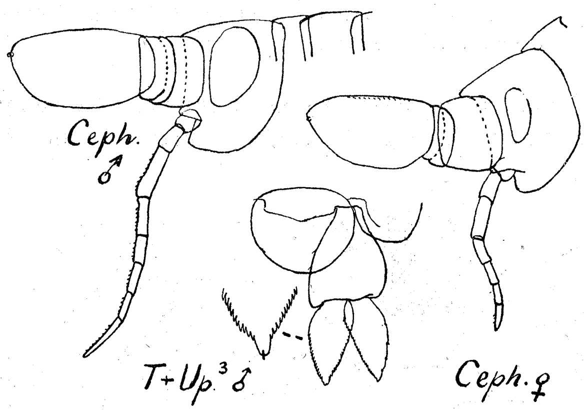

Fig. 17. Vibilia pyripes.

It lives, as we see, on the whole at depths to bottom over 1000 m., and has been taken during the night only at depths below the surface answering to 10—300 m. w. In the case of this species also, it is characteristic that the most northerly find is from 1905.

Distribution, The species is, if not rare, at any rate not numerous. It is characteristic that the most northerly find — far beyond the ordinary limit — is from 1905, on account of the north-going current. It has not, however, as a matter of fact, ever been found before in the waters investigated by the "Thor". I have only been able to find a single precisely indicated locality in the literature, *viz.* that from the German Plankton Exped. (St. 190) southern equatorial current, 4,1° S., 14,2° W. 0—400 m (Vosseler). Bovallius, in the Monograph, records it from "tropical parts of Atlantic". It is also noted on Behning's chart (Pl. 6) from the Atlantic between the Azores and Newfoundland, and at the equator, from the Indian Ocean close to the equator and from the eastern Pacific abt. 5°—10° S. These finds would seem to be from the "Michael Sars", "Valdivia" and "Albatross" Exped. (Behning, Zool. Anz. 1912—1913).

10. VIBILIA GRANDICORNIS Chevreux.

Vibilia grandicornis Chevreux, Hirondelle 1900, p. 131, Pl. 16 fig. 2.

Vibilia grandicornis Behning, Zoologica 1912, p. 213, 221, Pl. 6 (distrib.).

St. 74. *44°21′ N, 7°55′ W.* 2000 m. 8-3-1909. 300 m. w. 10^{50} pm. 60 min. 1 ♂, 7 mm.

This species is so closely allied to *V. pyripes*, that I am not certain that it may in reality be identical therewith. Chevreux gives (l. c.) a list of the differences between the two; the characters for *V. grandicornis* agree very well with my spec. save as regards p. 3—p. 6 which in respect of the features mentioned by Chevreux occupy an intermediate position between the two species, the telson also being not much shorter than the peduncle in up. 3, but about the same length.

My specimen is a ♂ of 7 mm. (Chevreux gives 5 mm.) and with 8 joints in ant. 2 (Chevreux, 7).

Behning (l. c.) incorrectly notes the eyes as round; they are as a matter of fact oblong, but remarkable small; in males of the other species (also *V. pyripes*) they are on the whole much larger. In his list of determinations, the carpal process on p. 2 is noted as more than half as long the metacarpus, whereas in my spec. it is abt. half as long.

This species which should possibly be combined with *V. pyripes*, has previously only been found in two localities *viz*; 43°47′ N, 20°51′ W, surface, and 44°02′ 15″N, 14°25′45″W, surface (Chevreux l. c.).

11. VIBILIA CULTRIPES Vosseler (fig. 18, chart 7).

**Vibilia cultripes* Vosseler, Plankton-Exped., 1901, p. 121, Pl. 11 fig. 6—18.
— — Behning, Zool. Anzeiger vol. 41, Nr. 1, 1912, p. 5
— — Behning ibid. Nr. 12, 1913, p. 533.
— — — , Zoologica, 1912, p. 213, 222, Pl. 6. (distrib.).

Mediterranean.

St. 10. *37°21′ N, 16°45′ E.* > 2100 m. 15-12-1908. 600 m. w. 60 min. 3^{45} pm. 1 ♂, 13 mm.

St. 15. *40°04′ N, 19°06′ E.* 1125 m. 22-12-1908. 1400 m. w. 60 min. (hour ?) 1 ♂, 11 mm., 1 ♀., 13 mm.

St. 22. *36°57′ N, 15°18′ E.* > 750 m. 7-1-1909. 25 m. w. 8^{00} pm. 30 min. 1 ♀, 15 mm.

St. 25. *40°34′ N, 13°24′ E.* > 1800 m. 17-1-1909. 300 m. w. 5^{40} pm. 60 min. 1 ♀ 11 mm.

St. 31. *41°44′ N, 10°52′ E.* 1420 m. 22-1-1909. 65 m. w. 4^{30} am. 30 min. 1 ♀, 11 mm.

St. 31. ibid. 200 m. w. 30 min. 3^{15} am. 1 ♂, 13 mm.

St. 31. ibid. 600 m. w. 30 min. 3^{05} am. 1 ♀, 10 mm.

St. 39. *39°41′ N, 10°02′ E.* 1750 m. 1-2-1909. 25 m. w. 5^{00} am. 60 min. 1 ♀, 14 mm.

St. 42. *38°58′ N, 9°37′ E.* 1120 m. 2-2-1909. 300 m. w. 9^{40} pm. 30 min. 3 ♀♀, 11 mm.

St. 45. *37°28′ N, 8°18′ E.* > 2150 m. 6-2-1909. 65 m. w. 0^{15} am. 30 min. 4 ♂♂, 8 ♀♀, 11—12 mm.

St. 46. *37°17′ N, 6°00′ E.* 1930 m. 7-2-1909. 65 m. w. 8^{20} pm. 30 min. 2 ♀♀, 9—10 mm.
St. 46. ibid. 300 m. w. 30 min. 7^{30} pm. 2 ♂♂, 10—11 mm.
St. 47. *36°55′ N, 3°12′ E.* > 2000 m. 10-21-909. 65 m.w. 10^{20} pm. 30 min. 1 ♂, 2 ♀♀, 11 mm.
St. 47. ibid. 300 m. w. 1^{25} pm. 30 min. 1 ♀, 11 mm.
St. 50. *37°02′ N, 1°17′ E.* > 2000 m. 17-2-1909. 25 m. w. 1^{20} am. 30 min. 1 ♀, 11 mm.
St. 50. ibid. 65 m. w. 2^{00} am. 30 min. 2 ♀♀, 11—12 mm.
St. 50. ibid. 1600 m. w. 5^{30} am. 60 min. 1 ♂, 2 ♀♀, 11—12 mm.
St. 53. *36°13′ N. 1°28′ W.* 2000 m. 18-2-1909. 2600 m. w. 5^{15} pm. 90 min. 6 ♀♀, 11—12 mm.
St. 59. *36°02′ N. 4°24′ W.* 1260 m. 21-2-1909. 25 m. w. 0^{10} am. 60 min. 1 ♀, 13 mm.
St. 59. ibid. 100 m.w. 1^{00} am. 30 min. 1 ♀, 12 mm., 2♂ 12—14 mm.
St. 106. *36°33′ N, 2°00′ W.* 1150 m. 25-6-1910. 300 m. w. 1^{45} am. 30 min. 1 ♀, 10 mm.
St. 106. ibid. 1200 m. w. 0^{20} am. 60 min. 1 ♂, 13 mm.
St. 107. *36°13′ N, 1°28′ W.* > 2000 m. 25-6-1910. 2000 m. w. 7^{30} am. 60 min. 1 ♂, 13 mm.
St. 108. *36°03′ N, 0°27′ W.* 2435 m. 25-6-1910. 300 m. w. 10^{30} pm. 30 min. 2 ♂, 12 mm., 3 ♀, 10—12 mm. (1 ♀ with ova 10 mm).
St. 113. *36°53′ N. 3°09′ E.* 815 m. 28-6-1910. 300 m. w. 3^{25} am. 30 min. 1 ♂, 13 mm., 1 ♀ 12 mm.
St. 116. *39°27′ N, 5°26′ E.* 2860 m. 30-6-1910. 300 m.w. 1^{40} am. 30 min. 2 ♂, 13 mm., 1 ♀, 12 mm.
St. 118. *41°00′ N, 6°43′ E.* > 2700 m. 30-6-1910. 65 m. w. 11^{25} pm. 30 min. 1 spec.
St. 123. *44°14′ N, 8°55′ E.* > 600 m. 3-7-1910. 300 m. w. 0^{05} am. 30 min. 1 ♀, with embryos, 12 mm.
St. 125. *43°57′ N, 9°13′ E.* 1082 m. 9-7-1910. 300 m. w. 9^{45} pm. 30 min. 1 ♂, 13 mm.
St. 129. *40°05′ N, 11°31′ E.* 3420 m. 12-7-1910. 3500 m. w. 120 min. 3^{00} pm. 1 ♂, 12 mm.
St. 206. *39°32′ N, 5°15′ E.* 2782 m. 28-8-1910. 300 m. w. 1^{05} am. 15 min. 1 ♀, 12 mm.
St. 206. ibid. 2000 m. w. 45 min. 3^{05} am. 1 ♂, 12 mm.
St. 215. *39°14′ N, 0°52′ E.* 1050 m. 31-8-1910. 25 m. w. 9^{20} pm. 30 min. 1 ♀, 11 mm.
St. 220. *36°25′ N, 0°42′ E.* 375 m. 4-9-1910. 25 m. w. 2^{15} am. 30 min. 4 ♂, 12—14 mm., 3 ♀, 9—12 mm.
St. 222. *36°53 N′, 0°57′ W.* 1950 m. 4-9-1910. 25 m. w. 10^{50} pm. 15 min. 1 ♀, 8 mm.
St. 224. *36°33′ N, 2°00′ W.* > 950 m. 5-9-1910. 300 m.w. 15 min. 7^{20} pm. 1 ♂, 11 mm., 1 ♀ ,11 mm.
St. 276. ("Pangan"). *36°30′ N, 19°20′ E.* > 3000 m. 4-4-1911. 132 m. w. 11^{35} pm. 15 min. 1 ♂, 12 mm., 1 ♀, 10 mm.
St. 277. ("Pangan"). *33°20′ N, 27°30′ E.* > 3000 m. 6-4-1911. 132 m. w. 11^{35} pm. 30 min. 1 ♀, 8 mm.

Atlantic.

St. 74. *49°23′ N, 12°13′ W.* 1245—1298 m. 10-6-1906. 2000 m. w. 1 ♂, 13 mm.
St. 61. *35°57′ N, 5°35′ W.* 740 m. 21-2-1909. 600 m. w. 3^{25} pm. 60 min. 3 ♀♀ : 8, 11, 12 mm.
St. 63. *35°50′ N, 6°03′ W.* 490 m. 22-2-1909. 25 m. w. 0^{05} am. 30 min. 1 ♀, 11 mm.
St. 65. *35°53′ N. 7°26′ W.* 1300 m. 24-2-1909. 65 m. w. 6^{30} pm. 60 min. 2 ♀♀ 11—13 mm.
St. 66. *36°16′ N, 6°52′ W.* 735 m. 25-2-1909. 65 m. w. 1^{40} pm. 60 min. 2 ♀♀, 13 mm.
St. 66. ibid. 300 m. w. 2^{55}pm. 120 min. 1 ♂, 14 mm. 1 ♀, 12 mm.
St. 66. ibid. 600 m. w. 5^{15} am. 120 min. 1 ♀, 13 mm.
St. 66. ibid. 1200 m. w. 8^{00} am. 120 min. 1 ♂, 12 mm.
St. 69. *36°13′ N, 9°48′ W.* > 3500 m. 28-2-1909. 300 m. w. 11^{40} pm. 1 ♂, 12 mm., 5 ♀♀, 9—12 mm.
St. 71. *39°35′ N, 9°45′ W.* 1150 m. 4-3-1909. 300 m. w. 8^{40} pm. 120 min. 2 ♂♂, 14 mm.
St. 74. *44°21′ N, 7°55′ W.* 2000 m. 8-3-1909. 300 m. w. 10^{50} pm. 60 min. 1 ♀, 12 mm.
St. 74. ibid. 600 m. w. 0^{10} am. 60 min. 1 ♂, 15 mm.
St. 75. *45°37′ N, 7°03′ W.* 4000 m. 9-3-1909. 300 m. w. 7^{45} pm. 60 min. 1 ♀, 13 mm.

For difference between sexes reference may be made to Behning, Zoologica. The eye may be almost as

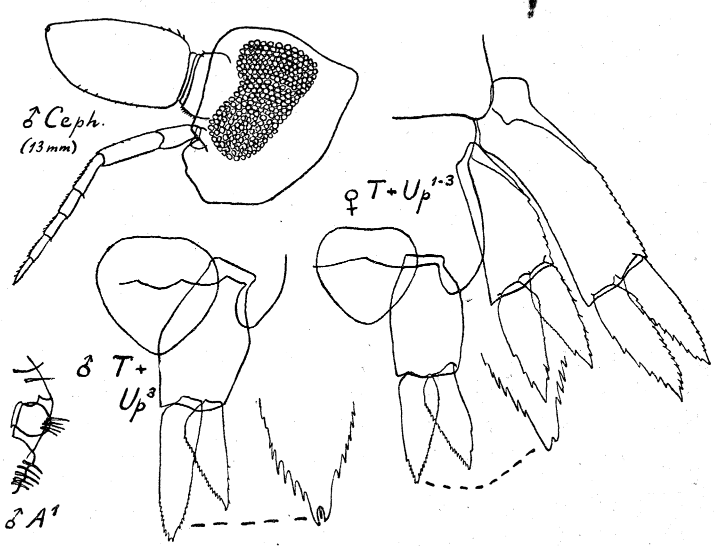

Fig. 18. Vibilia cultripes.

large in the female as in the male. There is hardly any rostrum to speak of in this species. The telson is more pointed than shown by Vosseler. Size 8—15 mm. (Behning 10.5—12 mm.).

A. Mediterranean (Chart 7).

Material and distribution. The material includes 29 stations, 38 hauls, 82 spec. (36 ♂, 46 ♀). The species is new to the Mediterranean, but is noted on Behning's chart as taken in the Straits of Gibraltar.

It will be seen from the table that this species prefers a depth to bottom between 1000 and 3000 m.

As will be seen from the chart, it is widely distributed throughout the entire western basin, but only exceptionally found in the eastern. Disregarding the two St. not made by the "Thor" itself (those of the "Pangan") the species was found at 25 St. in the western and 2 in the eastern basin. In the eastern basin, there are

17 negative st. (night hauls, 10—300 m. w., over 1000 m.) as against 22 in the western; there are thus more positive than negative in the western basin, whereas the eastern has 8—9 times as many negative. Despite the fact that the species is not numerous, it is nevertheless so widely distributed as to occasion some surprise at its not having previously been taken in the Mediterranean.

Depths of the stations	No. of positive stations
0—1000 m	5
1001—2000 -	12
2001—3000	9
> 3000 -	3
total...	29

Vertical occurrence. During the day, it was taken in so few hauls, and so few specimens, that nothing can be said as to its distribution. In the night, on the other hand, it was found almost exclusively at depths answering to 10—300 m. w. and appears to be more or less evenly distributed throughout this range of depth. (That there is only one positive haul between 135—250 m. w. is due to the fact that the "Thor" made but very few hauls at all in these levels). As a rule, only a single or few specimens were taken at one haul.

Night hauls, "Thor"

m. w.	No. of hauls
10—35.....	7
50—100....	7
135—250....	1
300......	10
> 300......	4
total ...	29

Propagation. Females with ova or embryos were only found in June.

B. Atlantic.

23 spec. (6 male, 17 female). It seems here to prefer similar conditions to those noted for the Mediterranean, save that it lives somewhat deeper, answering roughly to 300 m. w. From 1908—10 we have 8 positive st. (only 4 with depth to bottom over 1000 m.) against 8 negative; the proportion is thus approximately as in the western basin of the Mediterranean.

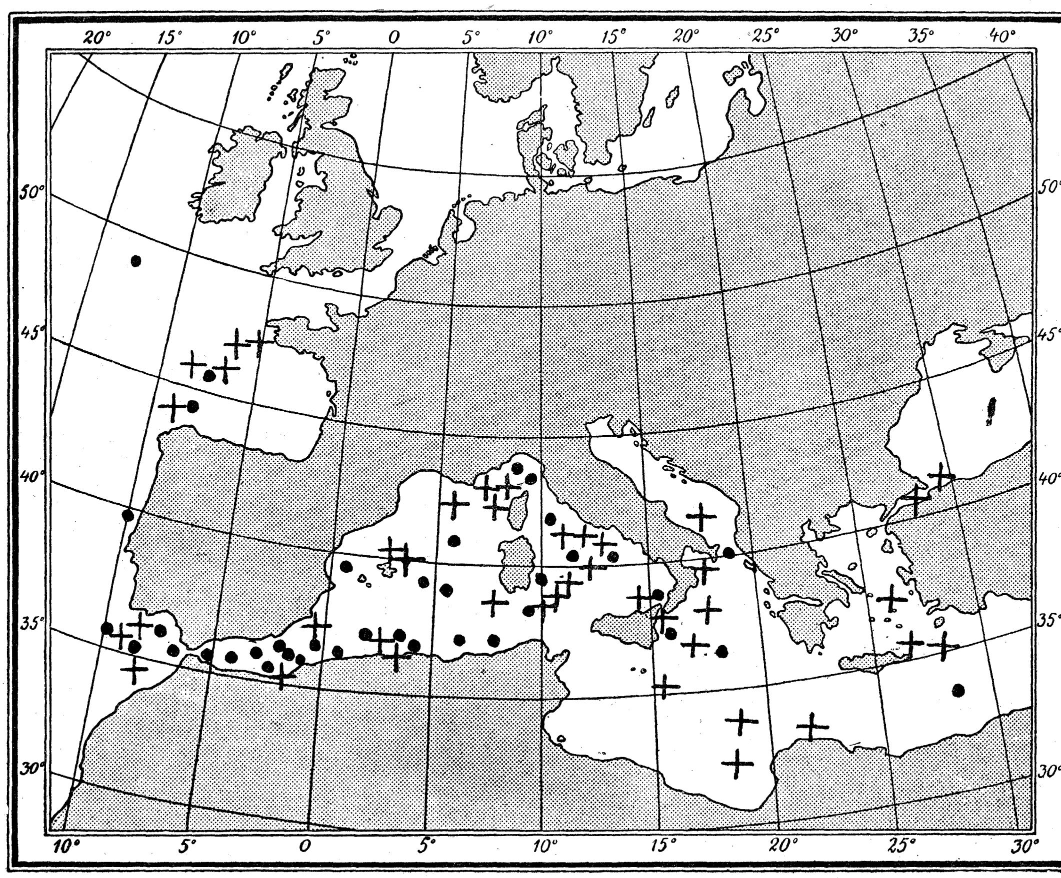

Chart 7. Vibilia cultripes. ● Positive stations, + negative st. (night, 10—300 m. w., > 1000 m). Some of the stations lie so close to each other that it was impossible to note them all.

Distribution.

1. Mediterranean. The species has never before been taken in the Mediterranean, but is noted on BEHNING's chart (Pl. 6) as from Gibraltar, just inside the Strait.

2. Atlantic. BEHNING's chart notes some finds between the Azores and Newfoundland; it has not hitherto been known from the area investigated by the "Thor". BEHNING further records it (Zool. Anz.) as taken by the "Valdivia" (St. 32) at 24°43′ N, 17°1′ W, and (St. 44) 5°5′ N, 13°27′ W, also, on his chart, at two places between the Guinea coast and the mouth of the Amazon. VOSSELER's type specimen is from 5.3° S, 37.6° W, 0—400 m.

3. Indian Ocean. BEHNING records it (Zool. Anz.) as taken by the "Valdivia" St. 214 and St. 217—23; all these stations lie in the Indian Ocean close round the equator, 8° N to 6° S, 73° to 89° E.

4. The Pacific. BEHNING's chart shows it from some places abt. 110°—120° W, abt. 10°—20° S; these are doubtless from the "Albatross" Exped.

2. Genus VIBILIOIDES Chevreux.

Vibilioides Chevreux, Bull. Mus. Océanogr. Monaco, No. 49, 1905.
Behning, Zoologica 1912, p. 223.

1. VIBILIOIDES ALBERTI Chevreux.

Vibilioides Alberti Chevreux, l. c. 1905.
— — Behning, l. c. p. 223, Pl. 6 (distrib.)

St. 74. *44°21′ N, 7°55′ W.* 2000 m. 9-3-1909. 1[30] am. 65 m. w. 1 spec., 17 mm.

The specimen from the "Thor" is larger than either Chevreux or Behning state; 12 mm.; still larger, however, (19 mm.) is a specimen from Rio de Janeiro, which has long lain in the collections of the Zool. Museum.

In contrast to at least the great majority of the genus *Vibilia*, belonging to the upper water layers (answering to 10—300 m. w.), there can be no doubt that this species lives very deep down; *inter alia* on account of the eyes, which are colourless (in spirits). Chevreux records it as taken in several places (*vide infra*) with "filet á grande ouverture" 0—3250 m. w. and Behning (Zool. Anz. vol. 41, 1913, p. 533—34) with vertical net 0—1500—3620 m. It may, however, also occur comparatively near the surface, as is evident from the find made by the "Thor". The specimen above mentioned as from Rio, in the Zool. Mus. was doubtless also taken not far from the surface, being of old date. The great depth at which this species lives doubtless explains why it does not penetrate into — or has any rate never been found in — the Mediterranean. (cf. *Lanceolidæ* and *Thaumatopsidæ*).

Distribution. 29°16′ N — 37°08′ N, 16°11′ W, 28°53′W, 0—3250 m. depth 2815—3620 m. (Chevreux). Behning states (Zool. Anz. vol. 41, 1913, p. 533) that it was found in the Atlantic by the Norwegian "Michael Sars" Exped. in 1910, but he does not give any locality, though it is marked, however, on his chart at various points in the same area as noted by Chevreux. — In the stores of the Zool. Museum, I have found the above-mentioned old specimen from Rio de Janeiro (Alfred Benzon ded.). — The find of the "Thor" (in the southern side of the Bay of Biscay) shifts its northern limit more than 6 degrees farther north, whereby it falls within the category of European marine fauna.

Fam. Thaumatopsidæ Bovall.

Cystisomidæ Willemoës-Suhm, Some Atlantic Crust. from the Challenger-Exped.; Transact. Linn. Soc., ser. 2, Zool., vol. 1, pt. 1, 1875 (1879), p. 23.
Cystisomidæ Stebbing, Challenger-Amphip. 1888, p. 1317.
Thaumatopsidæ Bovallius, Cysteosoma or Thaumatops; Bihang K. Svenska Vet. Akad. Handl., vol. 11, No. 9, 1886, p. 4.
— Bovallius, Monograph pt. 1:2, 1889, p. 39.
— Vosseler, Plankton-Exped. 1901, p. 93.
— Woltereck, Bemerk. üb. den Amphip. Hyper. d. Deutsch. Tiefsee-Exped., 1, Thaumatopsidæ; Zool. Anz., vol. 26, No. 700, 1903, p. 447.

This family comprises only a single genus.

1. Genus THAUMATOPS Martens.

Cystisoma Guérin-Méneville, Descript. d'un Crust. Amphip., formant un genre nouveau dans la fam. des Hyper.; Revue Zoologique 1842, p. 214.
— Stebbing, Challenger-Amphip. 1888, p. 1318 (*lit.*)
Thaumops Willemoës-Suhm, On a new gen. of Amphip. Crust.; Proc. Royal Soc., London vol. 21, 1873, p. 206.
— Willemoës-Suhm, On a new gen. of Amphip. Crust.; Phil. Transact. Royal Soc. London, vol. 163, 1873 (1874), p. 629, 637.
Thaum[*at*]*ops* Martens, Zool. Record for 1873 (1875), Crust. p. 189.
Thaumatops Bovallius, Monograph pt. 1: 2, 1889, p. 40 (*lit.*).
Physosoma Woltereck, 2. Mitt. Hyper. Deutsch. Tiefsee-Exped., Physosoma, ein neuer pelag. Larventypus, nebst Bemerk. zur Biol. von Thaumatops u. Phronima; Zool. Anz. vol. 27, No. 18, 1904, p. 553.
Thaumonectes ducis-aprutii Senna, Thaumonectes, un nuova genere di Anfipodo iperine de mare caraibico; Boll. Soc. Entomol. Italiana, vol. 35, 1903, p. 93.

In this genus, there is evidently so great difference between sexes and ages within one and the same species, that determination of single individuals is in many cases impossible from what we know at present.

Besides the "Thor", two earlier expeditions, the "Challenger" and "Valdivia", have contributed considerable numbers of specimens (Murray and Hjort, in "The Depths of the Ocean" 1912, on the Scottish-Norwegian "Michael Sars" Exped. in the Atlantic, likewise mention the finding of this genus, but do not state the number taken).

Stebbing ("Challenger" Exped.) has 7 spec.; in addition to Fabricius' old species *Cystisoma spinosum*, which Stebbing regards as including *C. Neptunus* Guérin-Méneville and *Thaumops pellucida* Will.-Suhm, Stebbing also establishes two new species: *C. Parkinsoni* and *C. Fabricii*.

Woltereck, on the other hand, ("Valdivia" Exped.) has 18 adult spec. (or at any rate not larvæ) representing at least 6 species, of which 2 (3) new (*vide infra*), and 7 larvæ representing 3 different types (species?).

The "Thor" took 12 specimens; in addition to these, I have also had at my disposal 3 of ancient date from the Zool. Museum, among which were found the types for "*Th. longipes*" Bovall. (*vide infra*). These 15 specimens in all comprise 12 (13) adult or least non larval stages, representing at least 5 species, of which one (*Th. latipes*) is new; also 3 (2) larvæ, of which only one can be referred to any form previously described.

The cephalon seems to present the most important systematic characters. The shape of the cephalon itself is however, often difficult to determine, as most of my specimens are so soft that they collapse at a touch, and it is thus impossible to take accurate measurements. The precise proportion between length, breadth and height I am therefore unable to state. The other body measurements are for the same reason generally difficult, not to say impossible, to take accurately, except of course as regards limbs and antennæ.

The length of the antennæ in proportion to the cephalon (or the whole of the body) is important, as also their position (laterally or medially situated). The spines along the edge of the cephalon, called by Woltereck "Aussenstackeln" (Stebbing, "central keel"), I would suggest should be termed *spinæ marginales* or *marginal spines*. Of these, the one nearest ant. 1, is called by Woltereck (l. c. 1904, p. 559, fig. 1, fig. 6) "Stirnstackel"; it is always somewhat larger than the remaining marginal spines. The spines on the under side of the cephalon, for which Woltereck has used the general term "Innenstackeln" might, I would suggest, be called *spinæ ventrales* or *ventral spines* (Stebbing, "Challenger": "ventral denticles"). The foremost ventral spine is as a rule long; I call it the *spina anterior* ("Hauptstackel"). Behind this is the *spina glandularis* or *glandular spine*, ("Drüsenstackel") which is much shorter as a rule and undoubtedly a rudiment of ant. 2, and into which the antennal gland opens out. (shown *inter alia* in fig. 19 of *Th. pellucida* from St. 67, 1906, 1700 m. w.) [Stebbing states, in the "Challenger" Exped. p. 1320 that "the foremost pair of ventral denticles may be regarded as rudiments of these organs" *viz*; the lower antennæ. Owing to the opening of a gland into the glandular spine, Woltereck (l. c. 1903 p. 450; l. c. 1904 p. 559, fig. 1 and 6) takes this, and not spina anterior, for ant. 2]. Behind this spine, there may be three or more spines set in a row out towards the lateral mandibular end; for these Woltereck has no name, but I would suggest calling them *oral spines* (*spinæ orales*). In some few species, these last-mentioned spines are not found. The number and shape of the ventral spines appears to be of systematic importance; but we should doubtless be careful not attach too great weight to these, as there may — as for instance in several of my specimens — be one more on the one side than on the other.

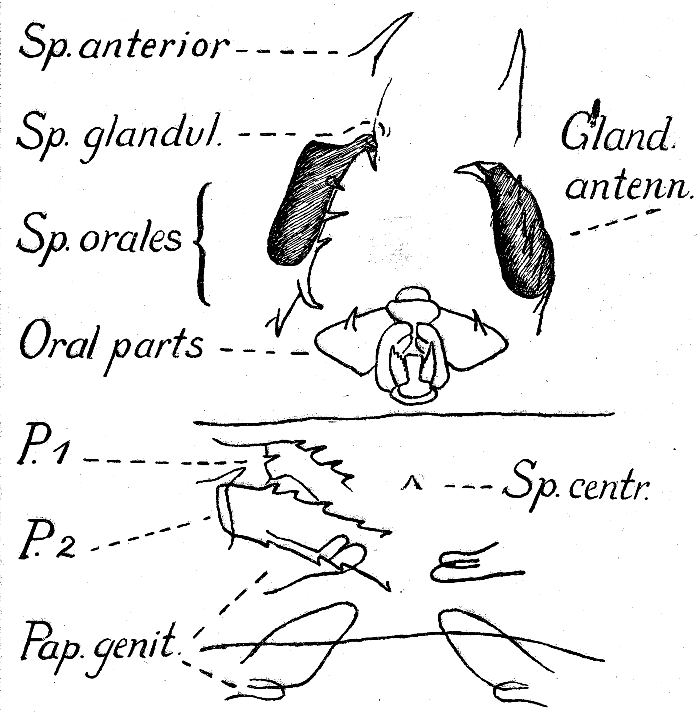

Fig. 19. Oral area etc. of Thaumatops pellucida ♀ (St. 67, 1906, 1700 m. w), ventral view (cf. fig. 24, p. 65).

Of the mesosome segments, 1. and 2. are always fused together save in *Th. Loveni* Bovall., which doubtless needs revision (for *Th. longipes* Bovall., *vide infra*), and in a single species, *Th. coalita* Woltereck (in W's fig. 4, l. c. 1903 this is styled, through a printer's error, *Th. oblita*) we even find 1.—4. segments fused. In larvæ, the whole of 1.—6. may be similarly fused together. Where a dorsal keel appears, it is always more prominent at the posterior than in the anterior part of the body; in the 7. mesosome segment, 1.—3. metasome segment and 1. urosome do. the posterior spine on each segment extends far up from and sometimes even partly out over the next segment; in the anterior segments of the body this is not generally the case.

The mandibles always have a more or less long and pointed central or median process about the middle of the anterior margin (if Bovallius' figure of md. in *Th. Loveni* in the Monograph pt. 1 : 2, Pl. 4 fig. 4, is correct, then the mentioned process should be almost entirely lacking in this species). This process is probably a rudiment of the palp (Stebbing, "Challenger" p. 1321). Some few species have furthermore a process farther out towards the lateral corner of the md.

Sex characters.

I have gone through the literature, and also my own specimens, to find reliable sex characters; that the result is in several respects not what might be desired, is due to the inadequancy of the material, or the poor state of preservation. The difficulty of coming to a good conclusion is moreover, augmented by the fact that evidently but few really grown specimens are known.

Up to the present, no good sex difference seems to been found in the shape of the body. True, Woltereck states (l. c. 1903 p. 455) with regard to a couple of males which he believes to belong to the species *Th. magna*, that they have longer antennæ and more pointed cephalon than the females, a sex character which would seem likely enough, as it is frequent in Hyperiidea; W. is, however, himself not certain of having referred his males to the right female specimens.

Ant. 1 does not appear to furnish any good sex characters. They vary greatly in length as compared with the cephalon, from about half to nearly double. The shape, on the other hand, is the same throughout, save that *Th. pellucida* has glands in the somewhat expanded point; in all other species, the ant. seems to taper down gradually towards the point.

Pereiopoda do not appear to differ between the two sexes save regards the distal end of p. 7, for which reference may best be made to Stebbing, "Challenger" p. 1324 (male) and p. 1327 (female), with figs.

The uropoda do not seem to differ in the two sexes save in the same female as above mentioned (Willemoës-Suhm's type for *Th. pellucida*) where the outer ramus is not only longer than the inner, but also becomes considerably broader out towards the point, and contains glands. In addition to the distinctly female spec. of *Th. pellucida* from 45°2′N, 17°20′W (Alfr. Benzon ded.) where the outer ramus is considerably longer than the inner, the long outer rami are also found in three other specimens of mine, all of which, however, appear to be male, *viz; Th. longipes* Bovall. type spec. B (46 mm.), *Th.* spp. "Thor" St. 72 (1905, 600 m. w. 38 mm.) and "Thor" St. 80 (1906, 1200 m. w. 41 mm.). That the outer ramus in the up. is longer than the inner can thus not be taken as any thorough sex character for all species; it is moreover, not found in the large female specimen of *Th. magna* described by Woltereck: at any rate, it does not appear either from the description or from the figures (Woltereck l. c. 1903, p. 454, fig. 2—3).

Of the characters here mentioned (ant. 1, p. 7, up. 1—3) p. 7 is thus the most reliable; where the 6. joint is much expanded, it is in the case of an adult or almost adult female, whereas a non-expanded 6. joint in specimens of less than abt. 50—60 mm. can hardly be taken as proof that the specimen in question is a male, but is more probably a common character for both sexes in young specimens. J. C. Fabricius' original description of *Oniscus spinosus* (Systema Entomologiæ 1775 p. 298) evidently refers to a female; he states, for instance, with regard to p. 7, "breve, articulo ultimo clavato, unguiculato". In ant. 1 and up. on the other hand, he makes no special mention of anything which could be regarded as sex characters, as is also distinctly evident from Stebbing's mention of Parkinson's drawings from Fabricius' type specimen ("Challenger" p. 1328—29). It is evident, however, from Bovallius' figure and description of p. 7 in *Th. Loveni*, that his specimen was not a male, as he states it to be, but a female.

For the peculiar arrangement in the female, with a marsupial groove and its external formations on 1.—3. mesosome segment (central spine and 2 pairs of cleft plates called genital papilla) and in 4.—5. mesosome segments, reference may be made to Willemoës-Suhm in Phil. Transact. 1873, Stebbing, and Woltereck l. c. 1903. The formations on 4.—5. mesosome segments appear only to occur in the female; the cleft plates, on the other hand (genital papilla) on 2.—3. segments are also found in the male*, and may even be comparatively large (see especially ***Cyst. spin.*** Stebbing, spec. A. male ["Challenger"]) even though they may not attain anything like the size found in old females. In the type spec. B. of *Th. longipes* Bovallius, which is undoubtedly a male (46 mm.) we find on the ventral side of 7. mesosome segment a couple of small protuberances; which appear to contain the male sexual apertures. In the specimen of *Th. latipes* n. sp. described below it will be seen that this really is the case, as the spermoducts lead out into these.

Larval characters.

For characters of the larvæ (*Thaumonectes* Senna, *Physosoma* Woltereck) see especially Woltereck l. c. 1904. Neither of the two mentioned writers however, has any reference to the fact that the rami in up. are comparatively much longer than in the adults, and that the inner ramus is longer than the outer (see my fig. 32 of urop. of the larva from "Thor" st. 181, 1906, 1800

* The central spine seems sometime to occur also in ♂.

m. w.), whereas in the adults, the reverse in general is the case, save where the two rami are of equal length.

The spinous marginal line appears to be partly lacking in the larvæ, and in the quite small animals is but faintly developed.

Systematic features.

WOLTERECK has (l. c. 1903) given a survey of the known species, arranged as a kind of determination list, but it is drawn up with considerable reserve, the difficulty of coming to a decision with regard to differences for age and sex being markedly apparent. Not until a great deal more material is available will it be possible to arrange the various stages of growth and sexes with certainty in a proper manner.

WOLTERECK divides the species according to whether some of the pereion segments are fused or not, and whether 1 or 2 processes are apparent on the fore margin of the mandibles; in this manner, he arrives at the following list, in which, however, I have interpolated my own corrections, rearranging the whole also as a dichotomic determination list:

1. All pereion-segments free .... 2.
   1.—2. or 1.—4. pereion segment fused .... 3.
2. [*Th. longipes* Bovall. partim = *Th. Bovallii* Woltereck].
   Th. Loveni Bovall. (p. 59).
3. Pereion segment 1.—2. fused .... 4.
   Pereion segment 1.—4. fused .... *Th. coalita* Woltereck.
4. Md. has 1 central process .... 5.
   Md. has 1 central and 1 lateral process .... 8.
5. In ♀ ant. is longer than ceph. and with glands at the tip; in up., outer ramus is longer than inner ramus, and likewise furnished with glands.... *Th. pellucida* Will.-Suhm. (p. 64).
   In ♀ ant. is shorter than ceph., and lacks the glandular swelling; in up., the outer ramus is not longer than the inner, and lacks the glandular swelling .... 6.
6. 2 pairs of ventral spines ....*Th. Fabricii* Stebb. (p. 63).
   5—8 pairs ventral spines .... 7.
7. 5 pairs of ventral spines ....*Th. magna* Woltereck.
   8 pairs of ventral spines ....*Th. Neptunus* Guér.
8. 1. free joint in p. 7 not much broader at base than at distal end .... *Th. Bovallii* Woltereck. (p. 59).
   1. free joint of p. 7 much broader at base than at distal end .... *Th. latipes* n. sp. (p. 62).

NB. In this list *Th. Parkinsoni* Stebb. (p. 66) is not included, and recently K. H. BARNARD has described a new species, *Cystisoma africanum* (Ann. S. Afr. Mus., vol. 15, pt. 3, 1916, p. 287).

[1. THAUMATOPS LOVENI Bovall.

Thaumatops Loveni Bovallius, Remarks on Cysteosoma or Thaumatops, 1886, p. 10, fig. 1—14.

Thaumatops Loveni Bovallius, Monograph pt. 1: 2, 1889, p. 52, Pl. 4.

BOVALLIUS states that his type specimen (the only specimen known at all) is in the Zoological Riksmuseum at Stockholm. In working on this genus, it occurred to me that there might possibly be an error in the statement of 1. and 2. pereion segments as separate (just as in *Th. longipes* partim = *Th. Bovallius* Woltereck, *vide infra*) and I therefore wrote to Stockholm, requesting the loan of the specimen, but was informed by Prof. Dr. HJ. THÉEL in reply that it was not there. I then enquired of the other Zoological institutions in Sweden where the animal in question might possibly be found, *viz*; Upsala (Prof. Dr. WIRÉN), Lund (Prof. Dr. H. WALLENGREN) and Gothenburg (Prof. Dr. L. A. v. JÄGERSKIÖLD) but received in all cases the answer that it was not there. It must therefore be supposed that it has in some way or other been lost. This is the more regrettable, since the species would, judging from BOVALLIUS' erroneous description of *Th. longipes* (*vide infra*) certainly seem to require a through revision, Possibly BOVALLIUS may be right with regard to the separated 1.—2. pereion segments, and in such case, it should of course remain in the group to which WOLTERECK has referred it; if, however, BOVALLIUS should be wrong, then it should probably be referred to WOLTERECK's Group B 1 b (6—7 in my table of determinatons above; *vide infra*).

At any rate, the specimen is not a male, but a female, which is distinctly evident from BOVALLIUS' fig. of p. 7; in his figure of the whole animal also, lateral view, (Pl. 4, fig. 1) both the central spine and the genital papilla are distinctly visible. That this is not specially noted in the text is probably due to the fact that the drawings — or at any rate most of them — were not made by BOVALLIUS himself, but by the excellent draughtsman A. M. WESTERGRÉN, who has thus seen more that BOVALLIUS himself.]

2. THAUMATOPS BOVALLII Woltereck.

(= Th. longipes Bovall. type-spec. A).

Thaumatops longipes Bovallius, Remarks on Cysteosoma or Thaumatops 1886, p. 13, fig. 15—23.

Thaumatops longipes spec. A (non B) Bovallius, Monograph pt. 1: 2, 1889, p. 47, Pl. 3 excl. fig. 2, 3, 4, 14.
— *Bovallii* Woltereck, Zool. Anzeiger vol. 26, 1903, p. 457.

Th. longipes Bovall. is a collective species, comprising two entirely distinct species; the one specimen (Bovallius' spec. A) must doubtless be referred to *Th. Bovallii* Woltereck, having both a central and a lateral process on the md., while the other (Bovallius' spec. B) belongs to Woltereck's Group B 1 b (6—7 in my list of determinations given above). Bovallius' worst error however, is his stating that 1. and 2. pereion segments are divided by a seam and not fused together; in both the two original specimens, which belong to the Zoological Museum at Copenhagen, this character is absolutely not present, the segments are indubitably fused, just as in all the other species, save only *Th. coalita* Woltereck.

The two specimens were found in the old Hyperin-magazine of our Museum, which I transferred to the collection last winter; strangely enough, they were not furnished with any name, and it is only from the localities that they could be identified as Bovallius' types.

Both specimens will be further dealt with below; spec. A under the present species, and B under *Th. Parkinsoni* Stebbing (p. 67).

Owing to Bovallius' confusion of the two species, I propose, that for the sake of avoiding further complication, Woltereck's name *Th. Bovallii* should be adopted instead; as a matter of fact, Bovallius' first description in Remarks on Cysteosoma or Thaumatops 1886 only refers to this species, as he had not then seen the other specimen (B) which he later, quite incorrectly, ascribed to the same species. —

Bovallius' type specimen A. 30°S, 90°E, 1870. Andréa ded. (Bovall. states the locality as "off the west coast of Australia").

I give below the necessary corrections to Bovallius' description; it is impossible to give any good description owing to the state of preservation of the specimen, and its defective condition generally. All Bovallius' figures in the Monograph Pl. 3 doubtless apply to the type spec. A, except figs. 2, 3, 4 and 14; the figures in the Monograph are, it should be noted, essentially the same as in the "Remarks on Cysteosoma" and when B. wrote the last named work, he knew only the type spec. A (see Bovallius, Remarks on Cysteosoma p. 16).

Male (?) Length abt. 40 mm. Bovallius gives the length incorrectly as 55 mm. (l. c. 1889) or 57 mm. (l. c. 1886.)

Ventral measurements: Cephalon 13.5 mm., mms. 16 mm., mts. 11 mm., us. 4 mm. There can hardly have been any real dorsal keel, but this cannot now be determined with certainty, as the specimen is quite soft and collapsed. The numbers of spines down the median dorsal line are (mss) 3 (1. and 2. segments) 2,2,2,2,4; (mts.) 6, ?, 1 (2?); (us) 2, 0.

Marginal spines: 16 right, 17 left. Ventral spines: 6 pairs; spina anterior is abt. 3 times as long as the glandular spine. The length of the antennæ cannot be stated, as they are broken off with the exception of a very thin remainder abt. 7—8 mm.; it was impossible to discern any articulation at all. The interval between the two antennæ 3 mm.; the whole frontal margin between the frontal spines 6 mm.

With regard to the oral parts, Bovallius states that they are "similar to those of *Th. Loveni*". Even without dissection (and I did not dissect at all save except to loosen the left md.) we can in the md. (fig. 20) discern the essential difference from *Th. Loveni* (Monograph p. 53, Pl. 4, fig. 4—5); the present specimen has both a central and a lateral process, whereas such should not be found in *Th. Loveni*. [There is, however, some inconsistency between Bovallius' text and his figures, as Pl. 4 fig. 4 shows an indication of such processes, and in the profile view of the whole animal, (Pl. 4 fig. 1) the processes are even drawn as very large*)]. From the two processes on each md., therefore, Bovallius' type specimen A must belong to a species called by Woltereck l. c. 1903 *Th. Bovallii.*

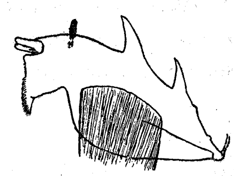

Fig. 20. Thaumatops longipes Bovall., type spec. A. The left mandible.

The appendices on the ventral side of 2.—3. mesosome segments are apparent as small undivided warts, but there is no central spine. The spine on the epimeral plate which is fused together with the body at p. 1—p. 2 is fairly large.

P.1 4—5 mm. p.2 7 mm. p.3 18 mm. p.4 26 mm. p.5 37 mm. p.6 33 mm. p.7 17 mm. As will be seen from the comparison with Bovallius' figures, the present measurements are somewhat less than stated by him. His dimensions would not agree, even if reckoning the

* In the Monograph p. 53, footnote, Bovallius writes as follows: "In Remarks .... Thaumatops" p. 7, fig. 3, I described and figured the apex of a mandible from the young specimen of *Th. longipes*". The figure referred to, which could not in any case be a mandible, is possibly the one half of the labrum inferior; it should, moreover, according to Bovallius' text to the figure in "Remarks" belong, not to *Th. longipes*, but to *Th. Loveni*, and is not referred to p. 7, but p. 11. How far it may have been dissected out from *Th. Loveni* I am unable to say, since, as noted above, Bovallius' type specimen seems to have disappeared; from my own observation, however, I can safely assert that it has not been taken from either of the two "type specimens" of *Th. longipes.*

epimeral plate fused with the body as included (my figures apply only to the free parts of the legs). Bovallius' description and figures do on the other hand agree on the whole very well with the actual facts. As with the other measurements, so also with those of the up. Bovallius' figures are too high; up. 1 is 9 mm., up. 3 7.5 mm. —

Th. Bovallii, "Thor" St. 61, 51°04'N, 11°39'W 1420—1300 m. 31—5—1906. (Y. 330) 500 m. w. 1.05 pm. 120 min. 1 spec. 52 mm., male (gonade distinct). Measurements on ventral side; ceph. 18 mm.; mss. 18 mm.; mts. 13 mm.; us. 5 mm. Greatest breadth of body 18 mm. (at 1.—2. pereion segments).

The outline in dorsal view much resembles Bovallius' fig. of *Th. longipes* (Monograph Pl. 3 fig. 2) save that that in Bovallius' figure the cephalon is somewhat broader than the pereion, whereas in the present specimen it is just a little narrower.

The numbers of spines along the dorsal line are (mss.) 1 and 1 (1.—2. segm.), 2,2,2,2,2; (mts.) 2,3,3; (us.) 2,0. Dorsal keel extremely faint in mss., considerably more marked in mts. and us.

Marginal spines, 15 pairs. Ventral spines, 5 pairs; spina anterior twice as long as the glandular spine.

Antennæ 11 mm., very thin; there does not appear to be any real articulation save for the outermost joint, which is quite small; only a very little longer than the two teeth in which the long joint of the flagellum terminates. The interval between the antennæ is 3 mm., the entire frontal margin between the frontal spines 5.5 mm.

Each md. has the same two processes situate at the same spot as shown in my fig. of *Th. longipes* Bovall. type spec. A. (fig. 20).

On the ventral side there is just a slight indication of a central spine. The appendices on the ventral side of 2.—3. mesosome segments are of about the same shape as shown in my figures 19 and 24 for *Th. pellucida* from the "Thor" St. 67, 1906, 1700 m. w., but are considerably smaller and situate farther from the median ventral line; also in the anterior pair, the small branch is only abt. $^1/_3$ as long as the larger.

P. 3 19 mm., p. 4 29 mm., p. 5 43 mm., p. 6 34 mm., p. 7 17 mm. Shape of the distal joints in p. 7 agrees with Bovallius' fig. (Pl. 3 fig. 13).

Up. 1 10 mm., up. 3 9 mm.; shape agrees with Bovallius' fig., but in up. 1 the rami are only $^1/_3$ as long as the whole limb.

As will be seen, this specimen agrees on the whole very well with Bovallius' type specimen. The most important differences are; fewer spines in the dorsal line on some of the segments, 1 pair ventral spines fewer, p. 6 smaller in proportion to p. 5. —

Th. Bovallii, "Thor" St. 73, 56°56'N, 9°32'W, 1180—1390 m. 10—6—1905. 300 m. w. 1.00 am. 120 min. 1 spec., male, 46 mm.

Ventral measurements: ceph. 15 mm.; mss. 16 mm.; mts. 12 mm.; us. 4 mm. Greatest breadth (14 mm.) is at the posterior third of the cephalon.

Dorsal spines: (mss.) 1 and 1, 2,3,2,2,2; (mts.) 2,3,3; (us) 2,0. Dorsal keel very slightly prominent save on mts. and us.

Marginal spines: 15 left, 17 right. Ventral spines; 5 pairs; on the left side, the penultimate much smaller than the rest. Spina anterior abt. 1½ time as long as the glandular spine.

Ant. 21 mm.; resemble ant. in the previous specimen save that they are fairly thick at the base. Interval 2.2 mm., entire frontal margin between the two frontal spines 7 mm.

On the ventral side there is neither central spine nor appendices at p. 2—p. 3. P. 3 18 mm., p. 4 27, p. 5 38, p. 6 30, p. 7 14 mm. In p. 7, the first free joint in the proximal part is abt. 1½ times as broad as in the distal; the distal portion of the limb agrees with Bovallius' fig. Up. 1 9 mm., up. 3 8 mm., agree very well with Bovallius' fig. This specimen is thus chiefly characterised by its long antennæ, which are almost 1½ times as long as the cephalon, as also by its broad frontal margin, where the ant. are medially situated (in the other specimens, the frontal margin is much narrower.) Further, by the shape of the first free joint in p. 7. —

Th. Bovallii, "Thor" St. 76, 49°27'N, 13°33'W, over 2700 mm. 12—6—1906. 300 m. w. (y. 330] 5.05 am. 120 min. 1 spec. (male?; gonade distinct) 38 mm.

Ventral measurements: ceph. 15.5 mm. ? (broken); mss. 12 mm.; mts. 8 mm.; us. 3 mm. Greatest breadth is just behind the head but cannot be stated exactly, as the specimen is not a little damaged in the anterior portion.

Dorsal spines: (mss.) 1 and 1 (1—2 segm.), 2, 1 (?), 2,2,3; (mts.) 4,4,3; (us.) 2,0. Dorsal keel appears to be only very faintly developed save in mts. and us.

Marginal spines: 16 pairs; ventral spines; 6 left, 5 right; spina anterior abt. 3 times as long as glandular spine.

Antennæ very thin, 10 mm. No real articulation. The very small apical joint is broken off; otherwise, the ant. are fully preserved. Interval 3 mm., total frontal margin between frontal spines 4.5 mm.

On the ventral side, there are quite small appendices at p. 2—p. 3. At the middle of the ventral side on 1. mesosome segment there is a small dark spot, possibly an incipient central spine; I was unable to see whether it really was a protuberance at all or merely a spot of colour.

P. 3 15 mm., p. 4 23, p. 5 35, p. 6 29, p. 7 14 mm. Up. 1 9 mm., up. 3 8 mm. Rami slightly shorter in proportion than BOVALLIUS' figure: only abt. $^1/_3$ of the length of the whole limb.

This specimen is chiefly characterised by its very large cephalon. —

Distribution. WOLTERECK records 2 females (41 mm., 60 mm.) both from the "Valdivia" Exped. from the Atlantic, St. 25 (33°43′N, 14°20′W) and St. 85 (26°49′S, 5°54′E).

As to the literature, I have not been able to discover any records of other finds of BOVALLIUS' species than from the 4 miles NW of the entrance to Desroches Atoll, (Indian Ocean), 750 fms., one, length 25 mm. (WALKER, Transact. Linn. Soc. London, Zool. vol. 13, 1909—10, p. 52). That the species has not otherwise been found, or at any rate recognised, is not remarkable, in view of the fact that BOVALLIUS' figures and description are incorrect in respect of a point so important as the proportion between 1. and 2. pereion segments.

3. THAUMATOPS LATIPES n. sp. (fig. 21).

St. 81, 49°22′N, 12°52′W, 1350 m. 4—9—1906. 1800 m. v. (Y. 330) 10.35 am. 60 min. One male (gonade distinct) 42 mm.

The specimen is in an unusually good state of preservation. Ventral measurements: Ceph. 13 mm., mms. 15 mm., mts. 11 mm.; us. 4 mm. Ant. 25 mm., p. 3 16 mm., p. 4 14 mm,, p. 5 32 mm., p. 6 27 mm., p. 7 14 mm. Up. 1 10 mm., up. 3 8 mm., both measured to point of outer ramus. Marginal spines; 14 left, 15 right. Ventral spines 5 left, 6 right. Spina anterior not longer than glandular spine.

For dorsal spines see fig. 21.

Eyes not particularly large. Broadest part of the body is at 1.—2. mesosome segments, and decreasing evenly thence both forward and back. Frontal margin very broad, $^2/_3$ the breadth of posterior margin of the head, but the head itself comparatively narrow, and in particular very little deep. On the ventral side it was impossible to discern anything whatever of the external genital apparatus save for the male genital orifices (see below, under p. 7).

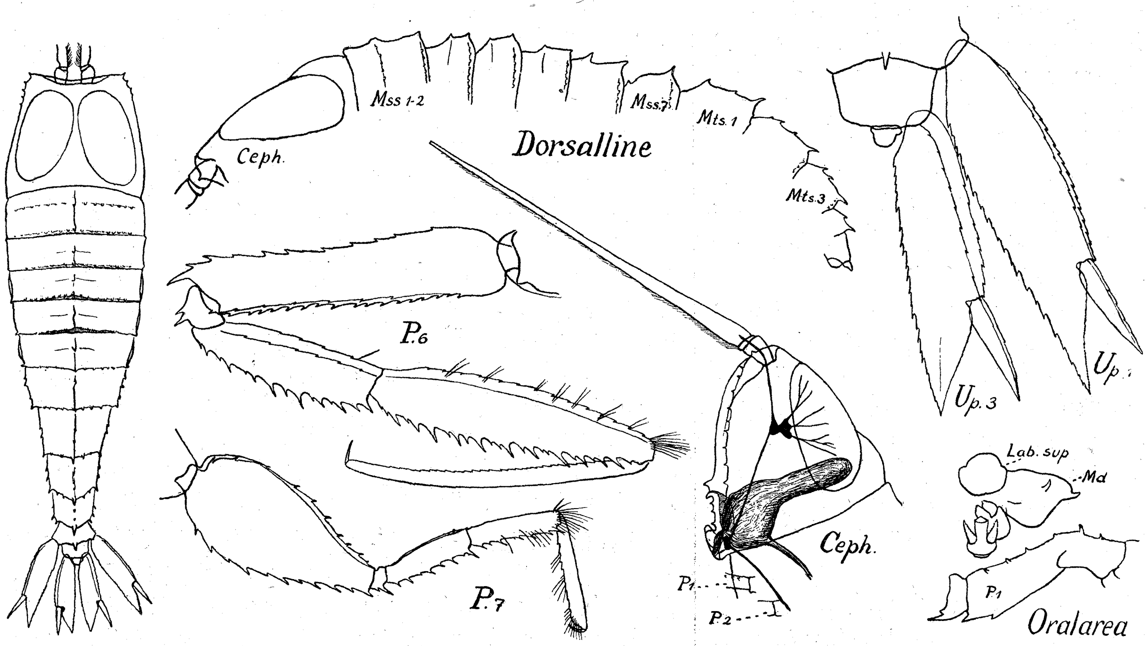

Fig. 21. Thaumatops latipes. St. 181, 1906, 1800 m. w.

Ant. are remarkable for their length, 25 mm. (one of them lacks the outer half) while the cephalon is only 10 mm. along the dorsal line, 13 mm. along the ventral side; the two joints in the peduncle are distinctly separate. The small terminal joint broken off. Ant. are very hairy in the inner side, and set unusually close together; the interval only 1 mm., whereas the margin between frontal spines measures 6 mm.

On md. there is a central, as well as a lateral process, just as in *Th. Bovallii* Woltereck.

P. 1—p. 2 are of practically the same shape as *Th. pellucida* figured by STEBBING in "Challenger" Pl. 155, but the spine on the 1. joint, which is fused with the body, is only a small wart. Otherwise, the pereiopoda are on the whole somewhat broader and heavier than the young specimen of *Th. pellucida* shown in my figure below (fig. 25) from the "Thor" St. 67, 1700 m. w.; the greatest difference however is in p. 6—p. 7. In p. 6, the third joint from the end is 4½ times as long as the breadth at broadest part (in *Th. pellucida* from St. 67, 1700 m. w. the joint is 9 times as long, so that it is of more or less uniform breadth throughout its whole length). In p. 7, the 2. joint is elliptical, so that the length is only a little more than twice the greatest breadth (proportion 9:4); the penultimate joint has no expansion. The spermoducts are preserved; they open into a couple of warts on the ventral side between the two p. 7; these same warts are found in BOVALLIUS' type spec. B. of *Th. longipes* mentioned below under *Th. Parkinsoni* (p. 67).

Up. 1—up. 3 also are comparatively broad. In up. 1, the inner ramus is a trifle longer than the very narrow outer ramus; the inner ramus is abt. half as long as the peduncle, and the breadth of the peduncle itself is abt. $^1/_4$ the length of peduncle and inner ramus together. Up. 3 is somewhat shorter than up. 1; 8 mm. as against 10; inner and outer ramus are of equal length. The length of the inner ramus is to the total length of the limb about as 2:5; greatest breadth abt. $^1/_4$ of the total length.

The specific name *latipes* refers to the expanded pereiopoda, especially p. 6—p. 7; the species is easily distinguished from all other known species by the two processes on md. together with the elliptical 1. (free) joint of p. 7 and the broad frontal margin with the long, very medially situated antennæ.

4. THAUMATOPS FABRICII Stebbing (fig. 22—23).

Cystisoma Fabricii (*Cystisoma* spec. G) Stebbing, Challenger-Amphip. 1888 p. 1333.
Thaumatops — Woltereck, Zool. Anzeiger vol. 26, 1903, p. 457.

St. 182. *50°11' N, 12°05' W.* 2200 m. 4-9-1096. 600 m. w. (Y. 330). 6^{45} pm. 120 min. 1 ♂ (gonade distinct), abt. 41 mm.

The above specimen must be referred to this species, which, according to WOLTERECK's survey, is characterised chiefly by having only two pair of ventral spines and 1 process on md.

For purpose of comparison with the measurements of the spec. from "Thor" (body measurements taken from the ventral side), I give here also those from the "Challenger" Exped., STEBBING's dimensions in inches being here transposed to mm. (1 inch = 26 mm.).

The section of the body segments thus agrees, as far as can be seen from the my specimen, which is badly collapsed, very well with WOLTERECK's description; how far the same can be said of the cephalon I am unable to decide.

Marginal spines: 16 left, 15 right. (WOLTERECK; ? — STEBBING; 13 pairs). There are two pairs of ventral spines, which totally agree with WOLTERECK's description: "von den Innenstackeln sind nur Haupt- und Drüsenstackel entwickelt; letzterer erhebt sich auf der kegelförmigen Basis des ersteren". Spina anterior (Hauptst.). is abt. 4—5 times as large as the glandular spine (Drüsenstackel).

Ant. 1 14 mm. long, thin; no real articulation save for the small apical joint, which is abt. twice as long as the apical teeth of the long joint. The antennæ are placed very close together, the actual interval at base of the antennæ is not quite 1 mm., whereas the entire frontal margin between the frontal spines measures 4 mm.

Lower side of the cephalon measures from frontal margin to anterior margin of mouth organs 13 mm., i. e. somewhat less than the ant., which agrees well with the "Challenger" specimen, where the antennæ are "eight tenths of an inch long, the tip broken, but probably a very small piece missing"; this answers to 22.4 mm., and the whole ant. with the missing part would thus have been a little more than 22.4 mm.

In the "Challenger" specimen, the under side of the ceph. is "seventeen-twentieths of an inch . . from the front to the mouth organs" which gives 23.8 mm. The proportion between ceph. and ant. is thus, in the "Challenger" specimen 23.8 : > 22.4; in the "Thor" spec. 13:14, which figures agree rather well. WOLTERECK gives the proportion for the "Challenger" spec. as 22:11, but I cannot see how he managed to arrive at this result from STEBBING's description. In the one of WOLTERECK's

	sex	total length	ant.	ceph.	mss.	mts.	us.	p. 3	p. 4	p. 5	p. 6	p. 7	up. 1	up. 3
"Thor"	♂	ca. 43	14	13*)	15	10	4	19	24	32	28	14	9	8
"Challenger"	♀(?)	78	> 22.4	23.8*)	. .	. .	. .	. .	. .	65	. .	>26	. .	. .

*) measured along ventral side from frontal margin to the mouth organs.

Same dimensions from the dorsal side: ceph. 10 mm., mss. 30 mm., mts. 10 mm., us. 4 mm. Spines in dorsal line: (mss.) 1 + 2 (1.—2. segm.), 2, 2, 2, 2, 3; (mts.) 3 (4?), 4, 4; (us.) 1, 0. On segments with 4 spines, nos. 1 and 3 are very small.

The dorsal keel very slightly prominent save at mts. and 1. segm. of us. (WOLTERECK: "Die ganz niedrige Firste und der cylinderartig gleichmässige Durchmesser des Kopfes und der 5 ersten Rumpfsegmente").

own specimens [female, "Valdivia" St. 182, size noted as over 51 cm. (presumably 51 mm.)] the proportion is 13:7, and thus, despite W.'s statement, not agreeing with the "Challenger" specimen.

The md. has a fairly high median process, but no lateral process.

On the ventral side of the 1.—3. mesosome segment, there are no appendices; neither central spine nor plates belonging to the genital papilla. This is doubtless connected with the fact that the specimen is a male: the testes are here excellently preserved, as also their emissory ducts.

With regard to the pereiopoda there is nothing

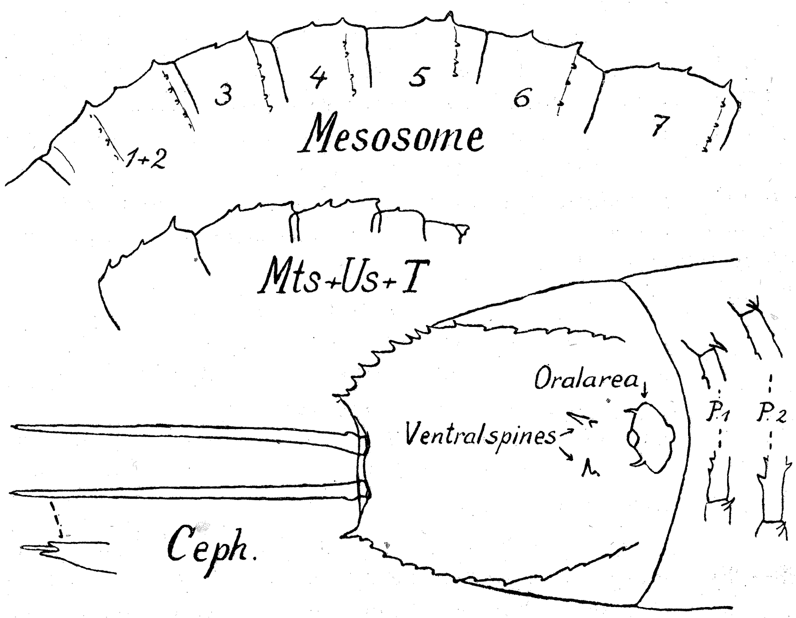

Fig. 22. Thaumatops Fabricii. St. 182, 1906, 600 m. w.

particular to remark, save that the first free joint in p. 7 is almost twice as broad in the proximal part as in the distal. The epimeral portion of p. 1—p. 2 has a spine, not very large.

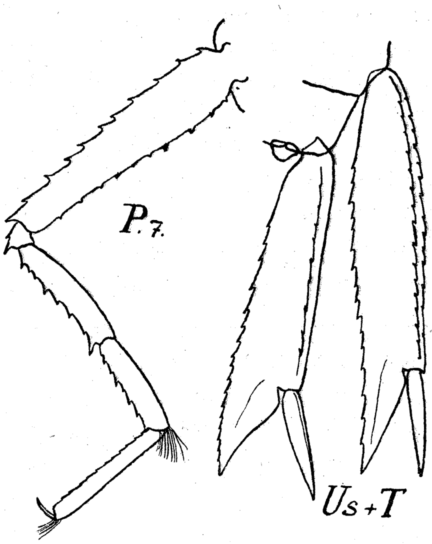

Fig. 23. Thaumatops Fabricii. St. 182, 1906, 600 m. w.

The urop. are rather narrow; in up. 3 the rami are abt. $^1/_3$; in up. 1 between $^1/_3$ and $^1/_4$ as long as the entire limb. The rami themselves are alike in length, in the right up. 3 however, (but not in the left) the outer ramus is just a trifle longer than the inner.

This species can thus be characterised as follows: Antennæ slightly longer than ceph. measured to the anterior portion of oral party; only two pairs of ventral spines; 1. free joint in p. 7 only half as broad in the distal as in the proximal part.

Distribution. Off the Meangis Islands, Molucs, 4°33′ N, 127°6′ E, 500 fath. (Stebbing). "Valdivia" Exped. St. 182 (10°8,2′ S, 97°14,9′ E, S of Sumatra), and St. 239 (5°42′ S, 43°36′ E, 43°36′ E, 1500 m. E of Zanzibar). (Woltereck). The species is thus not previously known from the Atlantic.

5. THAUMATOPS PELLUCIDA Will.-Suhm
(fig. 19 [p. 57], 24—27).

Thaumatops pellucida Willemoës-Suhm, Phil. Transact. Royal Soc. London, vol. 163, 1873, (1874), p. 634, Pl. 49—50.

— — Willemoës-Suhm, Proc. Royal Soc. London, vol. 21, 1872—73, p. 207.

**Cystisoma spinosum* Stebbing, Challenger-Amphip. 1888, p. 1325, Pl. 155 (spec. B, ♀).

Thaumatops pellucida Woltereck, Zool. Anzeiger, vol. 26, 1902—03, p. 452, fig. 1.

Spec. A. St. 67. *48°29′ N, 14°15′ W.* > 4000 m. 7-5-1906. 1700 m. w. (Aa. T.). 5^{00} am. 120 min. 1 ♀ jun., 55 mm. (?) (ceph. broken) (fig. 19 [p. 57], 24, 25).

Measuments: Ceph. 16 mm. (?, broken), mss. 22 mm., mts. 15 mm., us. 4 mm. Ant. 16 mm.; interval 4 mm., whole margin between frontal spines 7 mm. P. 3 ca. 20 mm., p. 4 35 mm., p. 5 50 mm., p. 6 50 mm., p. 7 20 mm.; up. 1 and up. 3 11 mm., both reckoned to point of outer ramus.

Spines on dorsal keel: (mss.) 1 + 2 (1.—2. segm.), 2, 2, 2, 1 (2 ?), 3; (mts.) 4, 5, 5; (us.) 2, 0; the hindmost spine on each segment longer than the rest.

Marginal spines: 12 right, 14 left (here, however two very small). Ventral spines 7 pairs.

The specimen is very soft and somewhat collapsed.

According to Woltereck's list in Zool. Anzeiger (l. c.) this specimen should be referred to the species *Th. pellucida*, provided that it be a female, and I consider it fairly certain, albeit not absolutely so, that it really is a female jun. As shown in my fig. the ant. lacks most of the expansion which should be typical of the female, and there are no glands in the outer ramus on up.; nor is the 6. joint in p. 7 particularly expanded. Possibly however, the lack of these characters may be due to the fact that it is a young specimen.

In the median ventral line there is, between p. 1 (Stebbing; gn. 1) a very small protuberance, which I can only regard as the early stage of a central spine (shown by Stebbing in "Challenger" Pl. 155). Behind this are found, (at p. 2) a pair of bifurcate appendices, the two branches of which are about equally large, and at p. 3 a similar pair but somewhat larger, the foremost however here abt. 3—4 times as long as the post-

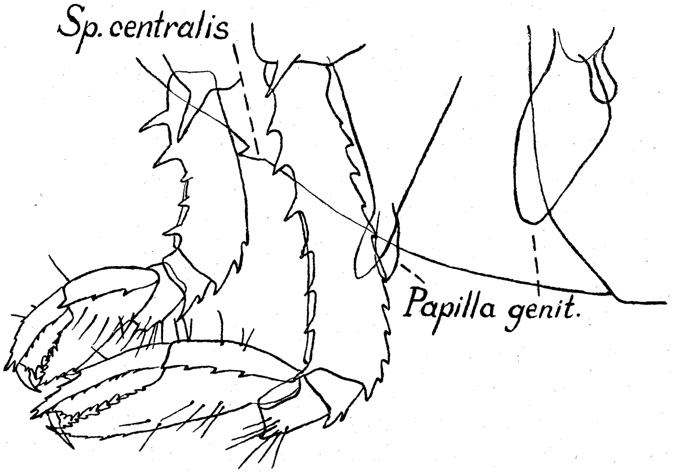

Fig. 24. P. 1—p. 2, spina centralis and papilla genitalis of Thaumatops pellucida ♀ (St. 67, 1906, 1700 m. w.), lateral view, (cf. fig. 19, p. 57).

erior one. These two pairs of appendices must be regarded as early stages of genital papilla, but they do not afford any certain sex character, as WOLTERECK states (l. c. p. 450) that they occur also "bei einigen reifen ♂ als kleine harte Zapfchen". This is also apparent from "*C. spinosum*" Pl. 154 in the "Challenger" (text p. 1323) where the large male is furnished with processes of exactly the same appearance as in my spec. On the ventral side of 4.—5. mesosome segments we find the protuberances noted both by STEBBING ("Challenger" Pl. 155) and myself in the specimen below (given by ALFRED BENZON 1863) albeit but just indicated, besides which, p. 4—p. 6 have the usual branchiæ.

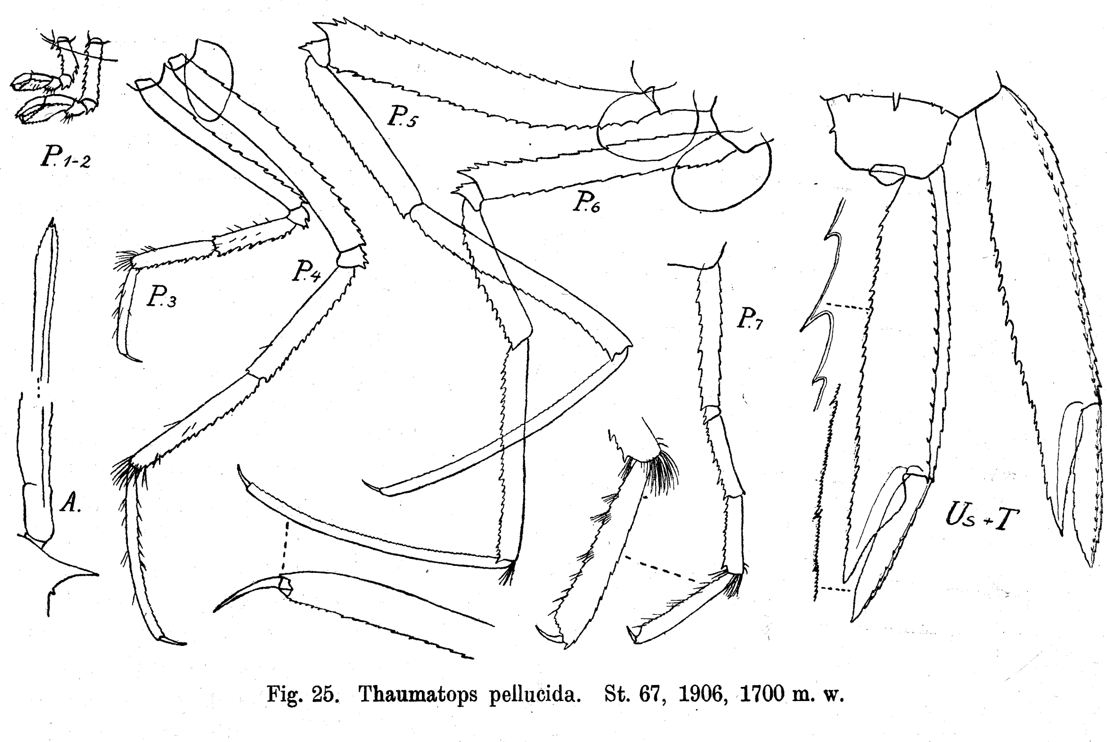

Fig. 25. Thaumatops pellucida. St. 67, 1906, 1700 m. w.

Unfortunately the specimen is not a little damaged, the ceph. in particular and anterior portion of mss. being spoiled. There is an oblong organ which can probably be interpreted as "Verbindungsdarm" (WOLTERECK).

Otherwise very little to add. In ant. 1, it was not possible to discern any real articulation, save for the extreme outermost joint, which is quite small. The orifice of the antennal gland in the glandular spine (ant. 2) is very distinct. There is a small lateral spine on either side of the fused 2.—3. urosome segments.

Spec. B: Th. pellucida, ticketed "Cystisoma Neptunus Guér. Oc. Atl. WEBERG. 31—5—63. 45°2'N, 17°20'W. ALFR. BENZON ded". (fig. 26—27).

This specimen, which as far as we know, has long been in the possession of the Zool. Museum, is strangely enough not mentioned in BOVALLIUS' Monograph, although he had borrowed the other old specimens of the genus found in our Museum (Type. spec. A and B of "*Th. longipes*" Bovall.). It is included here, although not from the "Thor", as it serves in various respects to supplement the foregoing. It is very soft and somewhat collapsed, and is thus hardly suitable for illustration.

Measurements: Total length 66 mm.; ceph. (ventral side) 20 mm., mss. (ventral side) 22 mm., mts. 18 mm., us. 6 mm.; ant. 22 mm. Interval between ant. 5,5 mm., whole margin between frontal spines 8 mm. Up. 1 14 mm., up. 3 15 mm., both to point of outer ramus. P. 3 23 mm., p. 4 40 mm., p. 5 60 mm., p. 6 51 mm., p. 7 25 mm. Spines in dorsal line (those in (), very small): (mss.) 1 + 1 (1.—2. mesosome segm.), (1 +) 1, (1 +) 1, (1 +) 1, (1 +) 1, 4; (mts.) 4, 5, 5; (us.) 2, 0. One very small spine on each side of the fused 2.—3. urosome-segm. as shown in my fig. of previous specimen (fig. 25).

Marginal spines: 14 left, 15 right. Ventral spines: 5 pairs.

The specimen agrees on the whole very well with STEBBING's description of spec. B in the "Challenger" Exped. but is somewhat smaller (66 mm. against 84 mm.) and thus younger, which is also apparent from the genital apparatus; but the glandular parts in ant., pereiop. and up. 1—3 seem to correspond entirely with STEBBING's specimen. The central spine is of exactly the same shape and developement as in STEBBING's spec. as also the small "marsupial plates" on the 4.—5. mesosome segments. There is a difference however, in the genital papilla, the two pairs of appendices of which this consists being less developed than in the "Challenger" spec. but considerably more so than in the spec. from the "Thor" St. 67 (see above). I have not been able to discern any genital opening in the posterior small "marsupial plates"; nor could I find any opening in the central spine leading into "Brutsack" (which is hardly present); this may, however, possibly be due to the fact that the specimen is considerably damaged.

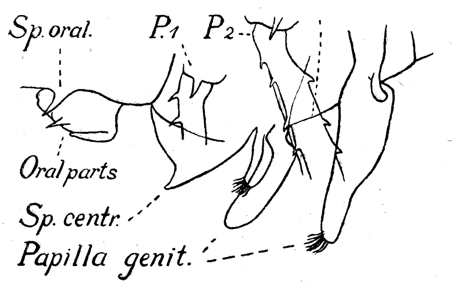

Fig. 26. Thaumatops pellucida ♀, Alfr. Benzon ded. Oral parts etc. seen from the left side (cf. fig. 27).

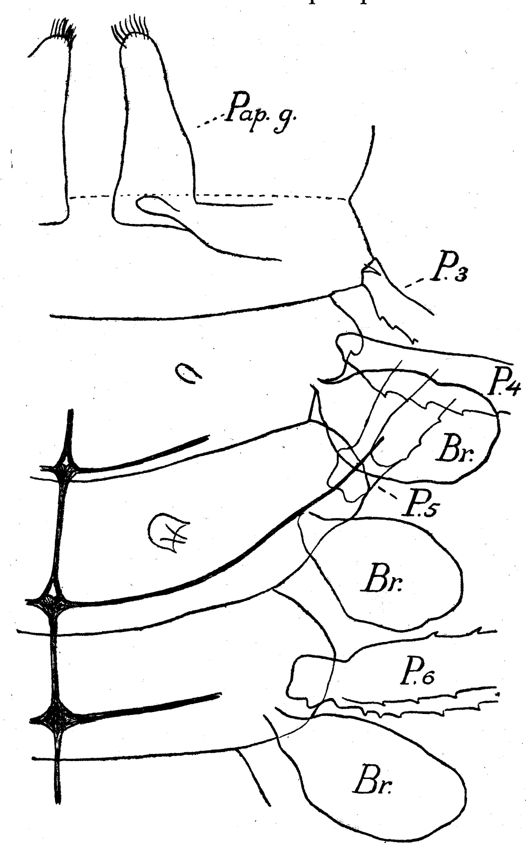

Fig. 27. Thaumatops pellucida ♀, Alfr. Benzon ded. The left side of the ventral surface of 3.—6. mesosome segments. In the middle of the drawn parties of 4.—5. segments the small marsupial plates are to be seen. Br. = the branchiæ. Drawn to about the same scale as fig. 26.

Distribution. W of Gibraltar 35°47′ N, 8°23′ W, 1090 fms. (WILL.-SUHM's orig. spec.), "Valdivia"-Exped. St. 190 and 236 (Indian Ocean, 2 joung ♀): 0°58′ S, 99°43′ E, 1280 m., 5,9° C, and 4°38′ S, 51°16′ E, 2000 m. (WOLTERECK).

Other specimens can hardly with certainty be referred to this species, though several such are mentioned in the literature. ("Challenger"; German Plankton Exped.). The species is thus known only with certainty from the Atlantic at Ireland and Gibraltar, and from the Indian Ocean.

6. THAUMATOPS PARKINSONI Stebb. (fig. 28—29).

Cystisoma Parkinsoni Stebbing, Challenger Amphip. 1888 (Cystisoma spec. F.) p. 1332.

One of the specimens from the "Challenger" Thaumatops material referred to by STEBBING both under the name of *Cystisoma spinosum* spec. F. and also under that of *Cystisoma Parkinsoni* (he regards it as possibly representing a distinct species) is characterised particularly by its remarkable long antennæ, which according to STEBBING's measurements, are abt. half as long as the whole animal (he gives no measurements for the ceph.) (the whole animal "not much over two inches" i. e. over 52 mm., ant. 28.6 mm.).

The character also applies to two specimens in my material, and as I cannot find sufficiently great differences between my specimens and STEBBING's, I think there can be nothing to prevent their being referred for the present to the same species, even though the principal "specific character", the long antennæ, is not a very good one from a systematic point of view, varying considerably as far as I can see according to age, and possibly also according to sex. The species has — or at any rate my two specimens have — only the median process on md.

The "Challenger" specimen was taken N of Amboina, 0°48′30″S, 126°50′30″E, 825 fath. and is a male.

Th. Parkinsoni. St. 72, *57°52′ N, 9°53′ W.* 1550 m. 8-6-1905. 600 m. w. 5^{00} pm. 120 min. ♂ (testes distinct). 38 mm (fig. 28).

Ventral measurements: Ceph. 12 mm., mss. 13 mm., mts. 9 mm., us. 4 mm. Greatest breadth (13 mm.) just behind the head. Dorsal spines: (mss.) 1 + 2 (1.—2.

segm.), 2, 3, 2, 2, 4; (mts.) 4, 5, 4; (us.) 2, 0. Dorsal keel very little prominent save in mts.

Marginal spines 16 left, 16 right. Ventral spines 6 pairs; spina anterior not much larger than spina glandularis.

Ant. 17.5 mm. i. e. 1½ times as long as ceph. measured ventrally (from frontal margin to anterior margin of mouth organs only 10 mm.) or almost half the entire length of the animal. Interval between the two antennæ 2 mm, whereas the whole frontal margin between frontal spines is 5 mm. No real articulation in ant. save for the quite small apical joint.

In md. the median spine is not particularly long, but very pointed.

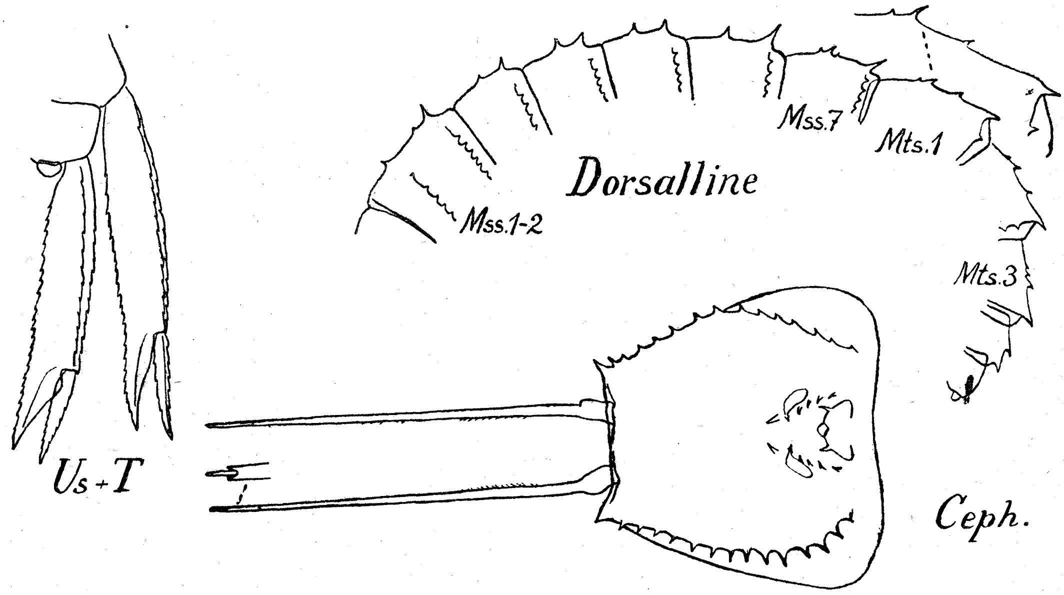

Fig. 28. Thaumatops Parkinsoni. St. 72, 1905, 600 m. w.

No appendices on ventral side of 1.—3. mesosome segments. In the epimeral part of p. 1—p. 2 the spine rather small. P. 3 14 mm., p. 4 21 mm,, p. 5 over 29 mm. (point lacking), p. 6 27, p. 7 14 mm., up. 1 8 mm., up. 3 8 mm. In the up., the rami are abt. $^1/_3$ the length of the entire limb, but somewhat shorter in p. 1; outer rami slightly longer than inner do.

Th. Parkinsoni ?. *Th. longipes* Bovall. type-spec. B, Bovallius, Monograph pt. 1: 2, 1889, p. 47, spec. B, pl. 3, fig. 2, 3, 4, 14; non Th. longipes aliis locis in litt. — *59°38′ N, 5°24′ W.* 19-5-1852. Rink ded. 1 ♂ (testes distinct), 46 mm (fig. 29)·

Under this species, I note with some doubt type spec. B of Bovallius' *Th. longipes*, in the possession of our Zool. Museum (type spec. A. belongs to a quite different species, *Th. Bovallii*, see p. 60). I have subjected this specimen to further examination, and give below the necessary corrections to Bovallius' description.

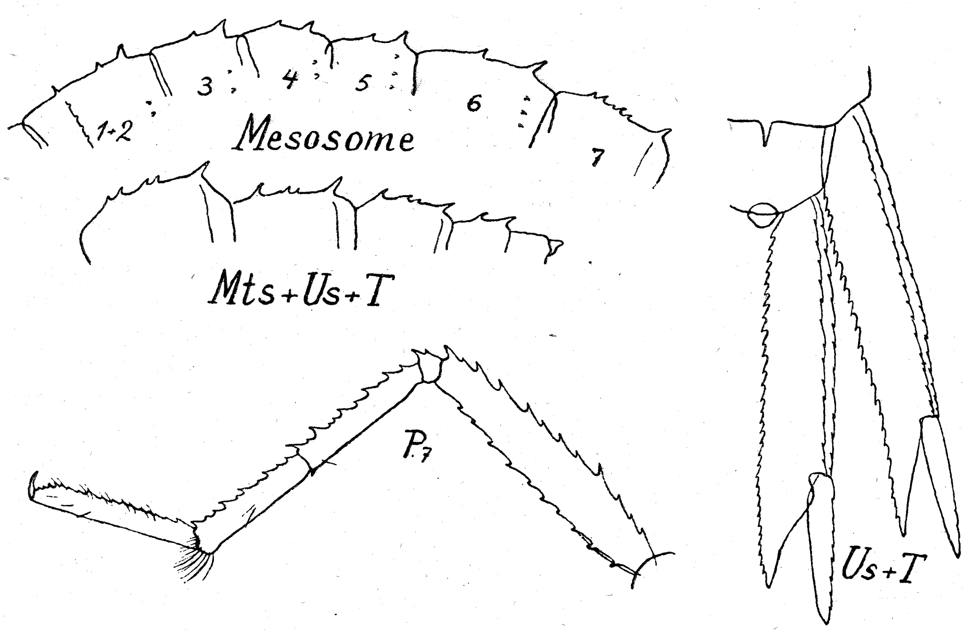

Fig. 29. Thaumatops Parkinsoni (longipes Bovall. type spec. B).

The two first mesosome segments are fused, not separated by a seam. Ventral measurements: ceph. 13 mm., mss. 18 mm., mts. 11 mm., us. 4 mm. Greatest breadth of body, 15 mm., is at the posterior third of the cephalon. Dorsal spines: (mss.) 1 and 2 (1. + 2. segments), 2, 2, 2, 2, 6; (mts.) 5, 5, 4; (us.) 2, 0. Dorsal keel very slightly prominent save in mts. Marginal spines 11 to the left, 13 to the right. Ventral spines 5 pairs, glandular spine very small, only abt. $^1/_3$ of spina anterior.

Ant. 25 mm. fairly hairy. Bovallius' description

(Monograph p. 48) and fig. (l. c. Pl. 3, fig. 3—4) are very good. Interval between the two antennæ 2.8 mm., whole of frontal margin between frontal spines 6 mm.

Md. has only the median projection, which is not particularly long, but pointed.

On the ventral side, there are appendices to 1.—3. mesosome segments, at a stage not quite so fully developed as described above under *Th. pellucida* from "Thor" St. 67 1906, 1700 m. w. (fig. 19, fig. 24, p. 65).

P. 3 20 mm., p. 4 29, p. 5 42, p. 6 35, p. 7 17 mm.; as will be seen, BOVALLIUS' measurements are thus on the whole somewhat too high. First free joint in p. 7 is as nearly as possibly uniform in breadth throughout. Between the two legs belonging to 7. pair, there are two small protuberances or warts on the ventral side, with the male genital apertures.

Up. 1 10 mm., up. 3 9 mm. Rami abt. 1/3 as long as whole limb, and outer rami slightly longer than the inner. The inner rami are of the usual shape; the outer, on the other hand, hardly pointed at all save just at the tip, the breadth in distal and proximal parts being very nearly equal (this applies in a greater degree to up. 3 than to up. 1).

This species is not noted in WOLTERECK's list 1903; he merely mentions it in passing, and evidently doubts whether it is justified. The great distance between the finds, Amboina and the northern Atlantic does not, however count against it.

7. THAUMATOPS sp. (fig. 30).

St. 80. *51°34′ N, 11°50′ W,* 1140 m. 16-6-1906. 1200 m. w. 6^{30} pm. 120 min. 1 ♂ (testes distinct) 41 mm.

Ventral measurements: Ceph. 13 mm., mss. 14 mm., mts. 10 mm., us 4 mm. Greatest breadth (14 mm.) at posterior third of ceph. Dorsal spines: (mss.) 1 + 2 (1.—2. segm.), 2, 2, 2, 2, 3; (mts.) 4, 4, 4; (us.) 2, 0.

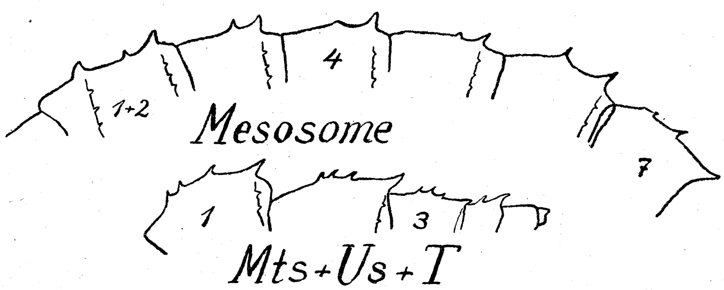

Fig. 30. Thaumatops sp., 41 mm. St. 80. 1906, 1200 m. w.

Dorsal keel very little prominent save in mts. Marginal-spines 14 left, 15 right. Ventral spines 5 pairs; glandular spine only 1/3 as large as spina anterior.

Of ant. only the proximal part, 10 mm., preserved. No real articulation. Interval between antennæ 3 mm.; whole margin between frontal spines 5 mm.

Md. has only the median projection, not very long, but pointed. On ventral side of 1.—3. mesosome segments the usual appendices; stage of developement as in my fig. (fig. 19, 24) of *Th. pellucida*, female, from "Thor" St. 67 1906, 1700 m. w. No warts on ventral side of 7. mesosome segment. P. 3 16 mm., p. 4 27, p. 5 39, p. 6 over 27 mm. (broken), p. 7 15 mm. In p. 7, the first free joint is very narrow, and dactylus about same length as the breadth of the previous joint. Up. 1 8.5 mm., up. 3 8,5 (to apex of outer ramus); outer rami a good deal longer than inner; on the whole, the up. are of the same shape as in BOVALLIUS' type spec. B. of *Th. longipes* (see above under *Th. Parkinsoni,* fig. 29).

8. THAUMATOPS sp. juv. (fig. 31).

St. 80. *51°34′ N, 11°50′ W.* 1140 m. 16-6-1906. 1200 m. w. 6^{30} pm. 120 min. 1 spec. 29 mm.

Dorsal part of body somewhat higher than ceph.

Ventral measurements: ceph. 8 mm., mss. 10 mm., mts. 8 mm., us. 3 mm. Greatest breadth of body (abt. 9 mm.) about at transition from ceph. to mss. Spines on dorsal keel: (mss.) 1 + 2, 3, 3, 3, 2, 4; (mts.) 4,4 (3 ?), 4; (us.) 2,0. Keel very little prominent save in mts; that some of the spines are comparatively long and thin is probably a juvenile character, as also the fact that the body is higher than the cephalon.

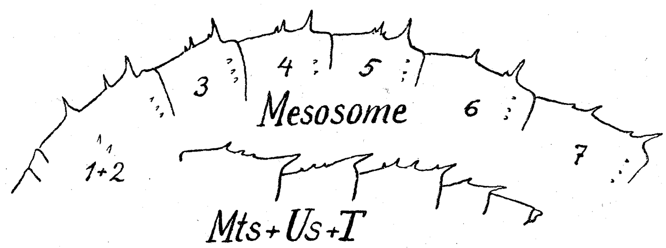

Fig. 31. Thaumatops sp., 29 mm. St. 80, 1906, 1200 m. w.

Marginal spines 13 left, 14 right; ventral spines 5 pairs; glandular spine only abt. 1/4 as long as as spina anterior. The marginal spines in particular are long and thin, perhaps a juvenile character.

Antennæ 10 mm.; no real articulation save in the quite small apical joint. Interval 2 mm.; whole margin between frontal spines 3.5 mm.

Md. has only the median projection, which is long and pointed. On ventral side of 1.—3. mesosome segments no appendices.

P. 3 10 mm., p. 4 15, p. 5 27, p. 6 22, p. 7 10 mm. In p. 7, the 1. free joint is very narrow, dactylus over twice as long as breadth of the previous joint. Up. 1 and up. 3

6 mm.; rami of equal length and abt. $^1/_3$ of whole limb.

Gonade (testis?) distinct, but loosened from its place.

The series of lateral spines but very slightly developed, distinct only at p. 7 and plp. 1—plp. 3. Where the row of spines is not developed, the corresponding fold or seam is likewise not found.

9. THAUMATOPS sp. juv. (larva?).

St. 181. *49°22′ N, 12°52′ W.* 4-9-1906. 1350 m. 1800 m. w. (Y. 330). 10^{35} am. 60 min. 1 spec. 19 mm.

This specimen, which is in excellent preservation and with fairly hard and stiff skin, is possibly an old larva, the dorsal part of mss. being somewhat higher than cephalon. All segments in mss. separated save 1. and 2.

Ventral measurements: ceph. 7 mm., mss. 7.5, mts. 5.5, us. 2.5 mm. That these figures added together amount to more than the total length is due, as in the other specimens, to the convex under side. Greatest breadth of body (8 mm.) at posterior part of cephalon. No real dorsal keel save in mts.; the row of spines is in the main of same appearance as shown in the specimen (No. 8) of 29 mm. (mentioned above) from St. 80, 1906, 1200 m. w. but the smallest spines on each segment in mss. are not present, so that the numbers are as follows: (mss.) 1 + 2, 2,2,2,2,3; (mts.) 4,5,5; (us.) 2,0. Marginal spines, 10 left, 11 right. Ventral spines 5 pairs; the glandular spine only $^1/_4$ as long as spina anterior. Antennæ 6.5 mm.; no real articulation save at the apical terminal joint. Interval between antennæ 1.5 mm., margin between frontal spines 2.5 mm.

Md. has a fairly long, curved median process. P. 5 is 17.5 mm.; otherwise nothing to remark as to the periopoda. Up. 1 and up. 3 4 mm., thin and slender, rami of equal length and a little over half as long as the peduncle.

10. THAUMATOPS, larva (fig. 32).

?"*Physosoma*"-*larva β*, Woltereck, Zool. Anzeiger, vol. 27, 1904, p. 553 seq., fig. 5—6.

St. 181. *49°22′ N, 12°52′ W.* 1350 m. 4-9-1906. 1800 m. w. (Y. 330). 10^{35} pm. 60 min. 1 spec. 13 mm.

This specimen agrees on the whole well with Woltereck's larva *β*, differing however, in certain respects which is doubtless due to the fact that it (the "Thor" spec.) is slightly larger (13 mm. as against 9 mm.). The measurement for W.'s specimen is calculated from the measurements given to his figure.

The entire animal is quite transparent, all the inner parts being visible through the skin; it is in excellent preservation, and stangely enough, in contrast to most of the older specimens, not collapsed at all.

1.—6. mesosome segments are fused together. Dorsal spines somewhat shorter than shown by Woltereck, especially the small anterior spine on each segment.

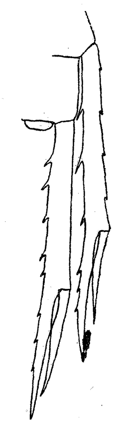

Fig. 32. Urosome of Thaumatops larva (Woltereck, larve *β*). St. 181, 1906. 1800 m. w.

Marginal spines 8 left, 7 right. (Woltereck, 6 pairs) In addition to spina anterior, which is as in W.'s figure, abt. 4 times as long as the glandular spine, there is also a small oral spine on either side (not shown by W.).

Ant. 3 mm. i. e. same length as whole ceph. measured ventrally (in W.'s figure, ant. is not half as long as ceph.). W. states that they "inserieren median"; this cannot be said of the ant. in the spec. from the "Thor", as the interval is 1.5, the whole margin between frontal spines being 2.5 mm. On the md. there is a small median process. The pereiopoda are of about the same shape as in the adults, and of more or less the same relative length (p. 5; 11 mm.) but with fewer spines on the margin, and are very slender. Up. 1 and up. 3 very thin and with long rami, inner ramus almost as long as peduncle, and, especially in up. 1, much longer than outer ramus.

Distribution. Woltereck states (l. c. p. 557) that he has four specimens of this larva, but does not give locality. — 50 miles N by W of Eagle Island, 1200 fath. coarse silk townet at 400 fath. 1 spec. 5 mm. (Tattersall, Amphip. Ireland 1906).

11. THAUMATOPS, larva.

St. 65. *35°53′ N, 7°26′ W.* 1300 m. 24-2-1909. 600 m. w. 10^{00} am. 120 min. 1 spec. 10 mm.

This larva is so greatly damaged that it is impossible to say to which of Woltereck's types it most nearly belongs. Some few characters are, however, distinctly discernible.

Of ant. there is a small remainder abt. 1 mm. long, interval hardly $^1/_3$ the breadth of frontal margin between frontal spines. Of marginal spines there are hardly more than 4 pairs. Of ventral spines, only the very long spina anterior and the very small glandular spine. Up. of a shape similar to that in the above mentioned larva (No. 10) from St. 181, 1906, 1800 m. w.

Biology of the genus Thaumatops.

WOLTERECK states (l. c. 1904) that practically nothing is known beyond the fact that the young and larvæ are apparently found right down in the dark layers, while the mature specimens live higher up in order to find each other and also to find their food; he also refers to the fact that the earliest known specimens were old individuals doubtless taken at the surface, whereas larvæ have only been taken in comparatively recent times and much farther down. In other words, reckoning that the light penetrates at least 1000 metres down (HELLAND-HANSEN in MURRAY and HJORT; The depths of the Ocean 1912 p. 251.) the grown specimens should be found above this limit, the young and the larvæ lower down. The only record in literature later than WOLTERECK's quoted work where I have been able to find biological remarks on this genus is MURRAY and HJORT: l. c. 1912, but here the statements are mutually conflicting. At several places in this work we are told that the genus belongs to the upper water layers, 0—150 (200) m., but on p. 583 this is altered to "depths exceeding 500 m."

The "Thor" material is too small to permit of our drawing biological conclusions for the several species, but as they appear to live under the same conditions and in the same manner, I take them together and consider them under one head.

Th. Bovallii St. 61. 1420—1300 m. 500 m. w. 1^{05} pm. 1 ♂ 52 mm.
— St. 73. 1180—1390 m. 300 m. w. 1^{00} am. 1 ♂ 46 mm.
— St. 76. < 2600 m. 300 m. w. 5^{05} am. 1 (♂?) 38 mm.
- *latipes* St. 181. 1350 m. 1800 m. w. 10^{35} am. 1 ♂ 42 mm.
- *Fabricii* St. 182. 2200 m. 600 m. w. 6^{45} pm. 1 ♂ 41 mm.
- *pellucida* St. 67. > 4000 m. 1700 m. w. 5^{00} am. 1 ♀ jun. 55 mm.
- *Parkinsoni* St. 72. 1550 m. 600 m. w. 5^{00} pm. 1 ♂ 38 mm.

Th. sp. St. 80. 1140 m. 1200 m. w. 6^{30} pm. 1 ♂ 41 mm.
- — jun. St. 80. 1140 m. 1200 m. w. 6^{30} pm. 1 spec. juv. 19 mm.
- — — (larva?) St. 181. 1350 m. 1800 m. w. 10^{35} am. 1 spec. 19 mm.
- sp. larva St. 181. 1350 m. 1800 m. w. 10^{35} am. 1 spec. 13 mm.
- — St. 65. 1300 m. 600 m. w. 10^{00} am. 1 spec. 10 mm.

The genus seems mostly to keep to depths between 1000—2000 m.; none were found in less than 1000 m. of water, but a single specimen was taken at a depth beyond 4000 m.

Depths of the stations	Number of specimens
0—1000 m....	0
1001—2000 -....	9
2001—3000 -....	2
3001—4000 -....	0
> 4000 -....	1

In contrast to many other species from the "Thor", we here find specimens taken in equal numbers by day and night hauls. During the night, the depth lies about between 300—1800 m. w., in the daytime 500—1800 m. w.; deeper than this the genus does not appear to go, the 7 hauls made by the "Thor" in the Atlantic with 2000—4000 m. w. all giving negative results. The 2 (3) larvæ taken by the "Thor" were taken with 600 and 1800 m. w. on the basis of which we cannot determine whether the larvæ live deeper down than the older specimens, or at the same depth; it should be pointed out however, that probably none of the "Thor" specimens are adult. No species has ever been found in the Mediterranean.

m. w.	Number of specimens	
	Night	Day
0—200	0	0
300	2	0
500	0	1
600	1	2
1200	2	0
1700—1800 ..	1	3
total ...	6	6

The specimens seem as a rule to occur singly; we have, however, from St. 80 two, and St. 181 three specimens.

REPORT ON THE DANISH OCEANOGRAPHICAL EXPEDITIONS 1908—10
TO THE MEDITERRANEAN AND ADJACENT SEAS
Vol. II. Biology.

D. 4.

Hyperiidea-Amphipoda

(part 2: *Paraphronimidæ, Hyperiidæ, Dairellidæ, Phronimidæ, Anchylomeridæ*)

by

K. Stephensen.

With 20 figures and 15 charts in the text.

Published, August, 1924.

CONTENTS

I. INTRODUCTION

THE present paper includes part 2 of *Hyperiidea* from the "Thor"-Expeditions (part 1. is contained in vol. II. D. 2. 1918). Together with part 3, which will be published shortly, I hope, this paper was sent to the Editor in Sept. 1918, but on account of the raised prices for printing it was left unprinted till now. This is also the reason why, generally speaking, no reference has been made to the (very few) papers published since 1918; only the list of literature at the end of the paper has been brought up to date.

For further details see Introduction to vol. II. D. 2. p. 3 *seq.*, 1918.

A complete list of all the stations of the Expeditions is found in Dr. JOHS. SCHMIDT's Introduction vol. I, pp. 26—49, with chart.

A few stations from 1908—10 are situated N. of the area of the two charts reproduced here (charts 8—9), viz:

St. 1—3, 77, 246—47: N. and W. of Bretagne,

St. 78, 248, 249: English Channel, central and eastern parts,

St. 75, 76, 79, 80, 241—45: Bay of Biscay.

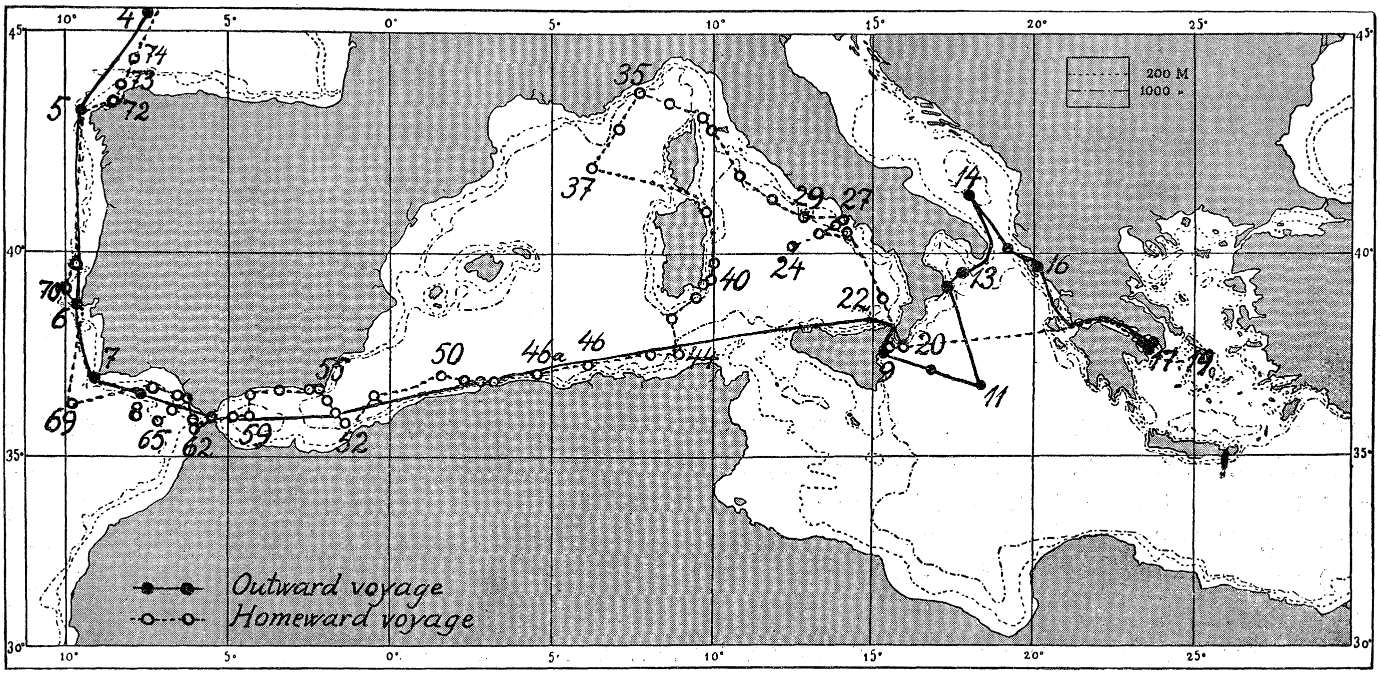

Chart 8. The Stations of the Winter Cruise 1908—1909.

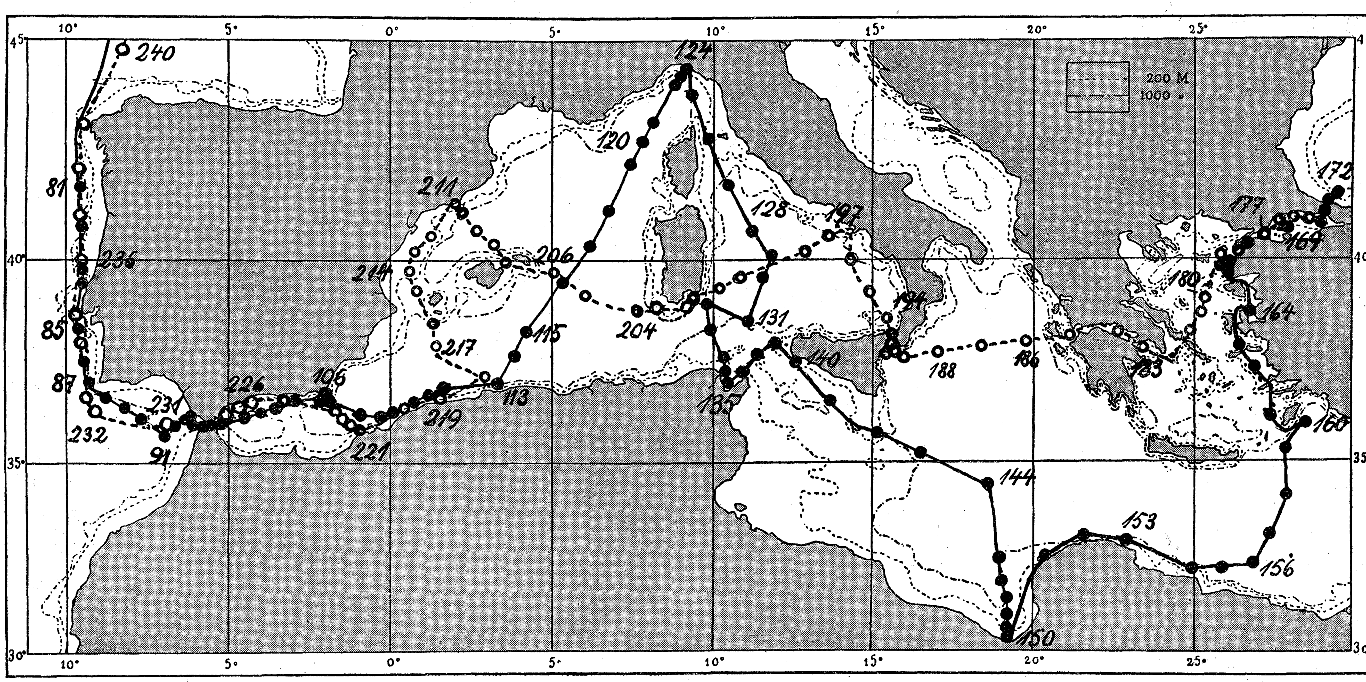

Chart 9. The Stations of the Summer Cruise 1910.

II. THE FAMILIES AND SPECIES

Fam. Paraphronimidæ Bovallius.

Paraphronimidæ Bovallius, Syst. list 1887, p. 13. — *P.* Stebbing 1888, p. 1335. — *P.* Bovallius 1889, p. 20 (lit. and key to the genera). — *P.* Vosseler 1901, p. 94.

The family comprises two genera with four species; the "Thor"-Expedition has taken the only two well-known species.

1. Genus Paraphronima Claus.

Paraphronima Claus, Zool. Anzeiger, Jahrg. 1, No. 12, 1878, p. 269. — *P.* Claus, Phronimiden 1879, p. 64 (6). — *P.* Stebbing 1888, p. 1335. — **P.* Bovallius 1889, p. 23 (lit. and key to the species).

1. PARAPHRONIMA GRACILIS Claus (Chart 10.)

Paraphronima gracilis Claus l. c. 1879, p. 65 (7), Pl. 1 figs. 4—5. — **P. g.* Bovallius 1889, p. 27, Pl. 2 figs. 1—10. — *P. g.* Vosseler 1901, p. 95. — *P. Edwardsii* Bovallius 1885, p. 12. — *P. cuivis* Stebbing 1888, p. 1337, Pl. 157. — *P. g.* Spandl 1924, p. 263, fig.

Mediterranean.

St. 152. 27-7-1910. 300 m.w., 11^{35} pm., 30 min. 1 ♀ with great marsupium. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 1 jun. — **St. 163.** 3-8-1910. Surf. (P. 100), 0^{15} am., 10 min. 2 jun. — **St. 163.** ibid. 300 m.w., 1^{05} am., 15 min. 1 ♂. — **St. 163.** ibid. 1000 m.w., 0^{05} am., 30 min. 1 ♀ with great marsupium. — **St. 178.** 12-8-1910. 65 m.w., 0^{20} pm., 15 min. 2 ♂. — **St. 181.** 13-8-1910. 300 m.w., 1^{25} pm., 20 min. 1 ♂. — **St. 182.** 13-8-1910. 600 m.w., 11^{40} pm., 30 min. 2 ♀ with great marsupium. — **St. 194.** 21-8-1910. 10 m.w., 4^{30} am., 15 min. 1 ♀ with great marsupium. — **St. 276.** 36°30′ N, 19°20′ E, 4-4-1911. 132 m.w. (S. 200); 11^{20} pm., 35 min. 10 spec.: 8 ♂, 1 ♀, 1 jun. — **St. 297.** 33°10′ N, 25°35′ E, 25-6-1911. 28 m.w. (S. 200), 11^{30} pm., 30 min. 1 ♂. — **St. 298.** 34°20′ N, 21°10′ E, 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 min. 2 ♂. — **St. 341.** 34°00′ N, 26°20′ E, 27-8-1911. 28 m.w. (S. 200), 11^{00} pm., 30 min. 2 ♂. — **St. 384.** 32°50′ N, 27°10′ E. 7-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 1 ♂, 1 ♀ with great marsupium.— **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 15 spec.: 11 ♂, 3 ♀ with great marsupium (1 with ova), 1 ♀ jun. — **St. 412.** 34°33′ N, 24°13′ E. 7-1-1912. 112 m.w. (S. 150), 6^{30} pm., 30 min. 2 ♀ with great marsupium, 2 jun. — **St. 699.** 36°00′ N, 18°58′ E. 7-2-1913, 5^{00} am. 2 ♀ with great marsupium. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 3 ♀ with great marsupium.

Atlantic.

St. 65. 24-2-1909. 65 m.w., 6^{30} am., 60 min. 1 ♂. — **St. 65.** ibid. 600 m.w., 10^{00} am., 120 min. 1 ♀ with great marsupium. — **St. 69.** 28-2-1909. 65 m.w., 10^{45} pm., 30 min. 3 spec.: 1 ♂ jun., 2 ♀ with marsupium. — **St. 89.** 18-6-1910. 1000 m.w. (S. 200), 4^{10} am., 30 min. 1 ♀. — **St. 91.** 18-6-1910. 1600 m.w., 5^{25} pm., 60 min. 1 ♀ with great marsupium. — **St. 264.** 38°14′ N, 24°34′ W. 19-3-1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 3 spec.: 2 ♂, 1 ♀ with embryos. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{45} pm., 30 min. 32 spec.: 20 ♂, 12 ♀ (1 with embryos, 1 with ova). — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 4 spec.: 1 ♂, 3 ♀. — **St. 377.**

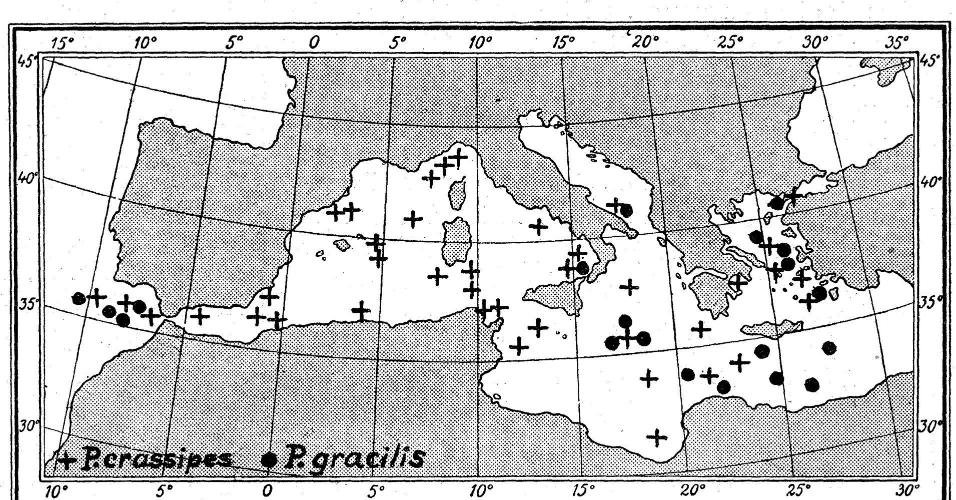

Chart 10. *Paraphronima gracilis* and *P. crassipes.* 8 stations lie outside the Chart to the S.W.

31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. 24 spec.: 17 ♂, 4 ♀, 3 jun. — **St. 382.** 34°21′ N, 16°24′ W, 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 1 ♀. — **St. 383.** 37°16′ N, 14°09′ W. 23-10-1911. 300 m.w. (S. 100), 6^{30} pm., 30 min. 11 spec.: 5 ♂, 6 ♀. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 1^{10} am., 30 min. 1 ♂, 1 ♀. — **St. 398.** ibid. 56 m.w. (S. 150), 0^{40} am, 30 min. 1 ♂. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911, 56 m.w. (S. 150), 9^{10} pm., 30 min. 9 spec.: 2 ♂, 7 ♀ (2 with ova, 1 with embryos). — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 10^{05} pm., 30 min. 1 ♂, 1 ♀ with embryos. — **St. 400.** ibid. 56 m.w. (S. 150), 9^{35} pm, 30 min. 2 ♂.

The "Thor" collections yield in all 151 specimens (83 ♂, 59 ♀, 9 jun.) from 28 stations, 34 hauls.

A. Mediterranean.

The material comprises 53 spec. (29 ♂, 18 ♀, 6 jun.), from 16 stations, 18 hauls.

Depths of the sea and occurrence (Chart 10). The species, which is new to the Mediterranean, seems to occur at all depths of the sea, except the lowest; only one station is less than 200 m (i. e. 68 m: St. 178).

All stations with the exception of one (St. 194) lie in the eastern basin, where the distribution of stations is as in the case of *P. crassipes*, and it enters the Adriatic (St. 729) and penetrates as far as the Dardanelles (St. 178). The only station in the western basin (St. 194) lies close to the north of the Strait of Messina; but the Zoological Museum at Copenhagen has long possessed a hitherto undetermined specimen from Naples, presented by Prof. Dr. P. Mayer. With this distribution it is sharply distinguished from *P. crassipes*, which is evenly distributed over both basins. The "Thor" only found it in the summer, but the other vessels likewise found it during winter and spring (Nov.—April).

Vertical occurrence. Of the 18 hauls in all, the length of line is not given in the case of 2; of the remaining 16 hauls there are two day hauls with 65 and 300 m. w. respectively; of the 14 night hauls, 6 have a length of wire of 10—38 m.

Size and propagation. The sizes generally vary between 6—7—8 mm; the only female with ova was taken on Nov. 9. (St. 385).

B. Atlantic.

The "Thor" material comprises 98 specimens in all (54 ♂, 41 ♀, 3 jun.) from 12 stations, 16 hauls. The depths of the sea are great, > 1100—> 4500 m. The northern limit is in the Bay of Cadiz, at about 36½° N.; the other stations are S.W. of the latter. The vertical occurrence is the same as in the Mediterranean, and ♀ with ova or embryos are found from March to the end of October. The species is new to the area of the "Thor" in the Atlantic.

Several of the hauls in the Atlantic are peculiar on account of the large number of individuals, though otherwise only few specimens of the species have been taken at a time: 3 hauls (each of 30 min.) yielded 32, 24 and 11 specimens respectively.

Distribution.

Mediterranean (almost exclusively eastern basin); Atlantic ca. 40° N—17° S; Indian Ocean; temperate and tropical regions of the Pacific.

1. Mediterranean; see above.

2. Atlantic. "Thor", see above. — Without special locality, 1 ♀ (Claus 1879). — Canaries (Chun, 1889, p. 532). — 6 localities 39⅓°—42° N, 33½°—45½° W, 5 ♂, 6 ♀ (Chevreux, 1900). — 34°22′ N, 34°23′ W. surf., 1 ♂ (Stebbing, "Challenger"). — Vosseler enumerates 49 spec. (28 ♂, 21 ♀) from 32 hauls from the German Plankton-Exped. from the following localities: Florida Current 2 hauls 40.4° N, 57° W, 0—200 m. w.; Sargasso Sea 9 localities: 37.1° N, 59.9° W; 35° N, 62.1° W; 31.5° N, 45.6° W, to 27.8° N, 33° W; 30.8° N, 30.9° W; 0—400 (0—200) m. w. N. Equatorial Current 10 hauls 28.9° N, 35° W, to 10.2° N, 22.2° W; 12° N, 40.3° W; 0—400 (or 0) m. Guinea Current 3 hauls: 5.3° N, 19.9° W; 3.6° N, 19.1° W; 9.4° N, 41.9° W; 0—400 m. S. Equatorial Current 7 hauls: 0° N, 15.2° W, to 7.8° S, 17.3° W, and 4.4° S, 29.2° W, 0—400 m; Gulf Stream, 1 haul 37.7° N, 25.2° W, 0—80 m. — 10°55′ N, 17°46′ W, surf., 1 ♂ (Stebbing, "Challenger"). — 7°37′ N, 22°26′ W, Reinhardt leg., Bovallius determ, 2 spec., and 7° N, 30° W, Reinhardt leg. 1852, 1 spec. (in our Zool. Museum). — 17°15′ S, 32°05′ W, 1 ♂ (Stewart 1913).

3. Indian Ocean. Walker enumerates (1909—10, p. 52) 9 spec. from the following localities: 4 and 6 miles NW of entrance into Desroches Atoll (Amirante), 750 fms. w., 1 spec., and 200 fms. w., 1 spec. 11 mm; 8°16′ S, 51°26′ E, 140 fms. w., 1 ♂; 10°27′ S, 51°17′ E, 200 fms. w., 1 ♀, and 350—0 fms., 1 spec.; Mauritius, W of Black River, 25 fms. w., 1 jun.; 7 miles NW of Yeye, Peros Atoll (S of Maldive Archipelago), 600 fms. w., 1 spec.; 4°16′ S, 71°53′ E, 1200 fms. w., 1 spec.; 3°31′ S, 72°27′ E, 125 fms. w., 1 spec.

4. Pacific. The "Challenger" Exped. has taken the species at the following localities: NW Pacific without special locality 2 ♂, 1 ♀; 36°42′ N, 179°50′ W, surf., night, 2 ♂, 1 ♀; 36°23′ N, 174°31′ E, 1 ♂; 35°41′ N, 157°42′ E, surf., 2 ♀; Api (New Hebrides, 23° N, 168° E)

to Cape York (N. Australia, $9^1/_2$° N, $142^1/_2$° E), 1 spec.; 7°17′ N, 147°20′ W, 1 ♂; 13°50′ S, 151°49′ E, surf., 1 ♂ jun.

2. PARAPHRONIMA CRASSIPES Claus (Chart 10, p. 75).

Paraphronima crassipes Claus, Phronimiden 1879, p. 65 (7), 66 (8), Pl. 1 figs. 6—9, Pl. 2 fig. 10. — **P. c.* Bovallius 1889, p. 31, Pl. 2 fig. 1. — *P. c.* Vosseler 1901, p. 97, Pl. 8 figs. 22—26. — *P. c.* Stewart 1913, p. 253. — *P. clypeata* Bovallius 1885, p. 11 fig. 3. — *P. cl.* Bovallius 1889, p. 33, Pl. 2 figs. 16—40. — *P. pectinata* Bovallius, Syst. list 1887, p. 13.

Mediterranean.

St. 58. 20-2-1909. 100 m.w., 2^{00} pm., 30 min. 2 ♂. — **St. 108.** 25-6-1910. 300 m.w., 10^{30} pm., 30 min. 2 ♂. — **St. 113.** 28-6-1910. 300 m.w., 3^{25} am., 30 min. 2 ♂. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 1 ♂. — **St. 118.** 1-7-1910. 25 m.w., 0^{20} am., 15 min. 6 ♂. — **St. 118.** ibid. 300 m.w., 5^{55} pm., 30 min. 2 ♂. — **St. 121.** 2-7-1910. 25 m.w., 3^{35} am., 30 min. 1 ♂. — **St. 123.** 3-7-1910. 25 m.w., 1^{50} am., 15 min. 1 ♂. — **St 123.** ibid. 65 m,w., 0^{55} am., 30 min. 1 ♂, 2 ♀ (1 with ova). — **St. 122.** 2-7-1910. 1200 m.w., 5^{30} pm., 60 min. 1 ♂. — **St. 125.** 9-7-1910. Surf. (P. 100), 10^{40} pm., 10 min. 1 ♂. — **St. 132.** 14-7-1910. 600 m.w., 4^{50} am., 30 min. 1 ♂. — **St. 133.** 14-7-1910. 300 m.w., 10^{15} pm., 30 min. 1 ♂, 2 ♀. — **St. 135.** 16-7-1910. 25 m.w., 12^{55} am., 30 min. 1 ♂. — **St. 137.** 19-7-1910 250 m.w., 9^{05} am., 30 min. 2 ♂, 1 ♀. — **St. 141.** 20-7-1910. 25 m.w., 10^{35} pm., 15 min. 1 ♂. — **St. 144.** 24-7-1910. 4000 m.w., 6^{20} am., 60 min. 1 ♀ with great marsupium. — **St. 147.** 25-7-1910. 25 m.w., 11^{35} pm., 30 min. 1 ♂. — **St. 147.** ibid. 300 m.w., 0^{20} am., 30 min. 2 ♂, 1 ♀. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 3 ♂, 3 ♀ (1 with ova). — **St. 163.** 3-8-1910. 1000 m.w., 0^{05} am., 30 min. 1 ♂, 1 ♀ with embryo. — **St. 178.** 12-8-1910. 65 m.w., 0^{20} pm., 15 min. 5 ♂. — **St. 181.** 13-8-1910. 300 m.w., 1^{25} pm., 20 min. 1 ♂. — **St. 182.** 13-8-1910. Surf. (P. 100), 10^{35} pm., 10 min. 1 ♂. — **St. 182.** ibid. 10 m.w., 11^{00} pm., 15 min. 1 ♂. — **St. 182.** ibid. 600 m.w., 11^{40} pm., 30 min. 4 ♂, 2 ♀ (1 with great marsupium). — **St. 183.** 16-8-1910. 300 m.w., 4^{45} pm., 15 min. 1 ♂. — **St. 187.** 18-8-1910. 25 m.w., 7^{45} pm., 15 min. 2 ♂, 1 ♀. — **St. 194.** 21-8-1910. 25 m.w., 5^{00} am., 15 min. 2 ♂. — **St. 194.** 1200 m.w., 6^{00} am., 30 min. 1 ♂. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 1 ♂. — **St. 197.** 24-8-1910. 25 m.w., 7^{45} pm., 15 min. 3 ♂,1 ♀. — **St. 204.** 27-8-1910. 65 m.w., 4^{30} am., 15 min. 1 ♂. — **St. 206.** 28-8-1910. 25 m.w., 0^{30} am., 15 min. 2 ♂. — **St. 210.** 30-8-1910. 25 m.w., 2^{45} am., 30 min. 1 ♂. — **St. 223.** 5-9-1910. 25 m.w., 4^{35} am., 15 min. 1 ♂, 1 ♀. — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 min. 4 ♂, 1 ♀. — **St. 339.** 40°30′ N, 3°10′ E. 20-8-1911. 28 m.w. (S. 200), 3^{00} am., 30 min. 1 ♀ with great marsupium. — **St. 340.** 35° 50′ N, 21°30′ E. 26-8-1911. 108 m.w. (S. 150), 9^{00} pm., 30 min. 2 ♂, 2 ♀. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 1 ♂, 1 ♀. — **St. 410.** 37°10′ N, 1°18′ W. 29-12-1911. 112 m.w. (S. 150), 7^{00} pm., 30 min. 2 ♂, 2 ♀. — **St. 412.** 34°33′ N, 24°15′ E. 7-1-1912. 112 m.w. (S. 150), 6^{30} pm., 30 min. 3 ♂, 1 ♀. — **St. 718.** 36°13′ N, 13°53′ E. 17-5-1913. 8^{15} pm., 1 ♂. — **St. 729.** 41°00′ N. 17°44′ E. 14-4-1913. 11^{30} pm., 1 ♀.

Atlantic.

St. 69. 28-2-1909. 65 m.w., 10^{45} pm., 30 min. 2 ♂. — **St. 69.** ibid. 600 m.w., 9^{00} pm., 60 min. 1 ♀ with ova. — **St. 89.** 18-6-1910. 1000 m.w., 4^{10} am., 30 min. 1 ♀. — **St. 95.** 23-6-1910. 300 m.w., 5^{10} am., 30 min. 1 ♂. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. 6 ♂, 6 ♀. — **St. 398.** 38°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 1^{10} am., 30 min. 1 ♂, 1 jun. — **St. 398.** ibid. 56 m.w. (S. 150), 12^{40} am., 30 min. 1 ♀ with ova. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 2 ♂, 2 jun. — **St. 399.** ibid. 56 m.w. (S. 150), 9^{10} pm., 30 min. 2 ♀ (1 with ova).

The material comprises in all 124 specimens (85 ♂, 36 ♀, 3 jun.) from 44 stations, 52 hauls.

A. Mediterranean.

	No. of stations	No. of hauls	No. of specimens ♂	♀	Total
"Thor" Feb. 1909	1	1	2	..	2
— June 1910	3	3	5	..	5
— July —	12	15	22	7	29
— Aug. —	13	16	30	8	38
— Sept. —	1	1	1	1	2
"Thor" total	30	36	60	16	76
Other vessels	8	8	13	9	22
	38	44	73	25	98

Depths of the sea and occurrence. The species is fairly evenly distributed throughout all depths of the sea between about 100 and 3000 m. The 7 stations 0—500 m have the following depths: 68, 85, 175—195, 200, 233, 255 and 480 m.

As regards geographical occurrence (Chart 10, partim, p. 75) the 30 stations of the "Thor" are so distributed that 20 stations lie in the western and 10 in the eastern basin, and the stations are spread over the whole of the distance from Gibraltar to the Dardanelles; as the "Thor" herself has twice as many stations in the western as in the eastern basin they are thus to be found in fairly equal numbers in the two basins. The 8 supplementary stations where investigations have been made by other vessels do not add to the distribution, apart from a single station (St. 729) situated in the southern Adriatic. All the positive hauls of the "Thor" with one exception (St. 58), were made during the summer only; but among the supplementary hauls from other vessels there are 3 winter hauls (St. 385, 410, 412).

Vertical occurrence. During the night, the species keeps almost exclusively to the upper water layers (10—35 m. w.). During the day, it has not been taken nearer the surface than with 65 m. w.; the 3 positive hauls with the smallest length of line were made with 65 (2 hauls) and 100 m. w.

Size and propagation. The size is generally 6—7—8 mm, and ♀ is often a little larger than ♂, as much as 10 mm in fact. There are about 3 times as many ♂ as ♀. Among the 25 ♀ there are only 3 with ova or embryos, taken on July 3rd and Oct. 3rd respectively.

B. Atlantic.

There are in all 26 specimens (12 ♂, 11 ♀, 3 jun.) from 6 stations, 8 hauls. From this scanty material it is impossible to deduce anything for certain; ♀ with ova were found on Feb. 28th and Oct. 26th. The species is new to this region of the Atlantic.

Distribution.

Mediterranean; Atlantic; Pacific.

1. Mediterranean. "Thor", see above. — Without special locality, 1 ♀ (Claus l. c.) — Vosseler, in Lo Bianco 1903—04, p. 278, enumerates 17 spec. from 9 day hauls, Feb. 5th to May 10th; 7 hauls are from the Gulf of Naples, 500—2000 m. w.; and 3 of them were taken with closing net 50, 100 and 200 m. w.; 1 haul is from Salina (Eolian Islands), 2500 m. w., and 1 haul from Stromboli, 1100 m. w. *Ibid.* p. 238 it is mentioned from 11 hauls, three of them 50—100 m (closing net). — Ponza, Ischia, Capri, 800—1300 m. w., in Jan., 40 and 900 m. w. (Chun, Bibl. Zoologica 1888).

2. Atlantic. Our Zool. Museum has 37 spec. from the following localities: 39°10′ N, 42°10′ W, Andrea 1863, 1 spec.; 36°6′ N, 39°28′ W, Warming 1866, 1 spec.; 36° N, 43° W, "Galatea" 23-7-1847, 1 spec.; 33° N, 47° W, "Galatea" 17-7-1847, 1 spec; 30°34′ N, 30°50′ W, Andrea 1862, 1 spec.; 26° N, 26° W, Iversen 1871, 1 spec.; 25° N, 39° W, Hygom 1863, 1 spec.; 24°—25° N, 31°—33° W, Iversen, 1 spec.; 11°45′ N, 27° W, abt. 15 spec.; 10°22′ N, 21°16′ W, 2 spec.; 10° N, 30° W, Reinhardt 1852, 4 spec.; 8°44′ N, ?W, Reinhardt, 1 spec.; 7°37′ N, 22° W, Reinhardt, 4 spec.; 7° N, 30° W, Reinhardt 4-7-1852, 1 spec.; 37° S, $7^1/_2$° E, "Galatea" 5-9-1845, 2 spec. — Chevreux (1900) enumerates 17 spec. (6 ♂, 11 ♀) from 5 stations $40^3/_4$°—42° N, 39°—$43^3/_4$° W, surf., night. — Vosseler enumerates (Plankton-Exped.) 17 spec. (9 ♂, 8 ♀) from 16 hauls: Florida Current 1 st. 40.4° N, 57° W, 0—200 m; Sargasso Sea 2 stations: 34.7° N, 62.4° W, 0 m, and 31.5° N, 40.7° W, 0—400 m; N. Equatorial Current 4 st. 28.9° N, 35° W to 10.2° N, 22.2° W, 0—400 (or 0) m; Guinea Current 3 st.: 5.9° N, 20.3° W, and 6.7° N, 43.2° W, 0—400 m; S Equatorial Current 6 st.: 0.1° N, 15.2° W to 5.1° S, 14.1° W, and there from to 0.1° N, 44.2° W, 0—400 m. — $37°33^3/_4$ S, 6°09′ E, 12 spec., and 37°47′ S, 3°59′ E, 1 ♀ (Stewart 1913).

3. Pacific. The tropical region of the Pacific (*P. clypeata*, Bovallius, Monogr.).

Fam. Hyperiidæ Dana.

Hyperiidæ K. Stephensen 1923, p. 13 (lit.)

Of the 9 genera of the family (in the following, *Euthemisto* has been considered synonymous with *Parathemisto*) with 45 (+ 3 doubtful) species, 6 genera with 18 species are represented in the "Thor"-material.

The table below shows where the species occur:

	Mediterranean	Atlantic
Hyperoche Kröyeri	—	×
— picta	×	(×)*
— mediterranea	×	..
Euiulopis Loveni	×	S*
Hyperia medusarum	—	×
— galba	(×)	×
— Fabrei	(?)	n*
— Luzoni	×	×
— schizogeneios	×	×
— crucipes	..	n
— macrodactyla n. sp.	n	..
— thoracica	..	n
— hydrocephala	×	n
Hyperioides longipes	×	×
Themisto gracilipes	×	×
— abyssorum	..	×
— compressa	?	×
Phronimopsis spinifera	×	×

* (×) = the species is known from the "Thor"-area, but not taken by the "Thor"-Exped.
S = the species is known from the Atlantic but only S. of the "Thor"-area.
n = new to the area in question.

From this it appears that all the species formerly found in the Mediterranean, excepting only *Hyperia galba* (*H. Fabrei* is doubtful) were also taken by the "Thor", and one species, *Hyperia macrodactyla*, is new to science.

All the 15 species known from the Atlantic area of the "Thor" (*Euiulopis Loveni* is only known from southern waters) with the exception of *Hyperoche picta* (of which hardly more than a single specimen is known from the

Atlantic) were found again by the "Thor", and 4 are new to the area viz. *Hyperia Fabrei*, *H. crucipes*, *H. thoracica* and *H. hydrocephala*, the four last-named species having previously only been found further south.

1. Genus **Hyperoche** Bovall.

Hyperoche K. Stephensen 1923, p. 13 (lit.).

1. HYPEROCHE MEDUSARUM Kr.

Hyperoche medusarum K. Stephensen 1923, p. 13 (lit.).

Atlantic.

St. 1. 94 m. 28-11-1908. 25 m.w. 2^{50} am., 30 min. 1 ♀ jun. 4 mm, 1 spec. jun. 2 mm. — **St. 76.** 1800 m. 10-3-1909. 25 m.w. 7^{15} pm., 30 min. 2 ♀ with ova 6 mm. — **St. 76.** ibid. 65 m.w. 6^{05} pm., 60 min. 1 ♀ with ova 5 mm. — **St. 247.** 100 m. 19-9-1910. 8^{40} pm. (P. 100), surf., 10 min. 3 ♂ ad., 6 mm.

Distribution. A boreo-arctic species (see K. STEPHENSEN 1923, p. 13, with chart). Very rarely encountered at depths greater than 1000 fath. (TATTERSALL 1906), and it seems to keep quite close to the surface, at the utmost 250 m. down (TESCH 1911). Otherwise its biology is practically unknown.

2. HYPEROCHE MEDITERRANEA Senna (Fig. 33).

**Hyperoche mediterranea* Senna 1906, p. 159, figs. 1—10, Pl. 1 figs. 1—2 (cold. figs.) — **H. m.* Steuer 1911, p. 5, Pl. 11.

Mediterranean.

St. 116. (W. of Baleares). 29-6-1910. Surf. (P. 100), 4^{15} pm., 10 min. 4 spec. jun., 1.5—2 mm. — **St. 223.** (S. of Almeria). 5-9-1910. Surf. (P. 100), 4^{40} am., 10 min. 1 ♂ (jun.?) 4 mm. — **St. 227.** (N. by W of Gibraltar). 6-9-1910. Surf. (P. 100). 5^{40} pm., 10 min., 1 spec. juv., 2 mm.

As far as can be seen, the small specimens coincide very well with the descriptions of small specimens given by SENNA and STEUER.

The size of the large specimen lies between the mature specimens (7 mm, SENNA) and the young ones delineated by SENNA and STEUER (2.5 and 2.7 mm respectively); consequently, and also in several other respects, it occupies an intermediate position. The antennæ are as long as in the adult form. The distal end of 3. free (properly speaking 4.) joint in p. 2 is like that of specimens of 2.5—2.7 mm, but not like that of the adult. In p. 3—p. 4 in particular 4.—5. free joints are somewhat shorter than on the adults, but longer than on the small specimens. In p. 5—p. 7 the dactylus is longer than shown by SENNA and STEUER, both as far as the adult animals and the young stages are concerned, and 3.—4. free joint slightly heavier than in the adult animals of 7 mm. Pleopoda have 10 joints in the inner ramus, in the outer ramus 9 joints.

As there is no fig. of the urosome, I have drawn it here. Uropoda do not quite agree with SENNA's description. In up. 1 the inner ramus is of the same length as

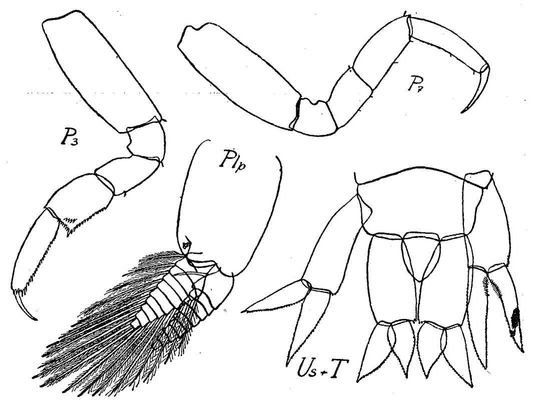

Fig. 33. *Hyperoche mediterranea* ♂ (ad.?).

the peduncle and slightly longer than outer ramus; the median margin of the two rami has a concave section in the proximal part, exactly as in certain species of *Hyperia* and in *Hyperioides*. Up. 2 reaches with its apex the apex of up. 3; the inner ramus is about three fourths the length of the very broad peduncle, and the outer ramus is a little shorter (about two thirds as long). In up. 3 the inner ramus is about two thirds the length of the very broad peduncle and the outer ramus a little longer. On the 3 pairs of uropoda the peduncle is totally smooth along the edge, with the exception of some small teeth at the distal part of the outer margin of up. 1, and on the distal part of the inner margin of up. 2—3. All the rami are serrated; the proximal half of the outer ramus in up. 1, however, and the total outer margin of the outer rami in up. 2—3 is quite smooth. The telson is elliptical, about half the length of the peduncle of up. 3.

The depths vary between 99—2860 m. All the specimen were taken at the surface.

Distribution. The "Thor"-specimens were taken in the western region of the Mediterranean. — Messina (SENNA l. c.) — Rovigno, 1 spec. in *Beroë Forskåli* (STEUER l. c.).

3. HYPEROCHE PICTA Bovallius.

Hyperoche picta Bovallius 1889, p. 111, Pl. 7 figs. 32—35. — *H. p.* Senna, 1906, p. 168, textfigs. 11—20.

Mediterranean.

St. 730. > 1000 m. 38°26′ N, 13°37′ E. (N. of Sicilia). 16-4-1913. 2^{00} pm. 1 ♂ ad. 4 mm.

Distribution. Mediterranean: Messina, April—June 1903 and March 1904, several spec. (Senna l. c.). Atlantic. 20° N, 39° W (Bovallius l. c.).

2. Genus Euiulopis Bovall.

Iulopis Bovallius, Syst. list 1887, p. 17. — **Euiulopis* Bovallius 1889, p. 116 (key to the species).

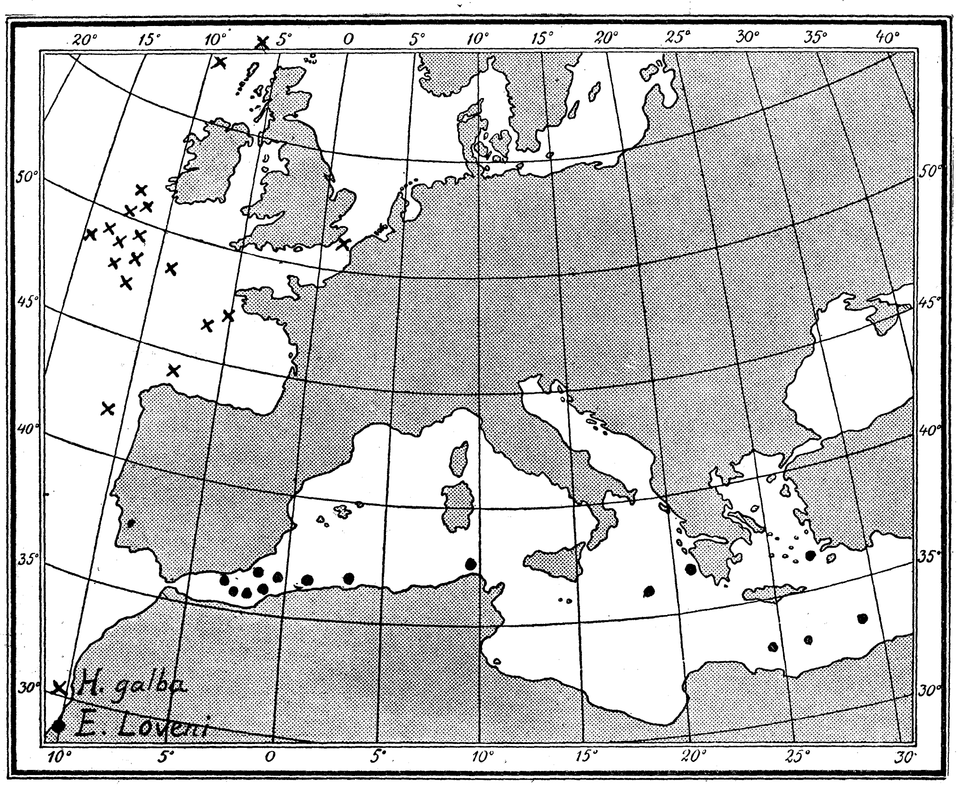

Chart 11. × *Hyperia galba*, ● *Euiulopis Loveni*. S.W. of Ireland the stations for *H. galba* lie so close to each other that it was impossible to note them all. St. 265—67 and 270 lie outside the chart to the West.

1. EUIULOPIS LOVENI Bovallius (Chart 11, partim).

Iulopis Loveni Bovallius l. c. 1887, p. 17. — **Euiulopis L.* Bovallius 1889, p. 118, Pl. 8 figs. 1—8. — *E. L.* Senna 1906, p. 173, Pl. 1 figs. 1—3 (cold. fig.).

Mediterranean.

St. 47. 10-2-1909. 65 m.w., 10^{20} pm., 30 min. 1 ♂, 5 mm. — **St. 47.** ibid. 300 m.w., 1^{05} pm., 30 min. 4 ♂, 4—5 mm. — **St. 106.** 25-6-1910. 300 m.w., 1^{45} am., 30 min. 1 ♂ 5 mm, 2 ♀ 4—5 mm. — **St. 107.** 25-6-1910. Surface (P. 100), 7^{40} am. 10 min. 2 spec. juv. 2 mm. — **St. 107.** ibid. 65 m.w., 9^{50} am. 15 min. 1 ♂ juv. 4 mm, 7 ♀ 4—5 mm (2 of them with ova 5 mm). — **St. 108.** 25-6-1910. 25 m.w., 11^{55} pm., 15 min. 1 ♀(?) 3 mm. — **St. 108.** ibid. 65 m.w. 11^{15} pm. 30 min. 1 ♂ juv. 3.5 mm, 1 sp. juv. 2 mm. — **St. 112.** 27-6-1910. Surface (P. 100), 0^{20} am., 10 min. 1 sp. juv. 2 mm. — **St. 112.** ibid. 25 m.w., 1^{30} am., 15 min. 1 ♂ juv. 3.5 mm. — **St. 112.** ibid. 65 m.w., 1^{05} am., 15 min. 1 ♂ 5 mm., 1 ♀ 5 mm, 1 sp. juv. 2 mm. — **St. 112.** ibid. 300 m.w., 0^{15} am., 30 min. 1 ♀ juv. — **St. 161.** 2-8-1910. Surface (P. 100), 3^{10} am., 10 min. 1 ♂ 5 mm. — **St. 161.** ibid. 25 m.w., 3^{00} am., 30 min. 1 ♀ 4 mm. — **St. 221.** 4-9-1910, (P. 100) Surface, 6^{40} pm., 10 min. 1 ♀ 4 mm. — **St. 224.** 5-9-1910. Surface (P. 100), 7^{25} pm., 10 min. 1 ♀ 3 mm, 1 ♂ juv. — **St. 225.** 6-9-1910. Surface (P. 100), 3^{35} am., 10 min. 1 ♂ juv. 3 mm. — **St. 276.** 36°30′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200), 11^{20} pm., 35 min. 5 ♂ (2 spec. juv. 4 mm, 3 spec. adult 4—5 mm), 12 ♀ (2 spec. 3 mm, 10 spec. 4—5 mm incl. 2 (1 ?) with embryos 5 mm). — **St. 277.** 33°20′ N, 27°30′ E. 6-4-1911. 132 m.w. (S. 200). 11^{00} pm., 35 min. 2 ♂ juv. 4 mm, 2 ♂ adult 4—5 mm, 7 ♀ 3—4 mm. — **St. 297.** 33°10′N, 25°35′ E. 25-6-1911. 28 m.w. (S. 200), 11^{30} pm., 30 min. 2 ♀ 3—4 mm. — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200). 11^{30} pm., 30 min. 3 ♀ 4 mm. — **St. 384.** 32°50′ N, 27°10′ E. 7-7-1911. 122 m.w. (S. 150), 8^{30} pm. 30 min. 1 ♀ 3 mm. — **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5^{00} am. 11 ♂ (2 jun. 3—4 mm, 9 adult 4—5 mm), 11 ♀ (2 spec. 3 mm, 9 spec. 4—5 mm; 3 of them with ova 4 mm).

Mediterranean.

Material and occurrence. All the specimens from the "Thor"-Expedition were taken in the Mediterranean. There are 89 specimens (33 ♂, 51 ♀, 5 spec. juv.) from 15 stations, 22 hauls. The depths of the sea are as a rule 1000—> 3000 m. It occurs fairly evenly distributed in the two basins, but generally keeps to the south side (see Chart 11).

Vertical occurrence. The species keeps near the surface; on an average 10—65 m. w.; no specimens were taken with a greater length of line than 300 m. w., and only a few were taken in each haul.

Propagation. ♂ and ♀ seem to be the same size viz. 5 mm. ♀ with ova or embryos were found in Feb., April and June, i. e. during both winter and summer.

Distribution. Mediterranean: 36°20′ N, 4°30′ W (Bovallius 1889). — Messina (Senna 1906). — Atlantic: 17°22′ N, 37°23′ W (Bovallius 1889).

3. Genus Hyperia Latr.

Hyperia K. Stephensen 1923, p. 15.

1. HYPERIA MEDUSARUM O. Fr. Müll.

Hyperia medusarum K. Stephensen 1923, p. 15 (lit. and syn.).

Atlantic.

St. 71. 1985 m. 57°47′ N, 11°33′ W. 7-6-1905. 1500 m.w. 10^{00} am., 60 min. 1 ♀ with ova and embryos, 11 mm. — **St. 178.** 4000 m. 48°04′ N, 12°40′ W. 2-9-1906. 1800 m.w. 9^{05} am., 120 min. 1 ♂ juv. 13 mm.

In my list of synonyms l. c. 1923 I have included *H. hystrix* Bovall., which as far as I have been able to see has not been found since it was established.

In the Hyperine-Magazine of the Copenhagen Zoological Museum I have found 2 (undetermined) specimens from the Japanese Sea (39° N, 133° E, Capt. Andréa 1869), and on comparing these with the Monograph of Bovallius and his locality I have determined them as belonging to his type-specimens of *H. hystrix* (his other type-specimens are said to belong to the Stockholm Museum and have been taken south west of Kamchatka 46° N, 165° E). The two specimens are males, 13(?)—16 mm; the large one is fairly complete, whereas the small specimen, besides the urus lacks all the left-hand pereiopoda, and on comparing them with the figures of Bovallius there is hardly any doubt that the limbs delineated by him were dissected from this very specimen, as p. 1—p. 2 coincide entirely with his statement to the effect that as contrasted with the very closely related *H. medusarum* "dactylus is long, protruding from the bristles" on metacarpus. The difference between the two "species", however, (according to the material of the Zoological Museum, including the types of *H. hystrix*) is not so much due to the fact that the dactylus is particularly long in *H. hystrix*, but to the bristles on metacarpus being considerably longer on *H. medusarum*, so that the dactylus is nearly hidden, whereas it protrudes very much on *H. hystrix*. If Bovallius had examined the large specimen he would have seen that as regards p. 1 (p. 2 is as in the small specimen) this specimen occupies an intermediate position between the two "species".

Both the "Thor"-specimens belong to the form *H. hystrix*, the male, however, not so typical as the female.

Biology. Extremely little is known (see Tesch 1911, p. 179).

Vertical occurrence. The depth below surface at which the species occurs seems to vary between very wide limits; the greater part of the specimens from the British Isles, however, were taken with 200—1800 m. w. (Tattersall and the "Thor"), at the surface it evidently occurs very rarely.

Distribution. Northern Atlantic and Pacific (see my paper l. c. 1923, p. 15, with chart); see also above.

2. HYPERIA GALBA Mont. (Chart 11, p. 80).

Hyperia galba K. Stephensen 1923, p. 17 (lit.).

This species is possibly synonymous with *Hyperia spinigera* Bovallius 1889, p. 191, Pl. 10 figs. 33—39. — *H. s.* Vosseler, 1901, p. 58. — *H. galba* (partim) Norman 1900, p. 128. — *H. spinigera* Tattersall 1906, p. 22 (with remarks on literature). — ?*H. Gaudichaudii* Milne-Edwards (teste Walker 1904, p. 235).

Atlantic.

St. 81. 51°32′ N, 12°03′ W. 14-6-1905. 200 m.w. (Y. 330), 2^{20} am., 120 min. 2 ♀ 13—18 mm. — **St. 82.** 51°00′ N, 11°43′ W. 15-6-1905. 800 m.w. (Y. 330). 3^{45} pm. 120 min. 1 ♀ 6 mm. — **St. 82.** ibid. 1200 m.w. 0^{45} pm., 120 min. 1 ♀ 8 mm. — **St. 88.** 48°09′ N, 8°30′ W. 20-6-1905. 300 m.w., 8^{45} pm., 120 min. 9 spec.: 1 ♂ jun. 9 mm, 1 ♀ with ova 19 mm, 2 ♀ with ova 13 mm, 5 ♀ 7—9 mm. — **St. 92.** 48°53′ N, 12°21′ W. 24-6-1905. 500 m.w. (Y. 330), 7^{30} am., 60 min. 5 spec.: 3 (1?) ♀ with ova 17 mm, 2 ♀ 13—14 mm. — **St. 167.** 57°46′ N, 9°55′ W. 1-9-1905. 65 m.w. 4 spec.: 2 ♀ 17 mm, 2 ♂ 15 mm. — **St. 167.** ibid. 100 m.w. 20 spec.: 5 ♂ 15 mm, 2 ♂ 11 mm, 13 ♀ (1 à 24 mm, 1 à 16 mm, 4 à 15 mm, 2 à 11 mm, 2 à 9 mm; 3 with ova 17 mm). — **St. 167.** ibid. 1500 mw. 4 spec.: 1 ♂ 13 mm, 1 ♂ jun. 8 mm, 1 ♀ 14 mm, 1 ♀ 10 mm. — **St. 168.** 58°42′ N, 6°13′ W. 2-9-1905. 65 m.w. 1 ♂ juv. 9 mm. — **St. 52.** 48°42′ N, 12°20′ W. 21-5-1906. 300 m.w. (Y. 330). 6^{10} am., 120 min. 2 spec.: 1 ♂ jun. 9 mm, 1 ♀ 9 mm. — **St. 62.** 50°25′ N, 12°44′ W. 5-6-1906. 1500 m.w. (Y. 330). 2^{45} am., 120 min. 6 spec.: 1 ♂ 11 mm, 5 ♀ 6—10 mm. — **St. 65.** 49°04′ N, 14°52′ W, 6-6-1906. 300 m.w. (Y. 330). 7^{00} am. 120 min. 1 ♂ 11 mm. — **St. 74.** 49°23′ N, 12°13′ W. 10-6-1906. 200 m.w. (Y. 330). 3^{10} am., 120 min. 5 ♀ 10—13 mm. — **St. 74.** ibid. 2000 m.w. (Y. 330). 11^{35} am., 60 min., 6 spec.: 1 ♂ 11 mm, 3 ♂ jun. (10, 8, 8 mm), 2 ♂ 8—10 mm. — **St. 76.** 49°27′ N, 13°33′ W. 12-6-1906. 100 m.w. (Y. 330). 0^{20} am. 120 min. 3 spec.: 1 ♂ jun. 11 mm., 2 ♀ 10—14 mm. — **St. 76.** ibid. 200 m.w. (Y. 330). 2^{40} am., 120 min. 10 spec.: 1 ♂ 12 mm, 2 ♂ jun. 9—11 mm, 7 ♀ 11—14 mm. — **St. 76.** ibid. 800 m.w. (Y. 200) 6^{15} pm. 120 min. 1 ♀ 13 mm. — **St. 76.** ibid. 2800 m.w. (D. 2). 3^{00} pm., 120 min. 9 spec.: 1 ♂ 10 mm, 4 ♂ jun. 6—8 mm, 4 ♀ 6—10 mm. — **St. 167.** 51°28′ N, 11°50′ W. 26-8-1906. 200 m.w. (Y. 330), 10^{30} am., 120 min. 3 spec. jun. 4—7 mm. — **St. 167.** ibid. 300 m.w. (Y. 200). 8^{00} am., 120 min. 2 spec.: 1 ♂ 13 mm, 1 ♀ 17 mm. — **St. 175.** 51°11′ N, 11°41′ W. 30-8-1906. 1050 m.w. (Y. 330). 7^{00} pm., 60 min. 45 spec.: 10 ♂ 13—14 mm, 1 ♂ jun. 11 mm, 1 ♀ with embryos 17 mm, 4 ♀ with ova 14—17 mm, 28 ♀ 12—18 mm, 1 ♀ 9 mm. — **St. 176.** 49°31′ N, 11°51′ W. 31-8-1906. 300 m.w. (Y. 330), 9^{30} pm., 120 min. 70 spec.: 6 ♂ 12—13 mm, 1 ♂ jun. 11 mm, 8 ♀ with embryos 12—16 mm, 37 ♀ with ova 12—17 mm, 4 ♀ without ova 11—12 mm, 14 ♀ 13—18 mm. — **St. 178.** 48°04′ N, 12°40′ W. 2-9-1906. 1000 m.w. (Y. 330), 7^{05} am., 60 min. 1 ♀ 6 mm. — **St. 178.** ibid. 1800 m.w. (Y. 330). 9^{05} am., 120 min. Abt. 700 spec.: 4 ♂ 12—13 mm, 4 ♂ jun. 12 mm, 1 ♂ jun. 11 mm, 6 ♂ jun. 10 mm, 18 ♂ jun. 7.5—9 mm. — 5 ♀ with ova 11—12 mm, 5 ♀ with ova 14 mm, 63 ♀ without ova (1: 17 mm, 3: 16 mm, 2: 15 mm, 8: 14 mm, 6: 13 mm, 1: 12 mm, 42: 7—11 mm). ca. 600 spec. jun. 4—8 mm. — **St. 179.** 47°20′ N, 13°20′ W. 3-9-1906. 1800 m.w. (Y. 330). 3^{40} am., 120 min. abt. 250 spec.: 3 ♂

12—13 mm, 2 ♂ jun. 11 mm, 2 ♂ jun. 10 mm, 2 ♂ jun. 9 mm, 6 ♂ jun. 8 mm, 5 ♂ jun. 7 mm, 21 ♂ jun. 5—6 mm, 3 ♂ jun. 4 mm. — 2 ♀ with ova or embryos 14 mm, 6 do. 13 mm, 2 do. 12 mm, 2 do. 11 mm. 1 ♀ without ova 17 mm, 3 ♀ 14 mm, 4 ♀ 13 mm, 4 ♀ 12 mm, 3 ♀ 10 mm, 4 ♀ 9 mm, 4 ♀ 8 mm, 12 ♀ 7 mm, 12 ♀ 6 mm, 2 ♀ 4.5—5 mm. 160 spec. juv. 3.5—7 mm. — **St. 180.** 48°19′ N, 13°53′ W. 3-9-1906. 1800 m.w. (Y. 330). 5^{05} pm. 60 min. abt. 360 spec.: 1 ♂ 11 mm, 1 ♂ jun. 12 mm, 2 ♂ jun. 11 mm, 5 ♂ jun. 10 mm, 2 ♂ jun. 9 mm, 17 ♂ jun. 7—8 mm. — 2 ♀ with ova 16 mm, 1 do. 14 mm, 3 do. 13 mm, 2 do. (1 with embryos) 12 mm, 2 do. 11 mm, 3 do. 10 mm. — 1 ♀ without ova 17 mm, 3 ♀ 15 mm, 1 ♀ 14 mm, 7 ♀ 13 mm, 4 ♀ 11—12 mm, 1 ♀ 10 mm, 5 ♀ 9 mm, 4 ♀ 8 mm. — abt. 300 spec. jun. 4—7 mm. — **St. 181.** 49°22′ N, 12°52′ W. 4-9-1906. 1800 m.w. (Y. 330). 10^{35} am. 60 min. Abt. 350 spec.: 4 ♂: 14,12,11,10 mm, 8 ♂ jun. 7—9 mm; 1 ♀ with ova 17 mm, 1 do. 16 mm, 3 do. 15 mm, 3 do. 14 mm, 3 do. 13 mm, 1 do. 12 mm, 1 do. 11 mm, 3 ♀ with embryos 13—15 mm; 1 ♀ without ova or embryos 20 mm, 1 ♀ 17 mm, 2 ♀ 15 mm, 1 ♀ 14 mm, 1 ♀ 13 mm, 3 ♀ 12 mm, 7 ♀ 10—11 mm, 5 ♀ 8—9 mm; abt. 300 spec. jun. 3.5—7 mm. — **St. 3.** 30-11-1908. 65 m.w. (Y. 200). 1^{15} pm., 30 min. 1 juv. 3 mm. — **St. 75.** 9-3-1909. 25 m.w. (Y. 200). 10^{15} pm., 30 min. 5 spec.: 1 ♀ with embryos 21 mm, 1 ♀ 16 mm, 1 ♀ with ova 14 mm, 2 ♂ jun. 8 mm. — **St. 75.** ibid. 300 m.w. (Y. 200). 7^{45} pm., 60 min. 2 spec.: 1 ♀ 20 mm, 1 ♂ juv. 13 mm. — **St. 75.** ibid. 600 m.w. 6^{30} pm., 60 min. 1 ♀ 14 mm. — **St. 76.** 10-8-1909. 65 m.w. 6^{05} pm., 60 min. 2 ♀ with ova 17—18 min. — **St. 76.** ibid. 1600 m.w. 2^{40} pm., 60 min. 1 ♀ 13 mm. — **St. 249.** 21-9-1910. Surf. (P. 100). 11^{55} pm., 10 min. 17 spec.: 8 ♂ 10—11 mm, 5 ♂ 8—9 mm, 2 ♂ jun. 5 mm, 2 ♂ juv. 4 mm. — **St. 265.** 39°22′ N, 22°49′ W. 20-3 1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 4 spec.: 1 ♀ 16 mm, 3 ♂ jun. 6—7 mm. — **St. 266.** 40°47′ N. 21°10′ W. 21-3-1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 17 spec.: 2 ♂ 12 mm, 1 ♂ 11 mm, 4 ♂ jun. 7—11 mm; 1 ♀ 14 mm, 4 ♀ 10 mm, 3 ♀ 7—8 mm, 2 spec. jun. (♀?). 4—5 mm. — **St. 266.** ibid. 47 m.w. (S. 100), 7^{00} pm., 30 min. 1 spec. jun. 5 mm. — **St. 267.** 42°37′ N, 18°06′ W. 22-3-1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 8 spec.: 2 ♂ 14—15 mm, 5 ♀ 12—15 mm, 1 spec. jun. 5 mm. — **St. 269.** 46°44′ N. 11°20′ W. 24-3-1911. 25 m.w. (S. 150). 7^{30} pm., 30 min. 13 spec.: 1 ♂ 15 mm, 2 ♂ jun. 9—12 mm; 1 ♀ with ova 17 mm, 1 ♀ 19 mm, 1 ♀ 17 mm, 2 ♀ 15 mm, 1 ♀ 13 mm, 3 ♀ 10 mm, 1 (♀?) jun. 5 mm. — **St. 270.** 47°01′ N, 19°03′ W. 13-2-1911. 116 m.w. (S. 150), 10^{05} pm., 33 min. 2 ♀ 11—20 mm.

All ♂ are full-grown when not designated as juv.

As regards the synonymy I follow G. O. Sars (1895) as also done by Tattersall (1906) (Walker [l. c.] is inclined also to include *H. Gaudichaudii*).

On the other hand, I have my doubts as to *H. spinigera* Bovall. (for previous writers see Tattersall 1906); but I may say at once that in the collections of the "Thor" there is not a single specimen which can be ascribed to *H. spinigera*.

Bovallius states (Monograph) that he has borrowed specimens of *H. spinigera* from the Copenhagen Museum among others. We have no specimens determined with this name, whereas there are six tubes with "*Hyperia spinosa*", determined by Bovallius. As there is no species of this name in extant literature, and as the specimens, at any rate as far as the most important character is concerned, fit in with the description of *H. spinigera*, there can be no doubt that we have here the types of Bovallius, or at any rate specimens of the species dealt with. That the name does not correspond in this context signifies nothing, as Bovallius has not carried through the labelling of the material borrowed from Copenhagen. This material has the following localities: North side of Iceland, Borch ded. 1859, 1 ♂ 17 mm; 61° N, 20° W, Olrik ded. 1867, 1 ♂ 19 mm; 57°25′ N, 47°12′ W, Olrik ded. 1867, 2 ♂ 18—19 mm; 42° N, 49° W, Andréa ded. 1862, 1 ♂ 19 mm (?, defective), 2 ♂ 17—18 mm; 18° S, 2° W, Andréa ded. 1864, 1 ♂ 18 mm; 33°20′ S, 33° 0′ E, Andréa ded. 1869, 1 ♂ 16 mm.

As regards p. 1—p. 2, Bovallius' specimens fit in well on the whole with his description; but in all specimens the 3. epimeral plate occupies an intermediate position between *H. galba* and *H. spinigera*. Tattersall says (l. c.) of 3. epimeral plate: "in *H. galba* the postero-lateral angles of these epimera are sharply pointed, while in *H. spinigera* they are rounded". If "they" only refers to the points themselves, not to the whole of the epimeral plate, the description of Tattersall agrees very well with the majority of Bovallius' specimens.

As, apart from the characters emphazised the agreement with *H. galba* is very marked, I am, as long as there is no more material at our disposal, inclined to follow the supposition of Norman that *H. spinigera* was established from old specimens of *H. galba*, for in the specimens mentioned in the literature the size, when indicated at all, is very considerable: 12—22 mm (Bovallius, Monograph), 16—19.5 mm (Bovallius' spec. in the Copenhagen Zool. Mus.), 18.5 mm (Vosseler). Curiously enough, all the specimens known seem to be ♂, with the exception of the ♀ mentioned by Norman from Birturbuy Bay and Valentia. —

The material is extremely large, comprising about 2000 specimens (202 ♂, 413 ♀, about 1350 spec. juv.), distributed among 27 stations, 40 hauls. Unfortunately, nearly the whole of the material dates from 1905—06, for which reason it cannot be used for quantitative investigations, as possibly parts of the collections from these years have not been preserved.

Occurrence (see Chart 11, p. 80). Nearly all of the specimens have been taken round the British Isles, in particular off S.W. Ireland.

The depths of the sea are on an average very great, 1000—6020 m, but a few specimens have been taken at lower depths (110—130 m). That the "Thor" took it at depths much greater than usual, must presumably be due to the fact that the "Thor", particularly in these waters, carried on its investigations at depths exceeding 500—1000 m.

Vertical occurrence. The majority of specimens were taken with a great length of wire, 300—2000 m.w. and a few of the deep water hauls yielded very large quantities indeed (shoals): St. 178 (1906), 1800 m. w.: 700 spec.; St. 179 (1906), 1800 m. w.: 250 spec.; St. 180 (1906), 1800 m. w., 360 spec.; St. 181 (1906), 1800 m.w. 350 spec.

Propagation &c. The material contains nearly twice as many ♀ (413) as ♂ (202), but a still greater number of specimens too young for sex determination. ♂ are on an average 11—12 (14) mm long; ♀ considerably larger, 12—20 mm, a single specimen of even 24 mm (St. 167, 1905). ♀ with ova are as a rule (11)12—17(19, 21) mm long. ♀ with ova or embryos have been found in March and June, but particularly in Aug.—Sept. and young specimens, too small for sex determination (< about 7 mm) during the same months, but more particularly in September, which thus shows that the spawning takes place chiefly during the summer and early autumn. As the ♀ with ova are not always the largest individuals in each haul, it seems that they do not die as soon as the young ones have left the marsupium of the mother. The sizes are larger than those given by Sars: ♂ 12 mm, ♀ 14 mm; a single specimen even as large as indicated in the case of Arctic individuals (24 mm).

All the "Thor" specimens seem to have been taken freely; as for the Medusæ in which the species may live see Tattersall, 1906, and Tesch 1911, p. 178.

Distribution.

1. Mediterranean. Bovallius (l. c. p. 164, *H. Latreillei*) states that it was taken in the Mediterranean, but without indicating the locality.

2. Atlantic (*H. galba*). The whole of the Arctic and northern part of the Atlantic, especially in the eastern region, and within the latter it is most frequently found off the British coasts, where it must be said to belong to the Plankton character forms. Towards the north it has not been found at such great depths as south and west of Ireland. South of this area, it is, as far as I can see, only noted from the Azores (Chevreux, 1900) and Madeira (Stewart 1913, p. 255). For a complete list of localities in Northern Atlantic see my paper l. c. 1923, p. 17, with chart.

H. spinigera is found in the following places, the specimens determined by Bovallius being mentioned above with their localities (p. 82). Bovallius specifies the distribution in the following manner: "The Arctic Region: Spitzbergen, off the Northern coast of Norway. The Northern temperate region: off the South coast of England." None of the above-mentioned specimens, determined by himself, are thus included in his own list of localities. — Birturbuy Bay and Valentia Harbour (Norman 1900). W. Ireland (Tattersall 1906). The Labrador Current 50° N, 48.1° W, surf., 1 ♂ 18.5 mm. (Vosseler 1901).

3. Indian Ocean. Close to the east of the south point of Africa; *H. spinigera* (see above); Galle (Gulf of Manaar, Ceylon; Walker 1904, p. 235 [*H. galba*]).

4. Northern Pacific at Puget Sound (*H. galba*) (Calman, *teste* Tattersall (1906)).

3. HYPERIA FABREI M.-Edw.

Lestrigonus Fabrei Milne-Edwards, Ann. Sci. Nat., vol. 20, 1830, p. 392. — **Hyperia Fabrei* Bovallius 1889, p. 206 (lit.), Pl. 10 figs. 40—53. — **H. F.* Vosseler 1901, p. 58, Pl. 5 figs. 5—15. — *H. Vosseleri* Stebbing 1904, p. 33—34.

Atlantic.

St. 376. 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w., (S. 200). 8^{15} am. 1 ♀ 3 mm. — **St. 377.** 31°23′ N, 18°08′ W. 24-7-1911. 15 m.w. (S. 200). 8^{05} pm. 1 ♀ 3 mm.

I cannot see that Stebbing is right in distinguishing the species of the later authors from the one determined by Milne-Edwards, only because of the difference in size (M.-Edw.: "long d'environ cinq lignes" = 10.5 mm, other authors: 3—6 mm).

Distribution. [Mediterranean. Is probably not known from this area, at all events not taken by the "Thor". Lo Bianco (1903—04, p. 238) gives it from Capri, but in his list of stations (l. c. p. 127, St. 17) it is marked with ?, and the same applies to Vosseler in his more detailed table (ibid. p. 278).]

1. Atlantic. Bovallius gives (Monograph) the distribution as tropical regions of Atlantic: Barbados, Caribbean Sea.

Vosseler (1901) mentions 71 spec. from 41 stations: Florida Current 4 st. 41.6° N, 56.3° W to 37.1° N, 59.9° W, 0—200 or 0 m. Sargasso Sea 6 st. 34.7° N, 62.4° W to 25.6° N, 34.9° W, and 27.8° N, 33° W; 0—200 (0—400) m. N. Equatorial Current 11 st. 28.3° N, 34.3° W, to 10.2° N, 22.2° W; 18.5° N, 38.1° W, and 20.4° N, 37.8° W; 0—200 m (or 0, 0—400, 0—1000 m). Guinea Current 3 st. 5.9° N, 20.3° W, to 2.9° N, 18.4° W, 0—400 m. S. Equatorial Current 17 st. 1.7° N, 17.3° W, to 5.1° S, 14.2° W; 6.8° S, 14.2° W; 7.5° S, 20.3° W, to 2.4° S, 36.4° W; 0—200 (or 0, 0—400) m.

The species is new to the "Thor"-area.

2. Indian Ocean. Without special locality (MILNE-EDWARDS).

4. HYPERIA LUZONI Stebb. (Fig. 34, chart 12).

**Hyperia Luzoni* Stebbing, 1888, p. 1382, Pl. 166 fig. A, and "young?", p. 1384 (teste STEBBING 1904, p. 33). — *H. L.* Bovallius 1889, p. 212. — **H. L.* Vosseler 1901, p. 64, Pl. 5 figs. 16—28. — *H. L.* Lo Bianco 1902, p. 424, 446. — *H. L.* Stebbing 1904, p. 33. — *H. L.* Vosseler, in Lo Bianco 1903, p. 278.

The "Thor" material contains far more ♂ than ♀, *viz.* 82 ♂ (81 ad., 1 juv.) against only 8 ♀. The adult ♂ is only described by VOSSELER;* but his description (l. c.) is so brief that I consider it necessary to supplement it with figures and descriptions of new important characters.

♂ adult. Length 3 mm (fig. 34). Considerably slenderer than ♀; there is a similar sexual difference, albeit not quite so marked, to that found in *H. schizogeneios*, the females of the latter species being considerably thicker, particularly in the head, than *H. Luzoni*.

The cephalon is nearly the same length as 1.—4. mesosome segments together, and about $^4/_3$ or $^3/_2$ as deep as the latter. There are no processes on the underside as in *H. schizogeneios*. 1.—2. mesosome-segments are, as far as one can see, entirely fused, except at the lower part of the lateral side, where there is a seam. 1.—4. mesosome segments are more or less of the same length; the following ones increase in length, so that 7. segment is nearly double the length of 4. segment. The metasome segments are about double the length of the posterior mesosome segment. The outline of the epimeral parts of the metasome segments (which are here shown, these parts being dissected separately) deviate slightly from the form of ♀ (VOSSELER l. c., fig. 16) and the young ♂

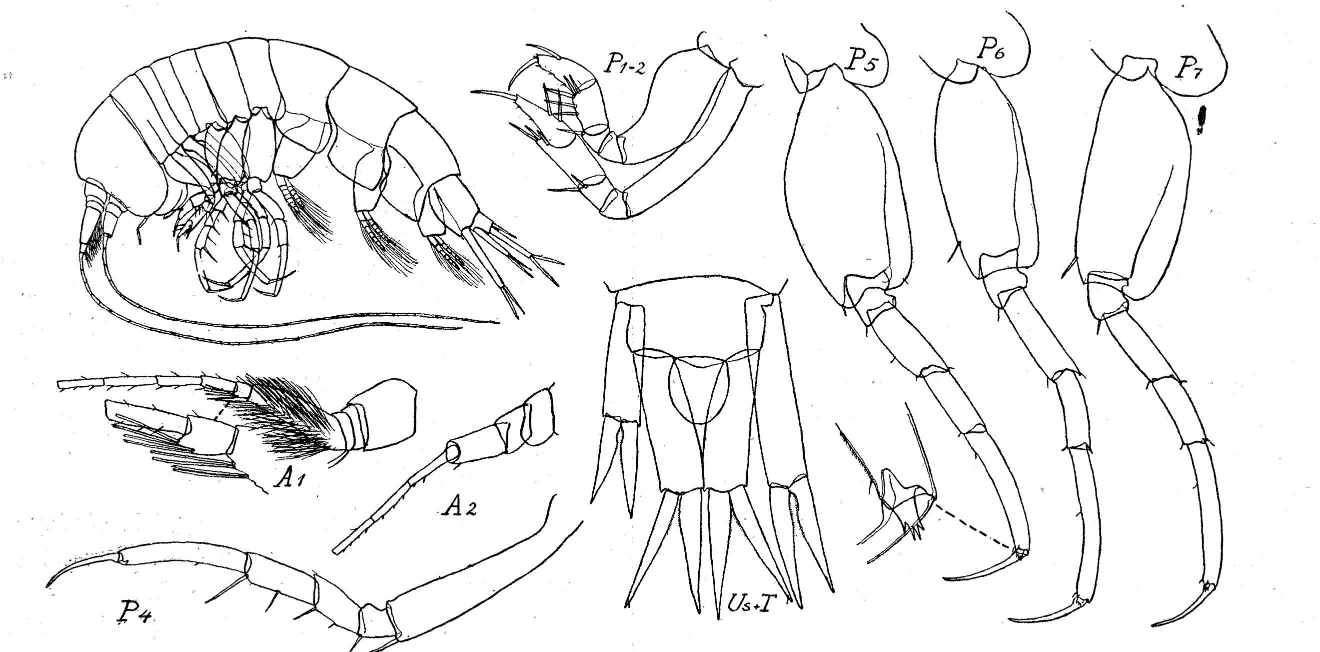

Fig. 34. *Hyperia Luzoni*, ♂.

Mediterranean.

St. 116. 30-6-1910. Surf. (P. 100), 1^{50} am., 10 min. 1 ♂ 2.5 mm. — **St. 129.** 12-7-1910. Surf. (P. 100), 3^{10} am., 10 min. 30 ♂ 2.5—3 mm. — **St. 132.** 14-7-1910. Surf. (P. 100), 1^{10} am., 10 min. 2 ♀ 1.5—2 mm. — **St. 144.** 24-7-1910. Surf. (P. 100), 2^{10} am. 10 min. 1 ♂ 3 mm. — **St. 145.** 25-7-1910. Surf. (P. 100), 3^{40} am., 10 min. 2 ♂ 3 mm. — **St. 154.** 29-7-1910. Surf. (P. 100), 3^{40} am., 10 min. 4 ♂ 3 mm. — **St. 156.** 30-7-1910. Surf. (P. 100), 2^{25} am., 10 min. 4 ♂ 3 mm. — **St. 160.** 1-8-1910. Surf. (P. 100), 2^{10} am., 10 min. 3 ♂ 3 mm. — **St. 161.** 2-8-1910. Surf. (P. 100), 3^{10} am., 10 min. 3 ♂ 3 mm. — **St. 163.** 5-8-1910. Surf. (P. 100), 0^{15} am., 10 min. 2 ♀ 2 mm. — **St. 187.** 18-8-1910. Surf. (P. 100), 7^{50} pm., 10 min. 1 ♀ 2.5 mm. — **St. 194.** 21-8-1910. Surf. (P. 100), 4^{35} am., 10 min. 7 ♂ 3 mm. — **St. 200.** 26-8-1910. Surf. (P. 100), 3^{50} am., 10 min. 9 ♂ 3 mm. — **St. 204.** 27-8-1910. Surf. (P. 100), 4^{35} am., 10 min. 12 ♂ 3 mm, 1 ♀ 2 mm. — **St. 222.** 4-9-1910. Surf. (P. 100), 11^{25} pm., 10 min. 1 ♂ 3 mm. — **St. 281.** 38°13′ N, 15°36.5′ E. 1-3-1911. 40 m.w. (S. 100) 6^{10} pm., 120 min. 1 ♂ 3 mm.

Atlantic.

St. 89. 18-6-1910. Surf. (P. 100), 3^{30} am., 10 min. 3 spec.: 2 ♂ 3 mm, 1 ♀ 2 mm. — **St. 233.** 10-9-1910. Surf. (P. 100), 5^{10} am., 10 min. 1 ♂ 3 mm. — **St. 376.** 34°41′ N, 16°14′ W. 24-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min. 1 ♂ jun. 2.5 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 1 ♀ 2 mm.

* Miss STEWART (1913) has also seen the adult ♂, but does not describe it.

(Stebbing l. c. 1888, Pl. 166) 1. segment in particular being practically rectangular, posteriorly not pointed, as shown by those writers. As regards the urosome, there is nothing to remark, but the telson in all the adult males is only half as long as the peduncle in up. 3, whereas in females and the young males it is as a rule $^2/_3$ as long. It is an interesting feature that the telson on the adult ♂ is thus comparatively shorter than on the ♀ and the young ♂, for the same character has formerly been mentioned by Vosseler (l. c.) as applying to *H. Fabrei.* True, Vosseler says (of *H. Fabrei* ♂) that the telson is "halb so long wie das letzte Urussegment, aber kürzer als das Grundglied des dritten Uropoden"; but this must be a printer's error for "das halbe Grundglied", as the whole thing otherwise becomes an impossibility. However, the telson in a few ♀ of my material (*H. Luzoni*) is not longer than in the adult ♂; this holds good of ♀ from St. 132 and the one ♀ from St. 163; in all the others the telson has the normal size depicted by Stebbing for ♂ jun. and by Vosseler for ♀.

Of the two pairs of antennæ, the upper pair are nearly as long as the whole body, and have about 18 joints in the flagellum, whereas the lower pair have about 20 joints in the flagellum and are a little longer. 2. joint of the flagellum in ant. 1. has on the underside of the distal end a process with sensitory hairs, exactly as shown by Chevreux in the adult ♂ of *H. schizogeneios* (see the latter). In p. 1, the second joint is a little heavier than shown by Stebbing (l. c. 1888); on the front margin of metacarpus there is as a rule 1 spine, but in a few cases 2. Metacarpus on p. 2 always seems to have 2 spines on the front margin. P. 3—p. 7 coincide extremely well with Stebbing's figures (l. c. 1888) of the young male with the exception that in the adult they are considerably slenderer, particularly at the distal end. An excellent and striking character of the species (which applies both to ♂ [juv. and ad.] and ♀) is afforded by the two large spines on the hind margin of 5. joint in p. 3—p. 4 in connection with the fact that 2. joint in p. 5—p. 7 is at most half as broad as long; the same spines are, it is true, to be found in *H. Fabrei*, but the pereiopoda are on the whole heavier, and 2. joint on p. 5—p. 7 (in particular in p. 5) is clearly more than half as broad as it is long. The sixth joint in p. 5—p. 7 terminates in a dentate process. The character which in the earlier literature was considered the most important one, the length of the telson in proportion to the peduncle in up. 3, can, according to the above, no longer be used as a specific character for *H. Luzoni,* at any rate not as far as the adult male is concerned.

The uropoda deviate from Stebbing's description of the young male in the following respects: the peduncle in up. 2 slightly longer (not shorter) than the inner ramus, and the rami in up. 3 extend as far posteriorly as the rami in up. 1. The rami in up. 1—up. 2 have at the proximal end of the median margin an excavation like the males of several of the other species; an excavation of this kind is hardly indicated in up. 3.

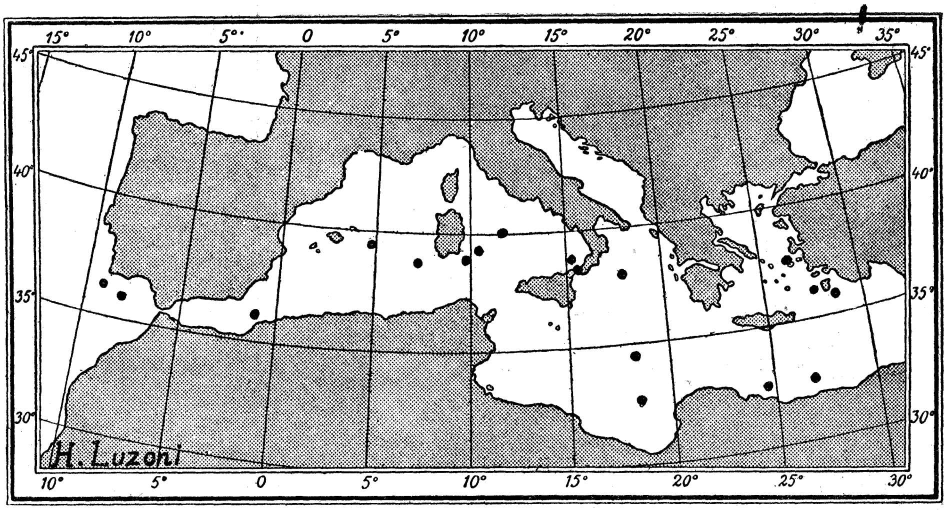

Chart 12. *Hyperia Luzoni* (St. 376 and 399 lie outside the map to the S.W.).

Material. As mentioned above, the material in all contains 90 spec. (82 ♂, 8 ♀) of which by far the greater number *viz.* 84 spec. (78 ♂, 6 ♀) are from the Mediterranean.

A. Mediterranean. The species was taken at 16 stations and practically only at depths > 1000 m, in several places even at depths > 3000 m. It seems to be fairly evenly distributed over the eastern and western basin, and even penetrates into the Ægean Sea, but appears to be limited to the region South of about 40° N. It was formerly only known from 3 localities at Capri, and only in 6 spec. in all (2 ♀: Lo Bianco 1901 [1902]; 1 ♂ ad., 3 ♀ ad. [1 locality]: Vosseler in Lo Bianco 1903; 10—11 am., 2000 m. w., 2000 m).

Vertical occurrence. All specimens were taken during the night close to the surface; only very rarely were they taken with 40 m.w. Where they live during the day, it is consequently not possible to say; but the two Lo Bianco specimens mentioned above were taken during the forenoon with 1500 and 500 m. w.

Other biological data cannot be given on the strength of the "Thor" material.

B. Atlantic. The "Thor" (and "Florida") have taken it at 4 stations in the Bay of Cadiz and west of that; the conditions under which it was caught were exactly like those in the Mediterranean.

Distribution. 1. Mediterranean (see above).

2. Atlantic. The most northerly locality known to me is the Bay of Biscay, 100—0 fms., 1 female with ova (Stebbing l. c. 1904), but this is clearly only an isolated find north of the northern limit proper. Vosseler (1901) mentions 22 spec. from 15 hauls about 39°—0° N, 14°—50° W, i. e. the Gulf Stream 39.1° N, 23.5° W, 0—400 m, Sargasso Sea 30.9° N, 50° W, 0—400 m, and 27.8° N, 33° W, 0—200 m. N. Equatorial Current 6 st. 28.9° N, 35° W, to 24.6° N, 31° W; and 10.2° N, 22.2° W; 0—400 m. Guinea Current 4 st.: 7.9° N, 21.4° W to 5.3° N, 19.9° W, 0—200 m, and 9.4° N, 41.9° W, 0—400 m. S. Equatorial Current 2 st. 0.1° N, 15.2° W and 5.1° N, 14.1° W, 0—200 m. — From the Atlantic S. of Equator Miss Stewart (1913) mentions it from near Bahia, 13°59′ S, 34°35′ W, 1 spec., and N. of Tristan da Cunha 28°25′ S, 23°56′ W, 1 spec.

3. Pacific. Stebbing ("Challenger") has it from the following localities: China Sea, off Luzon 16°35′ N, 117°47′ E, surf. 1 ♂ jun.; Zulu Harbour, Philippines, surf., 2 spec., and southern Pacific, 38°6′ S, 88°2′ W, surf. 1 spec. Miss Stewart (1913) mentions it from S. of New Zealand 56°30′ S, 169°30′ E.

5. HYPERIA SCHIZOGENEIOS Stebb. (Chart 13).

**Hyperia schizogeneios* Stebbing 1888, p. 1391, Pl. 168. — *H. s.* Bovallius 1889, p. 221. — **H. s.* Chevreux, Sur le mâle adulte d'Hyperia schizogeneios Stebb.; Bull. Soc. Zool. France vol. 17, 1892, p. 233, 3 text-figs. — **H. s.* Chevreux 1900, p. 139, Pl. 16 fig. 1. — *H. s.* Vosseler 1901, p. 66. — *Lestrigonus mediterraneus* A. Costa, Sopra une Specie Mediterranea del Genre Lestrigonus; Rendiconto dell' Acc. Sci. Fis. e Math., Anno 4, 1865, p. 34 (teste Chevreux 1900). — *H. mediterranea* Bovallius 1889, p. 240. — **H. promontorii* Stebbing 1888, p. 1385, Pl. 166 fig. B. — *H. p.* Bovallius 1889, p. 214, Pl. 11 figs. 3—13. — *H. p.* Vosseler 1901 p. 64. — *H. p.* + *H. schizog.* Vosseler, in Lo-Bianco 1903, p. 278.

Mediterranean.

St. 106. 25-6-1910. 0^{20} am. Surf. (P. 100), 10 min. 1 spec. jun. 1.5 mm. — **St. 107.** 25-6-1910. 7^{30} am. 2000 m.w., 60 min. 1 ♂ ad. 4 mm, 2 spec. jun. 1.5 mm. — **St. 108.** 25-6-1910. Surf. (P. 100), 10^{40} pm, 10 min. 5 spec.: 2 ♂ jun. 2.5—3 mm, 1 ♀ 3 mm (2 spec. jun. 1.5 mm?). — **St. 112.** 27-6-1910. Surf. (P. 100), 0^{20} am,, 10 min. 29 spec.: 10 ♂ (adult?) 3 mm, 5 ♂ jun. 2—3 mm, 4 ♀ (jun.?) 2 mm, 10 spec. jun. 1—2 mm. — **St. 113.** 28-6-1910. Surf. (P. 100), 3^{30} am., 10 min. 14 spec.: 12 ♂ adult 4 mm, 1 ♀ 2.5 mm, 1 jun.? 1.5 mm. — **St. 115.** 28-6-1910. Surf. (P. 100), 11^{30} pm., 10 min. 5 spec.: 2 ♂ adult 4 mm, 2 ♀ 2—3 mm; 1 ♀ with ova 3 mm. — **St. 116.** 30-6-1910. Surf. (P. 100) 1^{50} am., 10 min. 4 ♂ adult 4 mm, 4 ♂ jun. 2—3 mm. — **St. 116.** ibid. 25 m.w., 3^{00} am., 15 min. 1 ♂ adult 3 mm. — **St. 118.** 30-6-1910. Surf. (P. 100), 11^{05} pm., 10 min. 5 spec.: 2 ♂ adult 3 mm, 1 ♂ jun. 3 mm, 2 ♀ 2—2.5 mm. — **St. 118.** ibid. 1-7-1910. 25 m.w., 0^{20} am., 15 min. 1 ♂ adult 4 mm. — ? **St. 123.** 3-7-1910. Surf. (P. 100), 1^{05} am., 10 min. 1 ♂ adult 4 mm. — **St. 125.** 9-7-1910. Surf. (P. 100), 10^{40} pm., 10 min. 1 ♀ 3 mm. — **St. 126.** 10-7-1910. Surf. (P. 100), 10^{20} pm., 10 min. 1 ♀ 3 min. — **St. 129.** 12-7-1910. Surf. (P. 100), 3^{10} am., 10 min. 12 spec.: 5 ♂ adult 3 mm, 1 ♂ jun. 2 mm, 6 ♀ 2 mm. — ? **St. 129.** ibid. 1000 m.w., 4^{20} am., 60 min. 1 ♂ adult 4 mm. — **St. 132.** 14-7-1910. Surf. (P. 100), 1^{10} am., 10 min. 5 spec. jun. 1—2 mm. — **St. 136.** 19-7-1910. 25 m.w., 30 min., 3^{10} am. 1 ♂ 4 mm. — **St. 138.** 19-7-1910. 1000 m.w., 7^{40} pm., 60 min. 1 ♂ 3 mm. — **St. 139.** 20-7-1910. Surf. (P. 100), 2^{00} am., 10 min. 1 ♂ 4 mm, 1 ♀ 2.5 mm, 1 jun. 1 mm. — **St. 139.** ibid. 25 m.w., 1^{40} am., 30 min. 1 ♂ 4 mm, 1 ♂ 3 mm. — **St. 141.** 20-7-1910. Surf. (P. 100), 10^{40} pm., 10 min. 3 ♂ (2 adult, 1. jun). 3—4 mm. 1 ♀ 2 mm. — **St. 143.** 23-7-1910. Surf. (P. 100), 0^{40} am., 10 min. 9 ♂ 4 mm. — ? **St. 144.** 24-7-1910. Surf. (P. 100), 2^{10} am., 10 min. 1 ♂ 3 mm. — ? **St. 161.** 2-8-1910. Surf. (P. 100), 3^{10} am., 10 min. 3 ♂ jun., 3 mm. — **St. 163.** 5-8-1910. Surf. (P. 100), 0^{15} am., 10 min. 6 ♂ 4 mm. — ? **St. 185.** 17-8-1910. 11^{10} am., surf. (P. 100), 10 min. 2 ♀ 2—3 mm. 1 jun. 1 mm. — **St. 186.** 17-8-1910. Surf. (P. 100), 11^{30} pm., 10 min. 1 ♂ 5 mm. — **St. 187.** 18-8-1910. Surf. (P. 100), 7^{50} pm., 10 min. 4 ♀ 1—3 mm. — **St. 197.** 24-8-1910. Surf. (P. 100). 7^{10} pm., 10 min. 1 ♂ 3.5 mm. — **St. 199.** 25-8-1910. Surf. (P. 100), 9^{30} pm., 10 min. 1 ♂ jun. 3 mm. — **St. 204.** 27-8-1910. Surf. (P. 100), 4^{35} am., 10 min. 1 ♂ 3.5 mm. — **St. 205.** 27-8-1910. Surf. (P. 100). 7^{40} pm., 10 min. 130 spec.: 100 ♂ 3—4 mm, 20 ♂ jun. 3 mm, 10 (♀?) jun. 1 mm. — **St. 206.** 28-8-1910. Surf. (P. 100), 1^{10} am., 10 min. 120 ♂, 3—4 mm. — **St. 206.** ibid. 1000 m.w. (Y. 200), 1^{40} am., 45 min. 1 ♂ 4 mm. — **St. 207.** 28-8-1910. Surf. (P. 100), 8^{45} pm., 10 min. 1 ♂, 4 mm. — **St. 208.** 29-8-1910. Surf. (P. 100), 1^{45} am., 10 min., 12 spec.: 4 ♂ 3 mm, 1 ♂ jun. 2 mm, 7 ♀ 2 mm. — **St. 209.** 29-8-1910. Surf. (P. 100), 5^{00} am., 10 min. 12 spec.: 2 ♂ 3 mm, 2 ♂ jun. 2.5 mm, 8 ♀ (1 with ova 3 mm) 2—3 mm. — **St. 210.** 30-8-1910. Surf. (P. 100), 2^{50} am., 10 min. 18 ♂ 3—4 mm. — **St. 210.** ibid. 25 m.w. (Y. 200), 30 min., 2^{45} am. 1 ♂ jun. 3 mm. — **St. 218.** 2-9-1910. Surf. (P. 100), 2^{10} am., 10 min. 16 spec.: 10 ♂ 3 mm, 6 ♀ 1.5 mm. — **St. 220.** 4-9-1910. Surf. (P. 100), 2^{20} am., 10 min. 11 spec.: 8 ♂ 3 mm, 3 ♀ 1.5—3 mm. — **St. 222.** 4-9-1910. Surf. (P. 100), 11^{25} pm., 10 min. 10 spec.: 5 ♂ 3 mm, 1 ♂ jun. 3 mm, 4 ♀ 2 mm. — **St. 223.** 5-9-1910. Surf. (P. 100), 4^{40} am., 10 min. 24 spec.: 10 ♂ 3—4 mm, 4 ♂ jun. 2—3 mm, 10 ♀ 2 mm (1 with ova). — **St. 224.** 5-9-1910. Surf. (P. 100), 7^{25} pm., 10 min. Abt. 100 spec.: 24 ♂ 3—4 mm, 15 ♂ jun. (1)2—4 mm, abt. 65 ♀ 1—3 mm. — **St. 225.** 6-9-1910. Surf. (P. 100), 3^{35} am., 10 min. 4 spec.: 1 ♂ 3 mm, 2 ♂ jun. 2 mm, 1 ♀ 2 mm. — **St. 227.** 6-9-1910. Surf. (P. 100), 5^{40} pm., 10 min. 1 spec. jun. 1 mm. — **St. 228.** 7-9-1910. Surf. (P. 100), 2^{00} am., 10 min. 3 spec.: 2 ♂ 3 mm, 1 ♂ jun. 3 mm. — **St. 280.** 25-2-1911. 15 m.w. (S. 100), 5^{20} pm., 120 min. 2 spec.: 1 ♂ 4 mm, 1 ♀ 3 mm. — **St. 281.** 1-3-1911. 10 m.w. (S. 100), 4^{55} pm., 120 min. 3 ♂ 5 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 7^{50} pm., 120 min. 6 spec.: 2 ♂ jun. 2—3 mm, 4 ♀ 2 mm. — **St. 281.** 5—8 m. 1-3-1911. 30 m.w. (S. 100), 3^{45} pm., 120 min. 1 ♀ 2 mm. — **St. 282.** 8-3-1911. 40 m.w. (S. 100), 7^{15} pm., 90 min. 3 spec.: 1 ♂ jun. 3 mm, 2 ♀ 2 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 9^{00} pm., 90 min. 1 ♀ 2 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 2^{00} am., 60 min. 3 spec.: 2 ♂ 4 mm, 1 ♀ 2.5 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 10^{45} pm., 180 min. 1 ♀ 3 mm. — **St. 283.** ibid. 12-3-1911. 40 m.w. (S. 100), 6^{30} pm., 180 min. 1 ♀ with embryos, 2 mm. — **St. 339.** 40°30′ N, 3°10′ E. 20-8-1911. 28 m.w. (S. 150), 3^{00} am., 30 min. 5 ♂ 4 mm. — **St. 340.** 35°50′ N, 21°30′ E. 26-8-1911. 28 m.w. (S. 200), 9^{00} pm., 30 min. 1 ♂ 5 mm. — **St. 340.** ibid. 108 m.w. (S. 150), 9^{00} pm., 30 min. 3 spec.: 2 ♂ 4—5 mm, 1 ♀ 2 mm. — **St. 341.** 34°00′ N, 26°20′ E. 27-8-1911. 28 m.w. (S. 200), 11^{00} pm., 30 min. 2 ♂ 5 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 8 spec.: 4 ♂ 3—4 mm, 1 ♂ jun. 3 mm, 3 ♀ 3 mm. — **St. 410.** 37°12′ N, 1°18′ W. 29-12-1911. 112 m.w. (S. 150), 7^{00} pm., 30 min. 21 spec.: 3 ♂ jun. 2—3 mm, 18 ♀ 3 mm. — **St.. 697.** 36°05′ N, 4°40′ W. 22-2-1913. 5^{00} am. 1 ♂ 3 mm. — **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5^{00} am. 11 spec.: 9 ♂ 4 mm, 2 ♀ 3 mm. — **St. 699.** 36°00′ N, 18°58′ E. 7-2-1913. 5^{00} am. 3 spec.: 1 ♂ 4 mm, 2 ♂ jun. 3 mm. — **St. 718.** 36°13′ N, 13°53′ E. 17-5-1913. 8^{15} pm. 4 spec.: 1 ♂ 4 mm, 2 ♂ jun. 3 mm, 1 ♀ 2 mm. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 5 spec.: 1 ♂ 4 mm, 2 ♂ juv. 3.5 mm, 2 ♀ 3 mm.

Atlantic.

St. 232. 9-9-1910. Surf. (P. 100), 9^{00} pm., 10 min. 19 spec.: 5 ♂ 4 mm, 1 ♂ jun. 3 mm, 13 ♀ 2 mm. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} am., 30 min. 125 spec.: 43 ♂ 4 mm, 10 ♂ jun. 2—3 mm, 72 ♀ 2—3 mm. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. 65 spec.: 19 ♂ 3—4 mm, 10 ♂ jun. 3 mm, 36 ♀ 3 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 32 spec.: 7 ♂ 3 mm, 6 ♂ juv. 3 mm, 19 ♀ 2—3 mm (1 with ova). — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 12^{40} am., 30 min. Abt. 600 spec.: ca. 400 ♂ 3—4 mm, ca. 200 ♀ 2—3 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 9^{35} pm., 30 min. 102 spec.: 43 ♂ 3—3.5 mm, 59 ♀ 3 mm.

It must be considered an absolute fact that *H. promontorii* is the male of this species. While ♀ is easily recognized, ♂ has been subjected to various interpretations. Stebbing (1888) had besides ♀ only young ♂ of *H. schizog.* Bovallius (Monograph) says that he (B.) has had a full-grown ♂, but this does not seem likely from his description of uropoda, and Chevreux (l. c. 1900, p. 140) doubts whether the Bovallius ♂ belongs to this species at all. The adult ♂ was first described by Chevreux l. c. 1892, and his description l. c. 1900 is in the main only a reprint of the description from 1892, but with a number of additional figures.

Vosseler (1901) is inclined to think, that Chevreux' male is that of *H. Fabrei*, noting, in the first place, the points of resemblance between the Chevreux figure and Bovallius' figure (1889) of *H. Fabrei* (though without demonstrating the chief difference *viz.* p. 1 and p. 5—p. 7), and further its striking frequency. It is this very frequency of occurrence which seems to be the best proof that Chevreux has referred ♂ to the right ♀: no other ♀ belonging to any species of *Hyperia* is represented in the "Thor" collections from the Mediterranean in numbers even approximating to those represented by *H. schizogeneios*; and no other ♂ is so numerous as the one which may be determined as belonging to the Chevreux species. Moreover, the males and females in question have exactly the same occurrence.

In some of the males 1.—2. mesosome segments are fused, and these specimens should thus be determined as *H. promontorii*. But since there is no real disagreement between Stebbing's description of *H. promontorii* ♂ and Chevreux' description of *H. schizogeneios* ♂, apart from the fact that 1.—2. mesosome segments are said to be fused in *H. promontorii*, but free or at any rate "bien nettement délimités" in *H. schizogeneios*, I consider it a foregone conclusion that *H. promontorii* is the male of *H. schizogeneios*, as the fusion or non-fusion of the mesosome segments is a circumstance which may vary at any rate to some extent. A point in favour of my supposition is the fact that the female of *H. promontorii* is not known: true, Bovallius (l. c. p. 218, Pl. 11 figs. 7, 9, 12, 13) gives a short description and a few figures of a specimen, which he designates ♀, but in any case his figs. (12—13) of uropoda are taken from a ♂. Against my supposition stands the fact that the distinct process which on *H. schizogeneios* is to be found on the underside of the cephalon also on ♂ (though smaller and not so pointed as on ♀), according to Bovallius is said not to be found in *H. promont.* ("the head .... has the underside evenly rounded"); but in consideration of several positive misstatements in the work of Bovallius, there is hardly any reason to pay much attention to his remarks on this head.

Bovallius states (1889, p. 214) that he has borrowed the material of *H. promont.* from the Copenhagen Zoological Museum (but not of *H. schizogeneios*); we have, however, no specimens determined as *H. promont.*, but only a ♂ (5 mm, from 20° N, 26° W), determined by Bovallius as "*Hyperia macropis*", and this specimen is certainly a male of *H. promont.*

Sometimes there is in ♂ only one spine on the front margin of metacarpus in p. 1—p. 2, sometimes one on the one and 2 on the other, but as a rule there are 2 on each. The telson in ♂ is as a rule of the shape shown by CHEVREUX in ♂, or the form drawn by STEBBING in *H. promontorii*; BOVALLIUS' figure (Pl. 11 fig. 12) is hardly in accordance with the actual facts.

As to the confusion of the female with the closely related *H. hydrocephala* and *H. macrophthalma* see the latter (p. 92). In small or comparatively small ♀ 1.—4, or even 1.—5. mesosome segments are sometimes fused, but sometimes there is a deep groove between 2. and 3. segment.

As the male of *H. hydrocephala* is not known, it is perhaps possible that it resembles the male of *H. schizogeneios* so closely as to have been confused with the latter.

The colour is said to be brown with black eyes (CHEVREUX 1900).

The material contains in all 1559 specimens, *viz.* from the Mediterranean 673 (473 ♂, 168 ♀, 32 juv.) and from the Atlantic 886 specimens (500 ♂, 386 ♀) or in all 973 ♂, 554 ♀ and 32 juv.

A. Mediterranean.

The material contains 673 specimens distributed over 52 stations, 63 hauls, as shown in the table below:

	No. of stations	No. of hauls	No. of specimens
June 1910	8	10	72
July —	10	11	40
Aug. —	12	14	307
Sept. —	8	8	169
Febr. 1911	1	1	2
March —	3	8	19
Aug. —	3	4	11
Nov. —	1	1	8
Dec. —	1	1	21
Feb. 1913	3	3	15
April —	1	1	5
May —	1	1	4
Total...	52	63	673

but the "Thor" itself has only 38 stations, 43 hauls, 588 specimens. The species occurs most frequently in August—Sept., on an average 21—22 specimens per haul, Aug.—Sept. 1910; in June and July the figures are only 7.2 and 3.7 respectively. Of these 52 stations 41 are in the western basin, and only 11 in the eastern.

Depth of the sea and occurrence. The vertical distribution of the stations of the "Thor" itself is as shown in the table:

Depths in m	No. of stations ("Thor")
0—500	6
> 500—1000	7
> 1000—2000	9
> 2000—3000	14
> 3000	2
total...	38

From this it appears that >500—3000 m. is the most frequent depth of the sea; only exceptionally has the species been taken at depths beyond these limits.

As mentioned above, the "Thor" itself has taken the species at 38 stations in all; subtracting from this the six with a depth of 0—500 m, there remain 32 stations; of these 28 are in the western, 4 in the eastern basin. As there are 17 negative stations in the western and 13 in the eastern basin (surface, night, P. 100, > 500 m) the total number of stations will be 45 and 17 respectively.

Night hauls, > 500 m, P. 100, surf.

No. of positive stat.		Total no. of stations		Percent. of pos. stat.	
W. Basin	E. Basin	W. Basin	E. Basin	W. Basin	E. Basin
28	4	45	17	62.2 %	23.5 %

From this it appears that while there are 62.2 ‰ positive hauls in the western basin we have only a little over $^1/_3$ of that number in the eastern basin. Moreover, the hauls yielded much larger results in the western than in the eastern basin. 37 hauls yielded 564 or on an average abt. 15 spec. per haul, against 5 hauls with 24 or an average of abt. 5 specimens pr. haul. (It must be noted that the hauls, as far as this species is concerned, were on an average, only of 10 minutes duration, whereas in the case of nearly all the other species they lasted 30 min.)

Special emphasis should be given to the fact that the "Thor" did not take it at all on the winter cruise, whereas it has been taken all the year round by the other ships.

As will be seen from the chart, the species is to be found nearly everywhere in the western basin, as long as the depth is great enough; that it was taken in the Strait of Messina (St. 280—283) at lower depths than elsewhere, is a feature which it shares with many other species. In the eastern basin, on the other hand, it occurs much more sparsely, and is not found in the Adriatic; it does not penetrate far into the Ægean Sea, nor has it been found inside the Dardanelles. Though it must thus be said to belong to the ordinary species, and at any rate is the most common *Hyperia* —species in the western

Mediterranean, it has formerly only been found at a few places: Chevreux mentions it (l. c. 1892) from Garoupe at Antibes (the Bay at Genoa) and from Algiers: 37°36′ N, 4°18′ E and 36°59′ N, 2°48′ E. Lo Bianco (1902 p. 446; 1904 [German edition] p. 42) mentions 4 spec. (3 ♀ ad., 1 ♂ ad.) from south and south-east of Capri + 2 ♂ of *H. promontorii* from south-west of Capri; April, depth about 1000 m. Vosseler mentions it in Lo Bianco 1903 (table p. 278): 46 specimens from 12 hauls (6. Feb.—10. May) of which 9 hauls are south and south-east of Capri, 1 haul between Capo Corso and Monaco and 2 hauls at Salina and Stromboli (Æolian Isles), depth 900 (600) m — 2600 m; further 2♂ adult of *H. promontorii* south of Capri. Also Costa mentions it from the region round Naples.

Vertical occurrence. All the specimens were taken during the night at the very surface, as a rule at most 15 m. w., only in a very few cases with 40—122 m. w. Further, the "Thor" has only taken the species with implement P. 100. That the species has not been taken at greater depths by the "Thor" may perhaps be due to the fact that this implement was only used at the very surface, and that the nets used with a greater length of wire (in particular Y 200) are too large in the mesh to allow of these little animals being caught.

Besides the "Thor" material the only other large collections of the species (*H. schiz.* + *H. prom.*) from the Mediterranean are the above-mentioned made by Lo Bianco and Vosseler. All these 17 hauls have been made between 6. Feb. and 10. May and during the day (7.30 am.—5.00 p.m). In most of the hauls, the length of wire is 900—2000 m; 1 haul, however, has only 250 m. w., 2 hauls have 500 m. w., but on the other hand 1 haul has 2500 m.w.; one haul was made with closing net 100—0 m.

Propagation &c. The collections from the Mediterranean have nearly three times as many males as females. The two sexes attain the same size, abt. 4 mm (some single ♂ 5 mm); ♂ ad. and ♀ with ova are as a rule at least 3 mm. Animals of 1.5 mm can hardly be determined as to sex. Small individuals (1.5 mm) have been taken June—Sept. and females with ova in June, August, Sept. and March.

B. Atlantic.

The species is represented by 886 specimens from 6 stations, of which the one lies in the Bay of Cadiz, the other 5 west or south-west of this bay. The species has never been taken so near Europe. The "Thor" herself has only taken it at one of the above-mentioned stations, (in the Bay of Cadiz); as the "Thor" otherwise has 6 negative stations from the Strait of Gibraltar to Lisbon and 3 negative stations in the Bay of Biscay it can thus be considered an established fact that the species is not to be found at all off the coasts of Europe north of about 37° N. The depth of the sea is > 2600—> 4500 m or

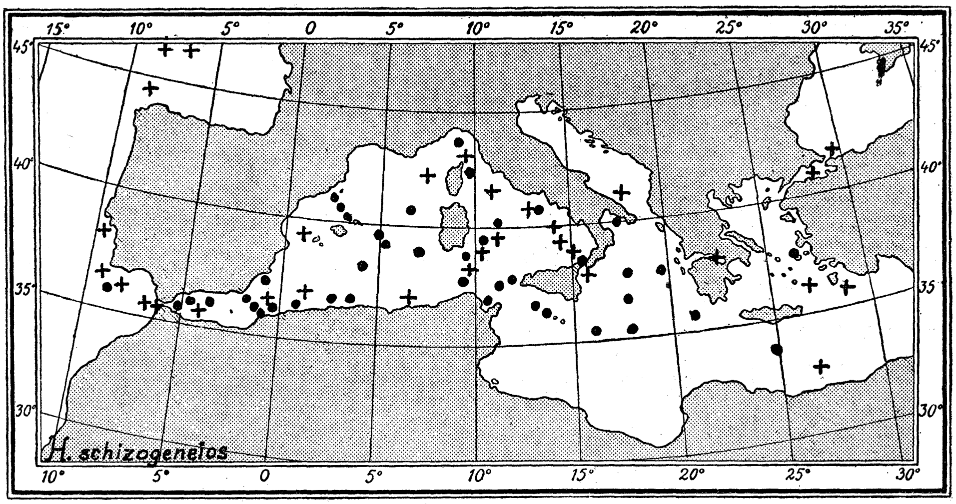

Chart 13. *Hyperia schizogeneios.* ● potitive stations (st. 376—77 and 398—400 lie outside the chart to the S.W.). + negative stations (night, > 500 m, P. 100, 0—25 m. w.)

in other words greater than in the Mediterranean, but otherwise, the species seems to live under the same conditions in the two seas.

Distribution.

1. Mediterranean: see above.

2. Atlantic. Chevreux (l. c. 1892 and 1900) gives 281 specimens in all from 21 stations (138 ♂, 143 ♀) from the area west of the Azores 37°40′ N—42°50½′ N, 22°12′ W—45°25′ W, and also from Tenerifa, Sahara (18°51′ N, 0°19′ W) and 47°42¾′ N, 19°30¼′ W, which is the northernmost of all known occurrences. With the exception of an isolated find, all of his specimens are taken at the surface, during the night, i. e. just as with the material from the "Thor". Vosseler (1901) gives 13 ♀ of *H. schizog.* and 16 ♂ of *H. promont.* from 22 hauls in all, *viz.* the Azores 37.7° N, 25.2° W and 39.1° N, 23.5° W. N. Equatorial Current 2 st.: 24.6° N, 31° W, and 20.4° N, 37.8° W, 0—200 m. Florida Current 37.9° N, 59.1° W, surf. Sargasso Sea 35° N, 62.1° W, 0—400 m

Guinea Current 9.4° N, 41.9° W, and 7.9° N, 21.4° W, 0—200 m. S. Equatorial Current 14 st.: 1.7° N, 17.3° W to 6.8° S, 14.2° W; besides 2.4° S, 36.4° W and 1.5° S, 39.2° W; 0—200 or 0—400 m. — BOVALLIUS mentions *H. schizogeneios* from Martinique and Caribbean Sea, and *H. promontorii* from 32°—45° S, 4°—20° E. — STEBBING ("Challenger") mentions *H. schizog.* from St. Vincent, Cape Verde Islands 16°49′ N, 25°14′ W, and *H. promont.* from 34°41′ S, 18°36′ E, surf. (off Cape of Good Hope), and the specimen in our Zool. Museum, mentioned above and seen by BOVALLIUS, is from 20° N, 26° W. — Miss STEWART (1913) mentions *H. schizog.* from Bahia, 13°59′ S, 34°35′ W.

Taking all these data together, it appears that about 325 specimens are known from the Atlantic, almost exclusively from about 7°S—40° N but otherwise fairly evenly distributed over the whole of this area; from more southerly localities it is hardly known except from South-west Africa.

3. Pacific. ?Zebu Harbour, Philippines (STEBBING, 1888). In the Copenhagen Zoological Museum there is one (but lately determined) typical female labelled "Yeddo Bay, 19-8-1846, "Galatea", REINHARDT".

6. HYPERIA CRUCIPES Bovall.

Hyperia crucipes Bovallius, 1889, p. 225, Pl. 11 fig. 14—25.

Atlantic.

St. 265. 39°22′ N, 22°49′ W. 20-3-1911. 47 m.w. (S. 100), 7^{00} pm., 30 min. 1 ♀ 2.5 mm. — **St. 266.** 40°47′ N, 21°10′ W. 21-3-1911. 47 m.w. (S. 100). 7^{00} pm., 30 min. 1 ♀ 2.5 mm. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. (S. 200). 15 m.w., 8^{15} pm., 30 min. 1 spec. (♀?) 2.5 mm. — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 2 ♀ (1 with ova) 2.5 mm. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. (S. 200). 15 m.w 8^{05} pm., 30 min. 6 ♀ 2.5—3.5 mm; 3 with ova or embryos. — **St. 383.** 37°16′ N, 14°9′ W. 23-10-1911. 30 m.w. (S. 100), 6^{05} pm., 30 min. 1 ♀ with ova 3 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200). 9^{10} pm., 30 min. 3 ♀ 2.5—3.5 mm.

There are in all 15 ♀ (no ♂) from the area north and north-east of the Azores, about $31^1/_2$°—$40^3/_4$° N, 14°—$22^3/_4$° W. The depth of the sea is very great, > 2600— > 5400 m, and all specimens were taken during the evening, either at or very near the surface.

Distribution. Off Barbadoes (BOVALLIUS), Gulf of Manaar, Ceylon (WALKER 1904, p. 236).

7. HYPERIA MACRODACTYLA n. sp. (Fig. 35).

Mediterranean.

St. 113. 28-6-1910. Surf. (P. 100), 3^{30} am., 10 min. 2 ♂ 2.5 mm. — **St. 145.** 25-7-1910. Surf. (P. 100), 3^{40} am., 10 min. 4 ♂ 2.5 mm. — **St. 176.** 12-8-1910. Surf. (P. 100), 4^{10} am., 10 min., 27 ♂ 2.5—3 mm. — **St. 217.** 1-9-1910. Surf. (P. 100), 1^{45} pm., 10 min. 1 ♀ 2 mm.

Of this species, which is new to science, the "Thor" has taken 34 specimens, *viz.* 33 males and only 1 female. The species is extremely characteristic, being distinguisable at first sight by its long and crooked dactyli in p. 3—p. 7, in conjunction with the fact that p. 5 is considerably shorter than p. 6—p. 7, whereas p. 3—p. 7 otheiwise as a rule are of the same length.

♂ (fig. 35). Length 2.5—3 mm. Cephalon very large, nearly twice as deep as and a little longer than the three first mesosome segments together. On the underside there are, as in so many other species, a couple of quite small pointed processes. All mesosome segments are

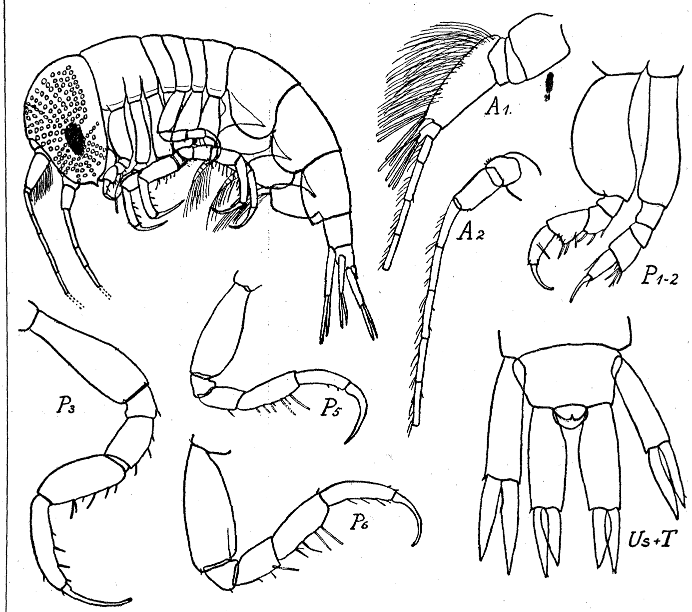

Fig. 35. *Hyperia macrodactyla* ♂, 3 mm, st. 176, 1910, surf.

somewhat of the same length, with the exception of no. 7, which is a little longer; the first 3 are fused and only half as deep as the cephalon. The mesosome a little longer than the 2, but shorter than the 3 metasome segments, each of which is nearly 3 times the length of each mesosome segment. The telson is broader than it is long, and only $^1/_4$ the length of the peduncle in up. 3; rounded triangular.

Ant. 1 at most as long as the pereion, ant. 2 a little longer, at times nearly as long as the whole animal. In p. 1—p. 2 2. joint is nearly the same length as the following joints together. In p. 1 2. joint is of a characteristically broad and curved form; the carpus is abruptly cut off with a process on the under margin, but not lengthened; the metacarpus is the length of the curved dactylus, with one bristle on the upper (front) margin. In p. 2 2. joint is a little broader at the distal than at the proximal end; the carpus has a small process, but there is no actual chela; the metacarpus and the dactylus nearly as in p. 1. P. 3—p. 4 of the same length as p. 6—p. 7 and of nearly the same shape; 2. joint, however, is somewhat heavier in p. 6—p. 7 than in p. 3—p. 4. In p. 3—p. 7 the long curved dactylus is nearly as long as the metacarpus, in p. 7 even fully as long; the under margin of the carpus has 4—6 long setæ and a few smaller ones. Curiously enough, p. 5 is considerably shorter than p. 6—p. 7, in a few cases even only $^2/_3$ as long. Of the uropoda, up. 1 extends as far posteriorly as up. 3. In up. 1, the peduncle is slightly longer than the rami; the inner ramus is longer than the outer ramus and, like several other species, with a small excavation at the proximal end of the outer margin. Up. 2 resembles up. 1, but is shorter, and there is no excavation in the inner ramus. In up. 3 the peduncle is between $1^1/_2$ and 2 times as long as the outer ramus, and rather broad; the outer ramus is longer than the inner ramus; there is no excavation.

♀. The only ♀ is only 2 mm; it resembles ♂, but is a little heavier, and the inner ramus in up. 3 is a trifle longer than the outer ramus.

Distribution &c. All the specimens were taken in the Mediterranean, from south of the Balearic Islands to the Sea of Marmora (St. 176), and it is a strange fact, that 27 specimens were caught in the last-mentioned locality. All specimens were taken at the surface during the night, the single ♀ during the day. The depth of the sea varies from > 500—3340 m.

8. HYPERIA THORACICA Bovall.

Hyperia thoracica Bovallius 1889, p. 233, Pl. 11 figs. 37—41. — *H. t.* Vosseler 1901, p. 73, Pl. 6 figs. 1—4.

Atlantic.

St. 400. 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 9³⁵ pm., 30 min. 1 ♂ 3 mm.

In regard to the dorsal line and the size of the telson, the specimen entirely coincides with Vosseler's correction to Bovallius's description.

Bovallius states that he has borrowed specimens from the Copenhagen Museum, among others. There is, however, no specimen under this name, but one which Bovallius calls *H. Reinhardi*, though it is in reality *H. thoracica*. It was taken by Reinhardt 7°37′ N, 22°26′ W. and agrees entirely with the above-mentioned specimen from the "Thor"; but is 4 mm long (♂).

Distribution. 1. Atlantic. Vosseler mentions in the Plankton-Exped. 23 spec. (12 stations) from the Atlantic (+ 7 spec. from the China Sea). The localities were as follows: Florida Current 37.9° N, 59.1° W, surf.; Sargasso Sea 2 hauls 37.1° N, 59.9° W and 34.7° N, 62.4° W, 0—300 m and surf. N. Equatorial Current 28.9° N, 35° W, 5670 m, and 13.3° N, 22.7° W, 0—200 m. S. Equatorial Current 7 st.: 2.6° S, 14.6° W, surf.; 5.1° S, 14.1° W, 0—400 m; 6.9° S, 23.4° W to 0.3° S, 47.4° W, 0 or 0—400 m; 5.6° N, 44° W, surf. Mouth of Rio Tocantin (S. America) 0.2° S, 47° W, 0—35 m. — Bovallius' specimens were from 13°—20° N, 43°—50° W. — Thus the species is distributed in the warm Atlantic 7° S—38° N.

2. Pacific. China Sea, without special locality (Vosseler, l. c.).

9a. HYPERIA HYDROCEPHALA Voss.
(Chart 14 partim).

Hyperia hydrocephala Vosseler 1901, p. 74, Pl. 6 figs. 26—28, Pl. 7 figs. 1—5. — *H. h.* Steuer 1911, p. 677, Pl. 2. — ?*H. macrocephala* Vosseler (see below). — ?*H.* sp. ?*hydroceph.* Vosseler, Pesta 1920 p. 30—31, figs.

Mediterranean.

St. 115. 28-6-1910. Surf. (P. 100), 11³⁰ pm., 10 min. 1 ♀ 2.5 mm. — **St. 116.** 30-6-1910. Surf. (P. 100), 1⁵⁰ am., 10 min. 6 spec.: 1 ♂ jun. 2 mm, 5 ♀ 2 mm. — **St. 118.** 30-6-1910. Surf. (P. 100), 11⁰⁵ pm., 10 min. 5 spec.: 1 ♂ jun. 2 mm, 4 ♀ 2—3 mm. — **St. 129.** 12-7-1910. Surf. (P. 100), 3¹⁰ am., 10 min. 3 spec.: 2 ♂ jun. 2 mm, 1 ♀ 2 mm. — **St. 133.** 14-7-1910. Surf. (P. 100), 9³⁰ pm., 10 min. 1 ♀ 2.5 mm. — **St. 163.** 5-8-1910. Surf. (P. 100), 0¹⁵ am., 10 min. 8 ♀ 1—3 mm. — **St. 142.** 22-7-1910. Surf. (P. 100), 3⁰⁰ am., 10 min. 1 jun. 2 mm. — **St. 197.** 24-8-1910. Surf. (P. 100), 7¹⁰ pm., 10 min. 1 jun. 1.5 mm. — **St. 205.** 28-8-1910. Surf. (P. 100), 7⁴⁰ pm., 10 min. (10×) 9 spec.: 3 ♂ jun. 2—2.5 mm, 6 ♀ 1—2.5 mm. — **St. 206.** 28-8-1910. 1¹⁰ am. Surf. (P. 100). 10 min. 50 spec.: 5 (♂ jun.?) 2 mm, 45 ♀ 1—3 mm. — **St. 223.** 5-9-1910. 4⁴⁰ am. Surf. (P. 100), 10 min. 1 (♂ jun.?) 2 mm, 11 ♀ 1—3 mm. — **St. 224.** 5-9-1910. 7²⁵ pm. Surf. (P. 100), 10 min. 46 ♀ 1—3 mm. — **St. 279.** 23-2-1911. 7⁰⁰ pm., 30 m.w. (S. 100), 120 min. 2 ♀ 3 mm. — **St. 282.** 8-3-1911. 10⁴⁵ pm., 40 m.w. (S. 100), 120 min. 1 ♀ 3 mm. — **St. 282.** ibid. 9⁰⁰ pm., 40 m.w. (S. 100), 90 min. 1 ♀ 3 mm. — **St. 282.** ibid. 2⁰⁰ am., 40 m.w. (S. 100), 60 min. 1 ♀ 2 mm. — **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5⁰⁰ am. 2 ♀ 3 mm. — **St. 718.** 36°13′ N, 13°53′ E. 17-5-1913. 8¹⁵ pm. 15 ♀ 2—3 mm. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 11³⁰ (pm.?). 1 ♀ with ova 3.5 mm.

As shown by the above, the collections of the "Thor" comprise a fairly large material of this species (247 spec.), but only from the Mediterranean.

On the whole, the specimens agree very well with the descriptions and figures of Vosseler and Steuer. In several of the specimens, which, by the way, are typical. 5. mesosome segment is free, not coalesced with 1.—4. segments, which are fused, and a few of the specimens have only 1 seta (not 2) on the metacarpus of p. 1—p. 2.

With its thick head and inflated pereion, the female of this species reminds one very much of the female of *H. schizogeneios*, and confusion is all the more possible, as the two species often appear in the same haul; it will quickly be identified, however, by the processes on the under side of the head, which are rounded and curved forward, not pointed, and the large wing on the front margin of 2. joint in p. 1.

For its relation to *H. macrophthalma*, which is undoubtedly synonymous with it, see below.

Material. The "Thor" has taken in all 247 spec. (37 ♂, 205 ♀, 8 juv.) which is remarkable, as only 4 spec. (♀) are otherwise recorded in extant literature; males are evidently much rarer than females.

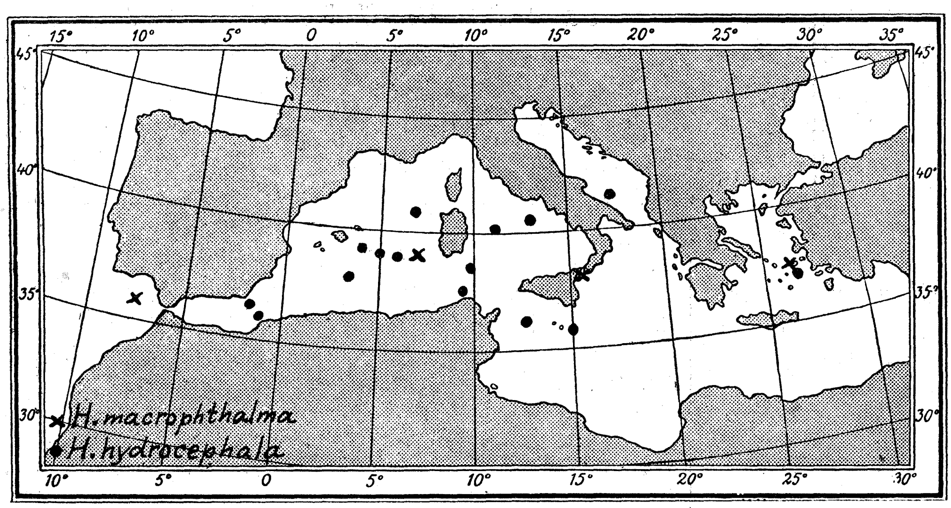

Chart 14. *Hyperia hydrocephala* and *H. macrophthalma.*

Occurrence. Nearly all the specimens are from the western basin, but a few were found right up in the Ægean Sea (St. 163). The only specimen previously found in the Mediterranean is a female juv. from the Bay of Trieste (Steuer l. c.[1]). The depth of the sea is on an average very great, 1000—3400 m though a few individuals were taken at smaller depths, 98—600 m.

Vertical occurrence. All specimens were taken at the surface, during the night.

Propagation. The only female with ova was taken in April.

Distribution. 1. Mediterranean (see above).

2. Atlantic. In Plankton-Exp. Vosseler mentions in all 3 ♀ from the North Equatorial Current 26.3° N, 32.5° W, 0—400 m, and 12° N, 40.3° W, 0—200 m, and from the South Equatorial Current 0.1° N, 15.2° W, 0—200 m. Other occurrences not mentioned in extent literature.

[1] Pesta (1920, p. 30) mentions 3 ♀ as *Hyperia* sp.? *hydrocephala* Vosseler from the Adriatic (42°11.3′ N, 17°47′ E, surf., and 43°5,6′ N, 15°18′ E, 120 m. w.).

9b. HYPERIA MACROPHTHALMA Voss.

(Chart 14, partim).

Hyperia macrophthalma Vosseler, 1901, p. 70, 75; Pl. 6 fig. 16—25.

Mediterranean.

St. 163. 3-8-1910. Surf. (P. 100), 0^{15} am., 10 min. 1 ♀ 2 mm. — **St. 163.** ibid. 25 m.w., 1^{35} am. 2 ♀, 3.5 mm and 2.5 mm. — **St. 205.** 28-8-1910. Surf. (P. 100). 7^{40} pm., 10 min. 70 ♀ 2 mm. — **St. 281.** 1-3-1911. 40 m.w. (S. 100), 7^{50} pm. 60 min. 1 ♀ 3 mm.

Atlantic.

St. 386. 36°30′ N, 7°30′ W. 15-11-1911. 122 m.w. (S. 150), 5^{00} am., 30 min. 1 ♀ 3 mm.

H. macrophthalma can undoubtedly not be maintained as a species, but is synonymous with *H. hydrocephala*. As regards the chief points of difference between the two "species" see Vosseler 1901, p. 75—76. In the following I propose to give a survey of the deviations between Vosseler's description and figures and my own material. Vosseler had only 8 specimens.

My determination of the species as *H. macrophthalma* is based on the fact that the first segment of the urosome is hardly shorter than the last segment of the metasome. It is not necessary to pay special attention to the proportion between length and breadth of the carpus in p. 1—p. 2, as this seems to vary according to age. Most of the specimens have 2 setæ (not 1) on the front margin of the metacarpus in p. 1—p. 2, which should be a character of *H. hydroceph.* In p. 3—p. 4 the dactylus is at most half as long as the metacarpus; according to Vosseler's text it should be shorter, which agrees well with his figure (Pl. 6 fig. 23) of p. 3, whereas his figure (fig. 24) of p. 4 represents the dactylus as far too short. In my spec. the proportions in up. 1 resemble *H. hydroceph.*, not *H. macrophth.* whereas up. 3 agrees with Vosseler's description.

Material. Of this form, of which only 8 spec. (all ♀) were previously known, the "Thor" has taken 74 spec. in the Mediterranean, 1 in the Atlantic.

all ♀; it is new to the Mediterranean (see chart 14 p. 92).

All that was said above of *H. hydrocephala* as to distribution &c. holds good of this species as well; only the specimen from the Atlantic was taken at somewhat lower depth *viz.*, with 122 m. w.

Distribution. 1. Mediterranean. New to this sea.

2. Atlantic. The material collected by the "Thor" advances the northern limit of the species as far as the Bay of Cadiz. Previously, it was (VOSSELER l. c.) only known from 6 hauls 16.1° N—5.3° N, 21.4° W—35.2° W, 0 or 0—200 m *viz.*, North Equatorial Current 16.1° N, 23.1° W; Guinea Current 7.9° N, 21.4°. W, and 4 hauls in the South Equatorial Current 0.1° N, 15.2° W to 5.3° S, 27.6° W and 2.8° S, 35.2° W, 0—200 m or surface.

As will be seen, the geographical distribution coinsides with what is known of *H. hydrocephala*.

4. Genus Hyperioides Chevreux.

**Hyperioides* Chevreux 1900, p. 143. — *Parahyperia* Vosseler 1901, p. 56. — *Hyperioides* Stebbing 1904, p. 34.

1. HYPERIOIDES LONGIPES Chevreux.

**Hyperioides longipes* Chevreux 1900, p. 143, Pl. 17 fig. 2. — *H. l.* Lo Bianco 1902, p. 422, 427. — *H. l.* Walker 1903, p. 229, Pl. 19 figs. 7—13. — *H. l.* Stebbing 1904, p. 34, 35, and 49, 53 (Fowler). — *H. l.* Chevreux 1913, p. 6. — *H. l.* Vosseler, in Lo Bianco 1903—04, p. 278. — *Hyperia sibaginis* Vosseler (non Stebbing) 1901, p. 60, Pl. 7 figs. 6—20 (*Parahyperia* p. 56, *Hyperia sibaginis* var. *longipes*, *Hyperia longipes* p. 63).

Mediterranean.

St. 10. 15-12-1908. 600 m.w. 3^{45} pm. 60 min., 1 ♂ 5 mm. — **St. 115.** 29-6-1910. 65 m.w., 1^{20} am., 15 min. 1 ♀ 4 mm. — **St. 118.** 30-6-1910. Surface (P. 100), 11^{05} pm., 10 min. 1 ♂ 4 mm. — **St. 120.** 1-7-1910. 300 m.w., 8^{50} pm., 30 min. 1 ♀ 5 mm. — **St. 122.** 2-7-1910. 600 m.w., 10^{00} am., 60 min. 2 ♀ with ova 4—5.5 mm. — **St. 122.** ibid. 1200 m.w., 5^{30} pm., 60 min. 3 ♀ 6, 5, 5 mm. — **St. 129.** 12-7-1910. 600 m.w., 8^{00} pm., 30 min. 1 ♀ 4 mm. — **St. 133.** 14-7-1910. 600 m.w., 9^{20} pm., 30 min. 1 ♀ 4 mm. — **St. 202.** 26-8-1910. 300 m.w. 5^{05} pm., 15 min. 1 ♀ 4 mm. — **St. 209.** 29-8-1910. 1000 m.w., 6^{00} am., 45 min. 1 ♀ with embryos 5 mm. — **St. 209.** ibid. 2000 m.w., 7^{25} am., 45 min. 1 ♀ with ova 5 mm. — **St. 210.** 30-8-1910. 600 m.w., 3^{35} am, 30 min. 1 ♀ with ova 5 mm. — **St. 279.** 23-2-1911. 30 m.w. (S. 100), 7^{00} pm., 120 min. 2 ♂ (1 jun., 1 adult) 3.5 mm, 2 ♀ 3 mm. — **St. 280.** 25-2-1911. 15 m.w. (S. 100). 5^{20} pm., 120 min. 1 ♂ 4 mm, 1 ♂ jun. 4 mm. — **St. 281.** 1-3-1911. 30 m.w. (S. 100), 3^{44} pm., 120 min. 4 ♂ 4 mm, 8 ♀ (1 with ova) 4 mm. — **St. 281.** 1-3-1911. 10 m.w. (S. 100). 4^{55} pm., 120 min. 2 ♂ 4 mm, 1 ♀ with ova 2 mm. — **St. 281.** ibid. 40 m.w. (S. 100). 6^{10} pm., 120 min. 5 ♂ adult 3.5 mm, 3 ♂ jun. 3.5 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 7^{50} pm., 120 min. 3 ♂ (1 jun.) 3 mm, 2 ♀ (1 with ova) 3.5 mm. — **St. 282.** 8-3-1911. 40 m.w. (S. 100), 7^{15} pm., 90 min. 1 ♀ 3 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 9^{00} pm., 90 min. 1 ♂ 4 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 10^{45} pm., 180 min. 3 ♀ (2 with embryos) 3 mm, 1 ♂ jun. 3 mm. — **St. 282.** ibid. 9-3-1911. 40 m.w. (S. 100). 2^{00} am., 90 min. 1 ♂ jun. 3 mm, 11 ♀ (3 with ova) 3 mm. — **St. 283.** 12-3-1911. 40 m.w. (S. 100), 6^{30} pm., 180 min. 1 ♂ 4 mm, 3 ♀ (1 with embryos) 3.5 mm, 1 ♀ 3 mm. — **St. 283.** 13-3-1911. 40 m.w. (S. 100). 9^{45} pm., 180 min. 3 ♂ (1 jun.) 3.5 mm, 2 ♀ 3.5 mm.

Atlantic.

St. 82. 51°00′ N, 11°43′ W. 14-6-1905. 300 & 600 m.w. (Y. 330), hour?, min.? 3 ♂ adult 6 mm, 4 ♂ jun. 4—4.5 mm, 52 ♀ 4—5 mm. — **St. 82.** ibid. 15-6-1905. 800 m.w. (Y. 330), 120 min. 3^{45} pm. 1 ♂ juv. 4 mm, 2 ♀ 4 mm. — **St. 82.** ibid. 800 & 1200 m.w. (Y. 330), hour?, min.?, 1 ♂ 5 mm. — **St. 82.** ibid. 1200 m.w. (Y. 330). 0^{45} pm., 120 min. 13 ♂ adult 5—6 mm, 8 ♂ jun. 4—5 mm, 1 ♂ jun. 3 mm, 15 ♀ 3—5 mm. — **St. 179.** 47°20′ N, 12°23′ W. 3-9-1906. 300 m.w. (Y. 330). 9^{30} pm. 120 min. 1 ♀ 5 mm. — **St. 180.** 48°19′ N, 13°53′ W. 3-9-1906. 1800 m.w. (Y. 330), 5^{05} pm., 60 min. 2 ♂ 4—5 mm. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 30 min., 8^{15} pm. 2 ♂ adult 3 mm. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. 1 ♂ 3 mm.

A. Mediterranean.

Material and occurrence. There are 78 spec. (31 ♂, 47 ♀) from 16 stations, 23 hauls. The species was taken almost exclusively in the western basin. On the border of the eastern basin it was taken at 5 stations (St. 279—83) in the Strait of Messina, and within the eastern basin only (St. 10) close to the south-east of the Strait of Messina.

The depth of the sea must no doubt be put at 500 m—> 3000 m; true, in the Strait of Messina the species was taken several times at 200 m, indeed, once even at 5—8 m.

Depth of the stations	No. of stations
0— 200 m	1
> 200— 500 -	5
> 500—1000 -	3
> 1000—2000 -	1
> 2000—3000 -	5
> 3000 -	1
Total...	16

Vertical occurrence.

m. w.	No. of night hauls	No of spec.
10—40...........	10	47
50—100..........	1	1
135—250..........	—	—
300...............	1	1
> 300	4	4

There does not seem to be any doubt that the species, during the night, chiefly keeps quite close to the surface.

During the day it stays deeper down (300—2000 m.w.), there are, however, 3 day hauls (St. 280—81) with only 10, 15 and 30 m. w. For data from extant literature see under Distribution.

Propagation. Females with ova or embryos were found in July and August, but particularly in March. Males and females seem to attain the same size, about 5 mm.

B. Atlantic.

From the Atlantic there are 106 spec. (36 ♂, 70 ♀); as in the case of the material from the Mediterranean, there are thus more females than males. It was taken at 5 stations, 8 hauls. It seems to follow the same laws as in the Mediterranean; north of 40° N, however, it is only found considerably deeper down than in more southerly regions (see under Distribution), and nothing can be said as to the propagation.

Distribution.

1. Mediterranean. Vosseler (1901) records 4 spec. from Naples, and Lo Bianco mentions it (1903, p. 235) as having been found at Capri and belonging to the Panteplankton. Chevreux mentions it (l. c. 1913) as common at Monaco, taken with 0—800 m. w. and from 9 stations in the western Mediterranean, without further data. Lo Bianco (l. c. 1901, and German edition 1904 p. 43) mentions in all 8 spec. from 2 day hauls at Capri; 500 and 1500 m. w.

The best biological data of the species in the Mediterranean, to be found in extant literature, are those which can be derived from the table of Vosseler (Lo Bianco l. c. 1903). Here mention is made of 116 spec. from 24 hauls, 5. Feb.—8. April, all day-hauls. All of them lie round Capri except 3 between Capo Corso and Monaco, and 1 at Salina (Æolian Isles). The depth is 600—2600 m (with the exception of 1 station at 100 m). The length of line is as a rule very great, 900—2000 (2500) m; there are, however, the following exceptions: 1 haul has only 50 m. w. (9.20—9.50 am.), 3 hauls with a closing net, 100, 300 and 400 m. w. respectively, and 1 haul 500 m. w.; but it has also been taken with closing net with 1100 and 2000 m. w. From this it appears that during the day the species as a rule lives very deep down.

2. Atlantic. On the West of Ireland it seems to be quite common, which — apart from the "Thor" investigations — appears from the work of Tattersall (1906, p. 23). The species seems to have its northern limit here, but as a rule, it has been found at lower levels than further south and west: Tattersall (l. c.) mentions having taken it in 30 hauls, 200—1500 fms. down, and Walker (l. c.) records it from 2 hauls, also from West Ireland, 150—510 fms. down; neither of these authors, however, states whether they are night or day hauls. Stebbing (l. c.) mentions 32 hauls from the Bay of Biscay, most of them 100 fath. below the surface; it is thus already found nearer the surface here than further north, but lives at much lower levels than further south. The great depths towards the north are perhaps due to the fact that the hauls are day hauls.

The species seems to be one of the most widely distributed Hyperiidea in the northern Atlantic. When data are given in extant works as to the number of specimens, the numbers are always rather small as far as the individual hauls are concerned, but it is very widely distributed. The "Princesse-Alice" and "Hirondelle II" have taken it at 43 stations, localities not stated. Chevreux l. c. 1913, and the "Hirondelle" has taken it at 4 stations from the Bay of Biscay to the Azores, or within the area investigated by the "Thor".

The German Plankton-Exp. (Vosseler 1901) has taken it at 40 stations in the northern Atlantic (68 spec.: 28 ♀ 40 ♂) distributed in the following manner: Gulf Stream 2 st. 41.1° N, 21.1° W, to 43.6° N, 17.9° W, 0—350 (400) m. Florida Current 5 st. 40.4° N, 57° W to 37.1° N, 59.9° W, 0 or 0—200 (400) m. Sargasso Sea 15 st.: 33.2° N, 63.8° W to 31.5° N, 59° W; 30.8° N, 51.1° W; 31.2° N, 48.5° W, to 25.6° N, 34.9° W; 27.8° N, 33° W, 0—400 (200) m. N. Equatorial Current 6 st. 28.9° N, 35° W to 16.1° N, 23.1° W, 0—400 (500) m. Guinea Current 2 st. 9.4° N, 41.9° W and 7.9° N, 21.4° W, 0—400 m. S. Equatorial Current 9 st.: 1.7° N, 17.3° W, to 0.3° S, 15° W, 0—200 (500) m; 7.8° S, 17.3° W, to 1.5° S, 39.2° W, 0—400 (200) m; 0.4° N, 46.6° W, and 5.6° N, 44° W, 0—200 or 0—400 (500) m. Mouth of Rio Tocantin 0.7° N, 48.2° W, 0—12 m. The temp. at the surface was 24.2° (23.4°) to 27.5° (28°) C, but in the Gulf-Stream 16.2° and 17.6°; the salinity (surface) 34.8 ‰—37.3 ‰ (in Rio Tocantin 11.4 ‰).

5. Genus **Themisto** Guérin.

(= *Parathemisto Boeck + Euthemisto Bovall.*).

Themisto Guérin, Uroptère; Encyclopédie Méthodique, Hist. Nat., vol. 10, 1825, p. 772. — *Parathemisto* Boeck 1870, p. 87 (7). — *P.* Bovallius 1889, p. 248. — **P.* G. O. Sars. 1895, p. 10. — *P.* Vosseler 1901, p. 80. — *Euthemisto* Bovallius, Syst. list 1887, p. 21. — *E.* Bovallius 1889, p. 275 (lit.). — *E.* Stebbing 1888, p. 1407 (lit. and syn.). — **E.* G. O. Sars 1895, p. 11. — *Themisto* K. Stephensen 1923, p. 19.

On the European species.

In 1870 (1871) Boeck established the genus *Parathemisto*, which was to be distinguished from genus *Themisto* Guérin (altered by Bovallius in 1887 to *Euthemisto*) by p. 5 not being (essentially) longer than p. 6—p. 7. Various authors, however, have clearly seen that the two genera are very nearly related; Norman & Scott say (Crust. of Devon and Cornwall 1906 p. 55) that "*Euth. compressa* is a connecting link." The confusion caused by the name of "*Euthemisto gracilipes*" (by other authors it has evidently been determined sometimes as *E. compressa*, sometimes as *P. oblivia* [Tesch 1911, p. 184—85] which latter again has been considered synonymous with *P. abyssorum*) clearly points in the same direction.

After carefully examining the material of the "Thor", I think I may say with certainty that the three genera ought to be combined. The name should then be *Themisto* after the first established genus, it having been proved that on the male, which must be referred to *T. gracilipes* Norm., p. 5 is considerably longer than p. 6, whereas these two pairs of legs are of the same length in the female, so that the latter should be referred to gen. *Parathemisto*, whereas ♂ is to be referred to genus *Euthemisto* (see further under the species in question).

A key to the European species is given in my paper 1923, p. 19; all these species were taken by the "Thor", except *T. libellula* (which is arctic).

The summary below gives an idea of the affinities of the species:

T. abyssorum — *T. gracilipes* — *T. compressa* f. *compressa*.

| /

T. compressa f. *bispinosa* — *T. libellula*.

From this it appears that both *T. compressa* (incl. the two forms) and *T. abyssorum*, though sharply distinguished one from the other, can nevertheless both be confused with *T. gracilipes*.

In young individuals of *T. compressa* (and *T. bispinosa*) the carpal process in p. 2 is often even as short as in the adult *T. gracilipes*. On the whole, it is difficult to determine young specimens, with the exception of *T. libellula* of which even quite small specimens (2—3 mm) always have the characteristic spines on the dactylus in p. 5 distinctly developed.

For further data see the individual species.

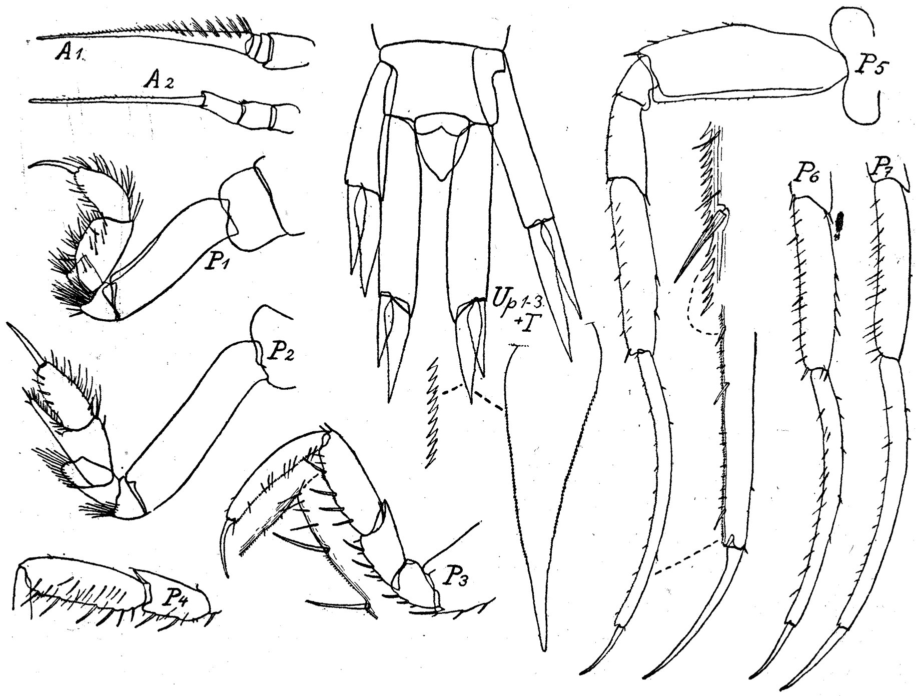

Fig. 36. *Themisto abyssorum* ♀ (without ova), 21 mm, st. 124, 1905. All figures drawn to the same scale except the detail figures of p. 3, p. 5 and up. 3.

1. THEMISTO ABYSSORUM Boeck (Figs. 36—38).

Parathemisto oblivia G. O. Sars 1895, p. 10, Pl. 5 fig. 1. — *Themisto abyssorum* K. Stephensen 1923, p. 20 (lit. and syn.).

Atlantic.

St. 124. 1075 m. 61°04′ N, 4°33′ W. 23-7-1905. 1000 m.w. 21 spec.: 19 ♀ 12—21 mm, 2 ♂ 7 mm.

Parathemisto abyssorum Boeck 1870, p. 7 (87) and *Hyperia oblivia* Kröyer 1838, p. 298 (70), Pl. 4 fig. 9 are considered synonyms by nearly all authors; but this is no doubt incorrect, and *H. oblivia* is probably identical with *Parathemisto gracilipes* Norman (p. 102).

Unfortunately, no comparison of the type-specimens could be made, as the only type of Kröyer is lost (see H. J. Hansen 1887, p. 57) which is all the more to be regretted, as Kröyer's text is incomplete and his figures too small, besides containing some mistakes (also the 9 specimens of "*Parathemisto abyssorum*" from

Greenland, found among the effects left by KRÖYER and mentioned by H. J. HANSEN 1887, p. 57, are lost).

Parathemisto abyssorum Boeck differs from *P.* (*Hyperia*) *oblivia* Kröyer in having the carpi of p. 3—p. 4 only slightly dilated, elongate ovate, — not broadly ovate; — while ant. 1 ♀ is straight and thin, not curved and heavy.

Of ant. 1 in *H. oblivia*, KRÖYER says that 4. joint (flagellum) is more than double the length of the three preceeding joints combined, strongly pointed and very curved. BOECK himself in respect of *P. abyssorum* only says of ant. 1 ♀, that it is abt. as long as the head is high (BOVALLIUS [1889, p. 251] has an excellent original figure [drawn by WESTERGREN] of BOECK's type; this figure is much better than that by BOECK himself). SARS, however, who (l. c. 1895) evidently only has described the species of Boeck, says that ant. 1 ♀ are "about as long as the cephalon and the first segment of the mesosome combined, flagellum only very slightly curved, about three times the length of the peduncle" (he says nothing of the thickness in proportion to ant. 2, but it appears from his fig. that the flagellum of ant. 2 in thickness agrees with the distal two thirds of ant 1.)

Altogether, my specimens agree well with the descriptions and figures given by BOVALLIUS (1889) and SARS (1895); the specimens described by both of these authors undoubtedly belong to the species of BOECK, but BOVALLIUS' list of synonyms also comprises the species of KRÖYER.

For relation to the other species see genus *Themisto* (p. 95) and *T. gracilipes* Norman.

In the following, some additions are made to the descriptions of BOECK, BOVALLIUS and SARS quoted above.

♀ (figs. 36—37). (I have in particular examined one specimen of 21 mm from St. 124, 1905, and one specimen of 5.5 mm from St. 173, 1905 (Skagerrak), 300 m. w.). The first pair of antennæ are of the same length as, or a little longer than, the second one, reckoned from the basis of both; but this does not mean that the apices of the two pairs of antennæ in their natural position would lie side by side, the apex of the first pair never quite extends to the apex of the second. Ant. 1 is straight or very slightly curved (never the shape of a hook); for further particulars see above. In the large female (21 mm) ant. 1 is considerably slenderer than on the small one (5.5 mm).

On the metacarpus of the large specimen p. 1—p. 2 are much more setose than shown by the above-mentioned writers, which undoubtedly stands in relation to the sizes of the animals; as it will appear from my figures, the quantity of setæ increases very much with the size.

In p. 3 the metacarpus in the small spec. is twice as long as it is broad; in the large ones, the proportion is as 3:1; in p. 4, the corresponding proportion is 3:1 and 7:2; the length thus increases with age, in proportion to the breadth.

P. 5—p. 7 become slenderer, as the animal grows older, in particular 6. joint, which in p. 5 of the large specimen is about 19 times, in the small specimen only 14 times as long as it is broad. In the small specimen, the teeth on the front margin of 6. joint are finer, but

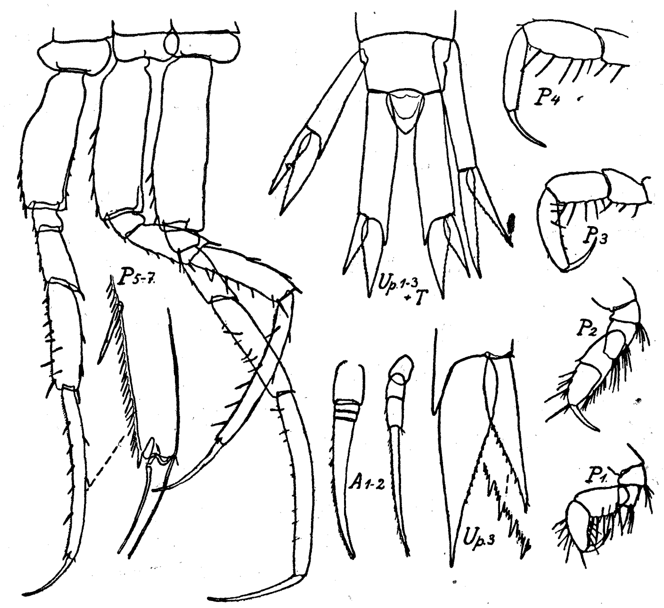

Fig. 37. *Themisto abyssorum*, ♀, 5.5 mm, st. 173, 1905, 300 m.w. All figures drawn to the same scale except the details of p. 5 and up. 3.

the spines are relatively bigger and fewer than in the large specimen. The dactylus is proportionally much longer in the small specimens, but in the small as well as in the large specimens the dactylus is considerably longer in p. 7 than in p. 5; in the small ones it is even half as long as the metacarpus.

The 3 pairs of uropoda are longer and slenderer in the large specimen than in the small one. The processes at the distal end of the inner margin of the peduncle in up. 2—3 become shorter, but much broader, as the individual grows older. In the large specimen, the inner ramus in up. 3 is serrate along both margins, in the young one only along the outer edge.

♂ (fig. 38). The figures and the remarks given below apply to one of the largest specimens in the "Thor" material, 8 mm, St. 173, 1905, 200 m. w.

As appears from the works both of SARS and BOVALLIUS, there is, apart from the antennæ, no great sexual difference in this species. Both of them, however, have overlooked the fact that the uropoda are somewhat heavier in ♂ than in ♀, and that in ♂ there is an excavation in the inner and outer edge of the outer and inner rami of the up. 1. (BOVALLIUS fig. 16 [Monograph] is

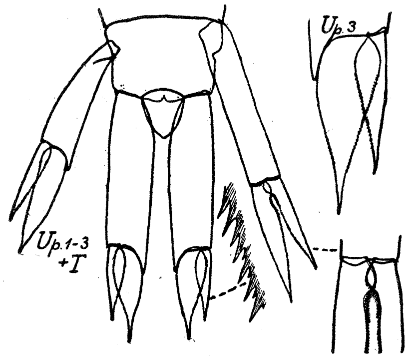

Fig. 38. *Themisto abyssorum* Boeck, ♂, 8 mm, st. 173, 1905, 200 m.w.

in reality of a female, not a male). Besides ♂ is a trifle slenderer than ♀.

Size. See my paper l. c. 1923, p. 24.

Distribution. An almost purely arctic, probably circumpolar species; for special localities see my paper l. c. 1923, p. 20 (with chart).

2. THEMISTO GRACILIPES Norman.

(*Themisto compressa* var. *gracilipes* Norman) (figs. 39-42).

Hyperia gracilipes + (?)*H. oblivia* Norman, Last Report Dredging Shetland; Brit. Assoc. Report for 1868 (1869), p. 287. — *Parathemisto gracilipes* Bovallius 1889, p. 268 (with reproduction of description and figures given by Bate & Westwood 1868). — *P. g.* Th. Scott, Fishery Board for Scotland, 10th Report, pt. 3, 1891 (1892), p. 265. — *P. g.* Norman 1900, p. 131. —*Euthemisto gracilipes* Norman & Scott, Crust. of Devon and Cornwall 1906, p. 54 (lit. and syn.). — *E. g.* Brady & Norman 1909, p. 301. — *E. compressa* var. *gracilipes* Norman, The Celtic Province, its extent and its marine fauna; Transact. Hertfordshire Nat. Hist. Soc., Hertford, vol. 14, pt. 1, 1909, p. 26 (note). — *E. g.* + *E. compressa* (partim) + *P. oblivia* (partim) Tesch 1911, p. 184, 183, 180, Pl. XXV. — *E. compressa* (young stage) Tattersall 1906, p. 24, 36 (partim). — *E. c.* Steuer 1911, p. 9. — *P. longipes* Bovallius, Syst. list 1887, p. 21 (teste Bovallius 1889). — *P. abyssorum* Fowler, Proc. Zool. Soc. London, 1898, pp. 583 —85, § IV (not § I—III, being the true *P. abyss.* Boeck). — ?*Hyperia oblivia* Kröyer 1838, p. 298 (70), Pl. 4 fig. 19. — *H. o.* Sp. Bate 1862, p. 298, Pl. 49 fig. 5 (teste Norman 1906). — *H. o.* Sp. Bate & Westwood 1868, p. 16, textfig. (teste Norman 1906). — *H. o.* Edward, Journ. Proc. Linn. Soc., vol. 9, 1867, p. 143, 166 (teste Norman 1900). — ?*Parathemisto oblivia* Chevreux 1900, p. 145. — ?*P. o.* Walker 1903, p. 223, 230. — ?*P. o.* Stebbing 1904, p. 36 (partim). — ?*P. o.* Tattersall 1906, p. 5, 24. — ?*P. o.* Chevreux 1913, p. 6. — ?*P. o.* Stewart 1913, p. 257. — ?*P. o.* + *Euth. grac.* Tesch 1915, p. 321, 322, 351, 352. — ??*Euth. Gaudichaudii* Stebbing 1888, p. 1411, Pl. 173 (not Pl. 172).

Mediterranean.

St. 12. 19-12-1908. 65 m.w. 1^{00} pm., 30 min. 4 spec. 5.5 mm: 1 ♂ ad., 3 ♀ (1 with ova). — **St. 18.** 30-12-1908. 300 m.w., 9^{30} pm.(?), 60 min.(?). 1 ♂ jun. 7 mm. — **St. 106.** 25-6-1910. 1200 m.w., 0^{20} am., 60 min. 1 ♀ 6 mm. — **St. 107.** 25-6-1910. 65 m.w., 9^{50} am., 15 min. 1 ♀ jun. 4 mm. — **St. 123.** 3-7-1910. 65 m.w., 0^{55} am., 30 min. 2 spec.: 1 ♂ ad. 5 mm, 1 ♀ with ova 6 mm. — **St. 183.** 16-8-1910. 300 m.w., 4^{45} pm., 15 min. 20 spec.: 3 ♂ ad. 6 mm, 17 ♀ (4 with ova 5—7 mm) 4—7 mm. — **St. 729.** 41°00′ N, 17°49′ E. 14-4-1913. 30 spec.: 17 ♂ ad. 4—5 mm, 13 ♀ (4 with ova) 5—6 mm.

Atlantic.

St. 72. 57°52′ N, 9°53′ W. 8-6-1905. 1500 m.w. 3 spec.: 1 ♂ jun. 5 mm, 2 ♀ 4 mm. — ? **St. 88.** 48°09′ N, 8°30′ W. 20-6-1905. 300 m.w. 33 ♀ (1 with embryos 9 mm) 5—9 mm. — **St. 90.** 47°47′ N, 8°00′ W. 21 (22)-6-1905. 300 m.w. 2 spec.: 1 ♂ 7 mm, 1 ♀ 7—8 mm. — **St. 47.** 45°00′ N, 2°57′ W. 17-5-1906. 300 m.w., 2^{25} pm., 120 min. 1 ♀ with ova 7 mm. — **St. 36.** 44°21′ N, 2°37′ W. 10-5-1906. 1250 m.w. 4 ♀ with embr. 7—8 mm. — **St. 168.** 58°42′ N, 6°13′ W. 2-9-1905. 65 m.w. 2 ♀ 4 mm. — **St. 74.** 49°23′ N, 12°13′ W. 10-6-1906. 2000 m.w. 11^{35} am., 60 min. 11 ♀ (5 with ova) 6—7 mm. — **St. 76.** 47°27′ N, 13°33′ W. 12-6-1906. 200 m.w., 2^{40} am., 120 min. 1 ♀ 7 mm. — **St. 76.** ibid. 2800 m.w., 3^{00} pm., 120 min. 44 spec.: 4 ♂ ad. 5—6 mm, 40 ♀ (7 with ova 5—6 mm) 4—7 mm (1 ♀ 8 mm). — **St. 181.** 49°22′ N, 12°52′ W. 4-9-1906. 1800 m.w., 60 min. 1 ♀ 5 mm. — **St. 1.** 28-11-1908. 25 m.w., 2^{50} am., 30 min. 74 spec.: 25 ♂ (ad. & jun.) 3—4 mm, 49 ♀ (3 with ova) 3—4 mm. — **St. 3.** 30-11-1908. 65 m.w., 1^{15} pm., 30 min. 1 ♀ 4 mm, 1 ♂ ad. 4 mm. — **St. 4.** 1-12-1908. 1500 m.w. 11^{45} am, 30 min. 2 spec.: 1 ♂ ad. 5.5 mm, 1 ♀ 4 mm. — **St. 70.** 4-3-1909. 65 m.w., 9^{00} am., 60 min. (6 ×) 172 spec.: 20 ♂ ad. 5—6 mm, 75 ♀ without ova 5 mm, 77 ♀ with ova (a few with embryos) 5—6 mm. — **St. 73.** 8-3-1909. 65 m.w., 3^{30} pm., 30 min. 5 spec.: 1 ♂ ad. 4 mm, 4 ♀ (1 with ova) 4—5 mm. — **St. 76.** 10-3-1909. 25 m.w., 7^{15} pm., 30 min. 45 spec.: 15 ♂ ad. 5—7 mm, 30 ♀ (9 with ova 6—8 mm) 5—9 mm. — **St. 76.** 65 m.w., 6^{05} pm., 60 min. 27 spec.: 9 ♂ ad. 6—7 mm, 18 ♀ 4—6 (7) mm (3 with ova 6 mm). — **St. 76.** 300 m.w., 11^{30} am., 60 min. Abt. 500 spec.: 200 ♂ (a few of them jun.) 5—7 mm, 300 ♀ (35 with ova) 5—6 mm. — **St. 76.** 600 m.w., 1^{15} am., 60 min. 109 spec.: 39 ♂ ad. 6—7 mm, 70 ♀ (14 with ova or embryos) 5—7 (8) mm. — **St. 76.** 1600 m.w., 2^{40} pm., 60 min. 9 spec.: 7 ♂ (1 juv.) 4—7 mm, 2 ♀ (1 with ova) 5 mm. — **St. 77.** 11-3-1909. 65 m.w., 3^{15} pm., 30 min. 42 spec.: 24 ♂ 5—6 mm (a few of them jun.; 1 spec. 8 mm), 18 ♀ (4 of them with ova or embryos 4 mm) 4—5 mm. — **St. 79.** 13-6-1910. 65 m.w., 8^{40} am., 15 min. 113 spec.: 67 ♂ (some of them jun.) 6—7 mm, 46 ♀ (5 with ova 5—6 mm) 5—7 (8) mm. — ? **St. 80.** 13-6-1910. Surf. (P. 100), 10^{05} pm., 5 min. 5000 jun.(?), 1—1.5 mm. — ? **St. 81.** 15-6-1910. Surf. (P. 100), 4^{05} pm., 5 min. 3 jun.(?), 1—1.5 mm. — **St. 85.** 17-6-1910. Surf. (P. 100), 2^{05} am., 10 min. 15 spec.: 9 ♂ (1 jun. 4 mm) 4—5 mm, 6 ♀ (3 with ova 4—5 mm) 3—5.5 mm. — **St. 87.** 17-6-1910. 300 m.w., 4^{00} pm., 30 min. 3 ♀ 5 mm. — **St. 236.** 13-9-1910. Surf. (P. 100), 11^{15} pm., 10 min. 23 spec.: 18 ♀ 4—5.5 mm, 5 ♂ 5—7 mm. — **St. 236.** ibid. 25 m.w., 11^{00} pm., 15 min. (70 ccm = 15 ×). 220 spec.: 108 ♂ (some of them jun.), 2 ♀ with ova 6—7 mm, abt. 110 ♀ without ova 5—6 mm. — **St. 239.** 15-9-1910. 25 m.w., 5^{10} pm., 15 min. 2 ♀ 6 mm, 1 (2 ?) ♂ jun. 5 mm. — **St. 245.** 17-9-1910. 400 m.w., 5^{15} pm., 120 min. 1 ♂ 7 mm. — **St. 246.** 18-9-1910. 100 m.w.,

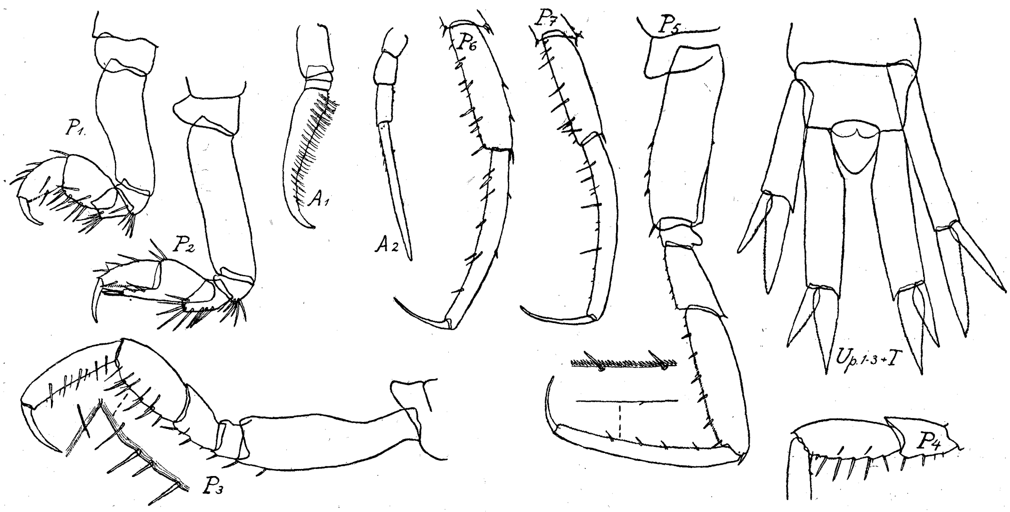

Fig. 39. *Themisto gracilipes*, the "short-legged" form. ♀ with ova 6 mm, st. 70, 1909, 65 m.w. All figures drawn to the same scale.

8^{15} am., 15 min. 30 spec.: 9 ♂ ad. 4—5 mm, 7 ♂ jun. 4—5 mm, 14 ♀ 3—5 mm. — **St. 247.** 19-9-1910. Surf. (P. 100), 8^{40} pm., 10 min. 6 spec.: 4 ♂ ad. 4 mm, 2 ♀ 3—3.5 mm. — **St. 248.** 20-9-1910. Surf. (P. 100), 9^{30} pm., 10 min. 6 ♂ (1 jun.) 5 mm. — ? **St. 242.** 17-9-1910. Surf. (P. 100), 4^{00} am., 10 min. 200 spec. jun., 1—4 mm. — ? **St. 242.** ibid. Surf. (P. 100), 10^{25} pm., 10 min. 3 spec. jun. 1 mm.

The greater part of the immense *Themisto*-material of the "Thor" is made up of small individuals, about 5—6 mm long, which cannot be identified either with *T. abyssorum* or *T. compressa*, but occupy an intermediary position between the two species; some few individuals indeed, come very near to *T. bispinosa*. It cannot be maintained that the deviation from the species mentioned is due to their being young individuals, for about half of those in the present material are clearly adult specimens, which appears, firstly from the long articulated antennæ and the shape of up. 1 in the male, and further from the fact that a great number of females have ova or embryos, without being larger or differing in other respects from the other specimens in the same sample.

As it has proved very difficult to determine these specimens from extant works, I will first of all give a description of the animals, and later on examine the question from a literary point of view.

The principal source of difficulty in making the determination is the extremely great variation as regards p. 5. The extremes are represented, partly by a form where p. 5 is not longer than p. 6, nor in other respects particularly deviating, so that the animals are made to resemble *T. abyssorum*, and partly by a form where p. 5 is so long that p. 6 (p. 5—p. 6 when fully straightened out) reaches only to about the proximal $^1/_4$ or $^1/_6$ of the metacarpus in p. 5, which in the most extreme cases can on the distal half be provided with a comb $^3/_4$ the breadth of metacarpus itself, in which respect the animals can easily be confused with *T. bispinosa*. The two forms are connected by numerous intermediary stages, which can easily be confused with *T. compressa*.

The two extreme forms are in the following called the short-legged and the long-legged type respectively.

A. The short-legged form (Figs. 39—40).

Probably identical with *Hyperia oblivia* Kröyer (see above p. 95).

♀ (fig. 39). Habitually bearing a strong resemblance to *T. abyssorum*; the difference between *H. oblivia* and *P. abyssorum* as regards ant. 1 and p. 3—p. 4 is given under this species (p. 96); see also the key in my paper on the "Ingolf" Amphipoda 1923, p. 19.

The size is 4—7 mm; in a very few cases 9 mm; ♀ with ova (4) 5—7 mm, rarely 8 (9) mm. On the other hand *T. abyssorum* is as a rule larger, 7—10 mm or even 17—22 mm.

The cephalon as in *T. abyss.* The mesosome along the dorsal line of the same length as the metasome + urosome. The body is slightly compressed, so that there may be an indication of a carina, particularly in the hindmost mesosome segments and the foremost metasome segments, but there are as a rule no dorsal teeth. A few specimens of the short-legged form approach *T. compressa* in having a suggestion of small teeth along the dorsum (St. 88, 1905; St. 79, 1910, 65 m.w.), but also in these specimens the carpal process in p. 2 is not so long as the metacarpus, but only extends to about its proximal $^2/_3$, which agrees with *T. gracilipes.*

For ant. 1—2 see under *T. abyss.* p. 96. P. 1—p. 2 hardly indicate any specific difference from small individuals of 5—7 mm of *T. abyss.*; in small individuals of *T. abyss.* the upper margin of the metacarpus in p. 1—p. 2 seems to have a few more spines than in *T. gracilipes* (about 8 against 3—4), but the carpal process in p. 2 is short in both species, in *T. gracilipes* only a little over half the length of the metacarpus.

In p. 3, the carpus is ovate, with a fairly regularly curved, upper and under margin; on the under margin

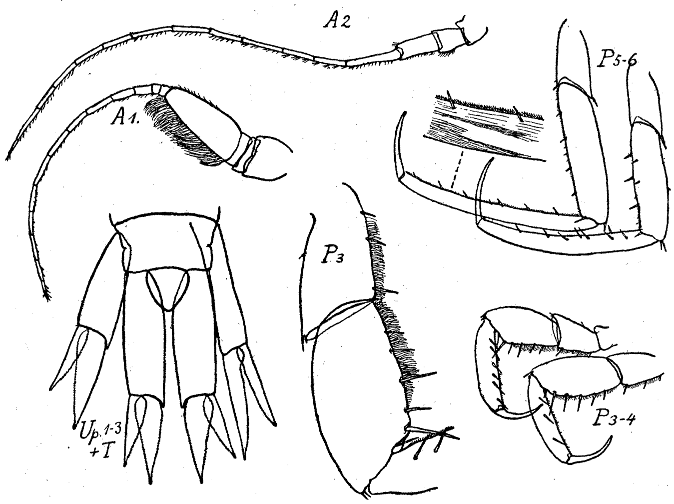

Fig. 40. *Themisto gracilipes* ♂, the "short-legged" form, st. 123, 1910, 65 mw. All figures drawn to the same scale except the details of p. 3 and p. 5.

there are some 5 rather large spines; the length is double the greatest breadth. Between the spines on the under margin of the carpus there are no fine hairs. The carpus in p. 4 is of similar shape, but more elongate; the length is between $2^1/_2$ and 3 times as great as the greatest breadth; on the under margin there are some 6 rather large spines, and at the distal end there are fine hairs between the spines. For difference from *T. abyssorum* see this species (p. 96); in other respects there does not seem to be any difference in p. 3—p. 4 between the two species.

P. 5 resembles p. 5 in *T. abyssorum*, but is slightly heavier than in specimens of a corresponding size of *T. abyss.*; there is hardly any character sufficiently pronounced to be designated as a specific difference. P. 6—p. 7 are a trifle shorter than p. 5, which is due to the fact that the carpus is a little shorter and narrower, in p. 7 only $^3/_4$ as long. As in *T. abyss.* there are small teeth on the front margin of the metacarpus in p. 5—p. 6 (not in p. 7), but the carpus and metacarpus have more and larger spines in p. 6—p. 7 than in p. 5. The dactylus in p. 7 longer than in p. 5; in p. 5 the metacarpus is $3^1/_2$ times as long as the dactylus, in p. 7 only $2^1/_2$ times as long.

The uropoda resemble up. in *P. abyssorum* of a corresponding size, but the inner rami in up. 1—2 are a little heavier in *T. gracilipes*, and there are teeth on both margins of the inner ramus in up. 3 (in small specimens of *T. abyss.* only along the inner margin). The distal end of the median-margin of the peduncle in up. 2—3 terminates in a rather large tooth (considerably longer in small specimens of *T. abyss.*). The telson is $^1/_3$ the length of the peduncle in up. 3; it is nearly as broad as it is long, and the apex is rounded.

♂ (fig. 40). The size very nearly as ♀ with ova; a few adult ♂, however, are only 4 mm. ♂ is as a rule a little slenderer than ♀; besides the other sexual differences, which will be mentioned later on, it is distinguished from ♀ by p. 5, even in the most shortlegged animals, being somewhat longer than p. 5; for further particulars see below.

In the following, only the difference from ♀ are mentioned; description and fig. apply to a 5 mm male, from St. 123, 1910, 65 m. w. which seems to have the shortest p. 5 in the whole of the material.

In ant. 1, the flagellum has 13 joints; in ant. 2, which is somewhat longer than ant. 1 and of the same length as cephalon + pereion, there are also 13 joints in the flagellum. In p. 3 the carpus is distinguished from ♀ in having the under margin almost entirely straight up to the distal end, where with a sudden bend it curves upwards towards the metacarpus. The under (hind) margin of the carpus and the preceding joint is also besides the usual spines covered with fine, soft hairs. In p. 4 the shape of the carpus is as in the female, but it has the same setose covering as in p. 3 ♂. P. 5 is a little longer than p. 6, the proportion of the carpus to that in p. 6 being as 6:5; the metacarpus in p. 5 is, on the other hand, only a trifle longer than in p. 6. Up. 1—3 are as in the female, but the peduncle is a trifle shorter. The inward excavations in the opposite margins of the two rami in up. 1 are not very large, for which reason I presume that the specimen shown is not an adult. In the other specimens, up. 1—3 are a little shorter and broader, and the above-mentioned excavations on the median margins longer.

B. The long-legged form (Fig. 41).

In its most extreme form this type can easily be confused with *T. bispinosa*, in that p. 5 has a high comb on the distal $^2/_3$ of the metacarpus; it is, moreover, so long that p. 6 does not extend to more than the proximal $^1/_4$ of the metacarpus; for the rest see below.

In the material there are not a few specimens of this form, particularly from St. 76 (1909, at all depths below

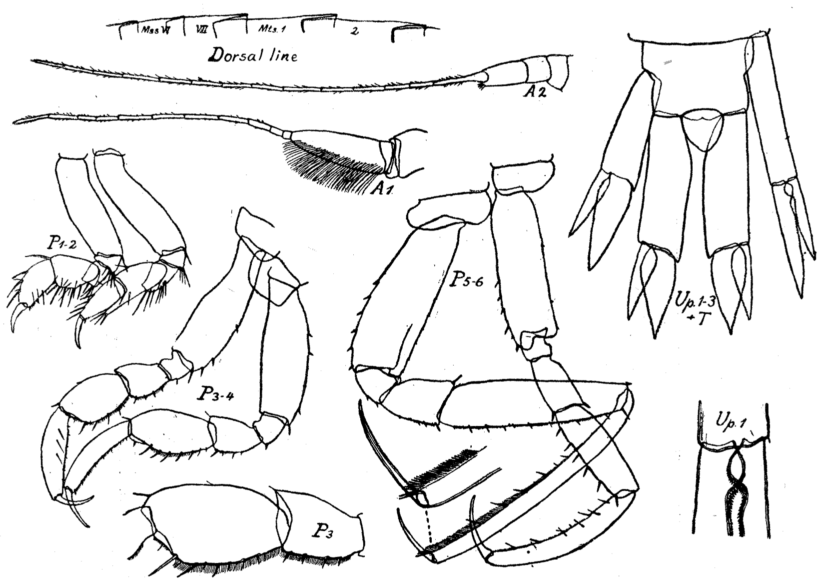

Fig. 41. *Themisto gracilipes* ♂ ad., 7 mm, the "long-legged" form. All figures drawn to the same scale except details of p. 3, p. 5 and up. 1.

the surface) and St. 236 (1910; surf. and 25 m. w.); but it is not nearly so numerous as the short-legged form. Apart from p. 5, both sexes seem to be entirely like the short-legged form; as to ♀ there is otherwise nothing to add.

♂ (fig. 41). The figures and the remarks below apply to a large male of 7 mm from St. 76, 1909; apart from p. 5 the differences between this and the short-legged ♂ of 5 mm mentioned and shown above, are as far as I can see, only due to the difference in size. The carpus in p. 3 is proportionally a little broader and with its sharp bend on the under margin it has a very characteristic form. P. 5 is so much longer than p. 6, that when both legs are straightened out, the metacarpus of p. 6 will at most extend to the proximal $^1/_4$ of the metacarpus of p. 5; this is due to the fact that both the carpus and the metacarpus of p. 5 are between $1^1/_2$ and 2 times as long as that of p. 6. The metacarpus of p. 5 has, on its front margin, besides larger and thick bristles, also a comb of teeth or spines at the distal end reaching a length corresponding to $^3/_4$ the breadth of the metacarpus.

The uropoda are a little broader and heavier than in the short-legged, somewhat smaller male described; besides there is a considerably longer excavation in the opposite margins of the rami in up. 1 than in the smaller male.

C. Intermediary forms between the short-legged and the long-legged forms. A large quantity of the material, not quite as numerous as the short-legged form, but considerably more numerous than the most extreme long-legged one, cannot be attributed to either of the above-mentioned forms, but form a continuous transition between the latter, so that the two extreme forms are not different species, but only the extreme links of a series of forms.

The specimens most nearly allied to the short-legged form have proportionally longer p. 5, but not a higher comb on the metacarpus in p. 5. The development tends in the direction of p. 5 becoming longer and longer; when it has attained proportionally the same length as in the long-legged form, the comb on the metacarpus increases in breadth, so that it becomes at last as broad as the long-legged, broad-combed form. All of these intermediary stages are represented in the material, and they are mixed in such a manner that, when one sample contains only a few animals, it is nearly always the short-legged form; in larger quantities of specimens some of the intermediary forms are represented, but only in the very large samples is the long-legged form with a high comb on p. 5 represented. There is nothing to suggest that the various forms represent different age-stages because in all of them there are adult males as well as females with ova. (The use of the word development in the above, must not be taken as meaning that the same individual commences by having a short p. 5 and later on has a long p. 5 with a high comb, but only that the above-mentioned characters may be more or less strongly developed in the various individuals.) The intermediary forms with long p. 5, but a low comb on the metacarpus can easily be confused with

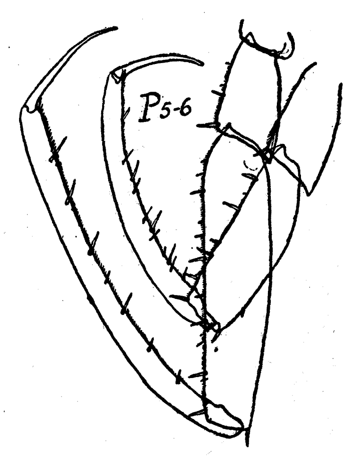

Fig. 42. *Themisto gracilipes* ♂, 5.5 mm, st. 76 (1909, 600 m.w.). Intermediate form.

a small *T. compressa*, where, however, the carpus in p. 3 is considerably narrower at the distal end, and where there are more (about 10) spines on the under margin of the carpus.

The material comprises 31 (36) stations, 37 (43) hauls, about 5500 spec., besides an almost equally large quantity of young ones, too small (1—1.5 mm) for certain determination. Distributed according to sex 23 ♂, 36 ♀ were taken in the Mediterranean, and about 2150 ♂, 3300 ♀ in the Atlantic; the proportion between number of males and females is thus in both seas nearly as 2:3.

A. Mediterranean.

In this sea, from which the species has not previously been recorded with certainty (see below under Distribution) it was found at 7 stations, 7 hauls, 59 spec. in all. The stations are distributed over the whole of the Mediterranean, as far as into the eastern region: 2 stations lie east of the Strait of Gibraltar, 1 in the Bay of Genova, 1 in Tarento Bay, 1 in the southern part of the Adriatic, and 2 in the Bay of Piræus. The depth of the sea is between < 100 m and 2000 m. The specimens were taken at all seasons and the greater number with a length of wire of 65—300 m, but no difference is to be seen between the depths during the night and the day respectively. Females with ova were found both in April, June, August and December.

B. Atlantic.

The species was taken here at 24 (29) stations, 30 (36) hauls in all; number of specimens about 5400. The distribution according to months is as shown in the summary below.

	stations	hauls	specimens
June 1905	2	2	5
Sept. —	1	1	2
May 1906	2	2	5
June —	2	3	56
Sept. —	1	1	1
Nov. 1908	2	2	76
Dec. —	1	1	2
March 1909	4	8	abt. 1750
June 1910	3	3	131
Sept. —	6	7	3399
Total...	24	30	abt. 5400

Depth of the sea and occurrence.

Depths in m	Total no. of posit. stations	Posit. stations of the "Thor" 1908—10
0— 500 m	13	12
> 500—1000 -	2	—
> 1000—2000 -	7	2
> 2000—3000 -	1	—
> 3000 -	1	1
Total...	24	15

From this it appears that of the 15 positive stations in 1908—10 12 are at depths of 0—500 m, 11 even at depths answering to 94—180 m and only 1 station (st. 245) at 330—460 m.

The species was taken all the way from the Bay of Cadiz along the coast of Portugal, across the Bay of Biscay as far as the Channel, and South-west Ireland, and also in two localities (St. 74 and 168, 1905) west of Scotland. Here it meets the *T. abyssorum*, which supplants it in the northern waters.

For information to be found in extant literature see below under Distribution.

Vertical Occurrence.

Depth 0—500 m. (1908—10).

	No. of hauls		No. of spec.	
	Night	Day	Night	Day
10— 25 m. w.	5	1	3409	3
65—100 —	—	6	—	860
150—250 —	—	—	—	—
400 —	—	1	—	1

The subjoined table, comprising only hauls from depths of 0—500 m, shows that during the night the species was only taken close to the surface (at most 25 m. w.), during the day almost exclusively with 65—100 m. w. It occurs both in shoals and sporadically.

Propagation. North of 40° N. females with ova or embryos were found in March, May, June and Novbr., and South of 40° N. in March, June and Sept.; it thus seems to propagate at least in the northern area all the year round.

One female from St. 76, 1909, 25 m. w. (6 mm, fairly long p. 5, with a low comb), which had the whole of its marsnpium full of ova, apparently without having lost a single one, had 37 ova, 0.6—0.7 mm in diameter.

Literature and synonymy.

On account of its very varying appearance, which makes it resemble no fewer than 3 different species, and the lack of any really good description or figure in extant literature, this species has given rise to much confusion.

Nevertheless there can not be much doubt that the species in question is *Euthemisto gracilipes* NORMAN.

From the short original descriptions given by NORMAN, especially NORMAN & SCOTT 1906, and BRADY & NORMAN 1909, we learn that it very nearly approaches *Euthemisto compressa* "in the form of the carpus of the two first pairs of legs and other particulars. The obvious differences are the total absence of any sign of the dorsal spination characteristic of *E. compressa* Goës, and its very small size (we have not seen any specimens that exceeded 6 mm length)" (Norman & Scott 1906, p. 54). "Although we have given it as a species, we really regard it as a depauperized form of *E. compressa*" (Brady & Norman 1909, p. 301). (Norman 1909 [The Celtic Province], p. 26, note, changes the name into *E. compressa* var. *gracilipes*). — "British writers, following the mistake of Bate & Westwood, have frequently recorded it as *Parathemisto oblivia*. From that species it may at once be distinguished by the carpus of the first two pairs of peræopods, which are ovately formed, and wider than the preceeding joint." (Brady & Norman 1909, p. 301). — The form described above must be that noted in the foregoing as the short-legged form.

The real *T. gracilipes* doubtless has not infrequently been determined in extant works as the species, which it may resemble in its various forms, *viz. T. abyssorum* Boeck and *T. compressa* Goës (= *T. bispinosa* Boeck) though of course this cannot always be demonstrated in each indicidual case from the literature alone. A good deal of light has been thrown on the confusion by the item of information given by Tesch (l. c. 1911, p. 185) as to the Bulletins of the International Marine Investigations. In not a few cases we find remarks of a morphological or biological character, and these can at times — at any rate to some extent — give valuable hints as to the question of species. For *T. abyssorum* Boeck and its relation to the present species see above.

Below will be given an examination of the literature which in my opinion ought to be referred to this species.

Hyperia oblivia Kr. 1838 (♀) is probably the present species (and not *T. abyssorum* Boeck), which in particular is evident from the strongly curved ant. 1 (Kröyer l. c., Pl. 4 fig. 19 a) and the oval carpus in p. 3 (ibid. fig. 19 c). That it is the short-legged form appears from the statement that p. 5—p. 7 are "inter se nearly of the same length" (Kröyer gives no figure of this). Kröyer's figure of uropoda (l. c. fig. 19 f) contains various mistakes, the greatest being that up. 1 has been made shorter than up. 2.

On Edward 1867, Sp. Bate & Westwood 1868, Scott 1891 and Norman 1900, see Tesch 1911, p. 184—185.

Norman l. c. 1869 mentions firstly *H. oblivia* Kr. (non B. & W.) which he characterizes among other things by p. 5—p. 7 having "the whole hinder edge of the propodos microscopically pectinate", and also *H. oblivia* B. & W. (non Kr.) which, on account of B. & W.'s erroneous statement of the form of p. 2, he proposes to call *H. gracilipes*, and thus this name was introduced into the literature. (It can hardly be considered out of the question that his "*H. oblivia* Kr." is in reality *Parath. abyssorum* Boeck).

Bovallius l. c. 1887 refers *H. oblivia* Bate to genus *Parathemisto*, and calls it at the same time *P. longipes* n. sp., from which it seems evident that he was not acquainted with Norman 1869. In 1889 he changes the name into *P. gracilipes*.

Euthemisto Gaudichaudii Stebbing 1888 is perhaps the present species, but has been taken in the South Sea.

Fowler l. c. 1898 examines "*T. abyssorum* Boeck" from biological points of view, and arrives at the conclusion that it can be divided into a larger form (7—10—17 mm) living over great depths of the sea in the more northern waters, and a smaller form (3—5 mm) which is encountered at shallower depths towards the south (British coasts). I now consider it an absolutely foregone conclusion, partly on the strength of the list of literature given by Fowler, and partly by comparisons with the biological results from the "Thor", that the larger northern form of Fowler (Fowler l. c. p. 583—584, § I—III) is *T. abyssorum* Boeck, whereas the small form from shallower depths (Fowler ibid. § IV) is *T. gracilipes*. *P. oblivia* Walker 1903 is, on account of the locality, undoubtedly *T. gracilipes*, and the same holds good for Chevreux 1900 and 1913 and Stewart 1913, perhaps also partly for Stebbing 1904.

What Tattersall 1906 p. 24 mentions under the name of *Euth. compressa*, also comprises *T. gracilipes* (note ibid. p. 36) which, however, Tattersall only considers a juvenile form of *T. compressa*. What T. calls *P. oblivia* undoubtedly also includes *T. gracilipes*.

Steuer l. c. 1911 says that *T. compressa* "scheint der häufigste Planktonamphipod der Adria zu sein;" the size is given as 7.5—8 mm at the most. On the strength of the "Thor"-material I consider it exceedingly probable that the species in question is really *T. gracilipes*.

Tesch 1911 gives a short summary of the fate of the name *Euth. gracilipes* in the literature. To this species must, however, also be reckoned part of the material, which he records, partly under *Euth. compressa*, partly under *P. oblivia*. As to Tesch's chart of the distribution see below under "Distribution".

Apart from Tesch 1911, no attention has been paid to the statements of the International Marine Investigation as regards the species in question [Publications de circonstance No. 33 (1906), No. 48 (1909), No. 70 (1916)], for the determinations are, at any rate as far as the Danish material is concerned, not reliable (O. Paulsen, Meddel. Komm. Havundersøg., Plankton vol. 1, No. 9, 1909, p. 53).

As to Tesch 1915 there is nothing to add beyond the fact that "*T. oblivia*" undoubtedly does not comprise Boeck's species.

Distribution and biology.

For the "Thor", see above.

?Greenland (Kröyer 1838) see above p. 102.

1. The waters on both sides of the British Isles. "Shallow waters round our coasts": Banff (Moray Firth), Forth, Clyde, St. Andrews (between Leith and Dundee), Valentia, Galley Head (Co. Cork) (Fowler l. c. 1898, p. 584 § IV). — ?Shetland (Norman 1869). — Moray Firth (Bate & Westw.). — Largo Bay (Firth of Forth) (Scott 1891). — Devon and Cornwall, at all seasons; W of Scotland (Norman & Scott 1906). — 52°7.5′ N, 11°20.1′ W, surf., 20 fath., 50 fath. several young, the largest being 7 mm long (Walker 1903). — Redcar, North Yorkshire (Norman 1909). — Northumberland, different localities (Brady & Norman 1909). — Southern W. Ireland, shallow water, at all seasons (Tattersall 1906). — North sea 27 (39) stations, 16—80 m. Jan. 25—May 13 (Tesch 1915).

2. Bay of Biscay: without locality (?Stebbing 1904 and Chevreux 1900, surf. (night) and 494 m (day).) — ?The west coast of France between Pen March or Ile de Sein (south of Brest) and Spain, 50—90 m below the surf. (Chevreux 1900 and 1913).

3. Bay of Cadiz 39° N, 10° W, a few spec. 3—4 mm (in the Copenhagen Zool. Museum).

4. ?Southern Atlantic. 15°45$^1/_2$′ S, 33°11$^1/_2$′ W, 1 ♀ 3.5 mm, determination not certain (Stewart 1913).

5. Mediterranean. Beaulieu (between Nizza and Monaco) 0—50 m (Chevreux 1913). — ?Adriatic. (Steuer 1911). —

If the above list of distribution, which agrees in a striking degree with the collections of the "Thor", is correct, the chart of the distribution given by Tesch (l. c. 1911, Pl. XXV) is incorrect, as it extends too far towards North and East.

It must undoubtedly be considered a small southern shallow water form (esp. on 0—200 m) of *T. abyssorum* (Fowler 1898) or *T. compressa* (Norman & Scott 1906, Norman 1909) and forms a connecting link between the two species. It is probably a good species.

The statements contained in the works of several writers that it may at times occur in immense quantities agrees well with the results of the "Thor" (Tattersall 1906, Brady & Norman 1909); indeed, it may at times be washed ashore in such quantities as to form an actual wall (Norman 1909, Brady & Norman 1909).

According to Brady & Norman, the specimens found off the northern part of the east coast of Great Britain must have been carried thither by a current coming from the North. This agrees well with the fact that the species has never been found in the middle regions of the North Sea; the specimens to be found in the southern regions (Tesch 1915) or in the Channel ("Thor") have thus been brought there from the south.

Symbiosis. Norman l. c. 1869 mentions a female found in *Aurelia*; but perhaps it is *T. abyssorum*.

3. THEMISTO COMPRESSA Goës.

(= *Themisto compressa* Goës + *Th. bispinosa* Boeck).

As it appears from the literature (see the historical summary in Vosseler 1901, pp. 81—83) there are very different opinions as to whether *Themisto compressa* and *T. bispinosa* are one or two species. Since they were first distinguished by Stebbing, (1888) however, and Sars (1895) all modern authors (with the exception of Bovallius 1889) seem to consider them two species.

The fact that both of the above-mentioned authors only had a few specimens at their disposal has made the matter appear simpler than it really is, as will also be seen from the work of Vosseler; the figures of Sars of both "species" present extreme forms, and my material shows clearly that the specific characters are by no means always so strongly developed as represented in Sars' figures.

In 1887 p. 59—60 H. J. Hansen mentions intermediary forms, for which reason he considers them synonymous; he is of opinion that *T. compressa* is the young, *T. bispinosa* the older individual, which, however, is no more correct than the opinion of Bovallius (Monograph) that *T. compressa* is ♀, *T. bispinosa* ♂, for in the material at my disposal there are great quantities of ♂ and ♀ among typically developed individuals of both "species". In the "Thor" material also I have now found intermediary forms which, though adult, can neither be ascribed to the one nor the other species, but combine the characters of both; it is thus an established fact that they are in reality one species.

Vosseler's summary of the specific differences (l. c. p. 83) is in some points not a happy one. In *T. compressa* the thorax (pereion) is said to be longer than the pleon, in *T. bispinosa* shorter; in all the specimens I have measured, the pereion is longer than the pleon in both "species". Further, the cephalon in *T. compressa* is said to be shorter, in *T. bispinosa* longer than the following

3 segments. This ought to be corrected to the following: in *T. compressa* the pereion is of the same length as the 3 first pleon segments, in *T. bispinosa* corresponding in length to about $3^1/_2$—4 first segments. In *T. compressa* the under margin of the carpus in p. 3 is fairly regularly curved, in *T. bispinosa* on the other hand, the greatest breadth is proximal in relation to the middle.

The comb on the metacarpus in p. 5 is in *T. bispinosa* not infrequently as broad as the metacarpus itself; it is almost entirely absent in the proximal half. The dactylus always extends beyond the comb and is at least twice as long as the breadth of the metacarpus + comb. In *T. compressa* there is no comb, but only a row of fine teeth or spines. In both "species" the epimeral part of p. 5—p. 6 (1. joint) is provided with a process near the under margin; in this manner two rather large teeth appear on either side of the animal (see fig. 47, p. 108[1]). Vosseler's specimens differ both from my specimens and, as far as I know, from all those mentioned in the literature, by frequently having the peduncle in up. 1 longer than in up. 2, whereas it is generally shorter.

Both "species" have teeth along the dorsal line, in particular on 6.—7. mesosome segment and 1. metasome segment, but on the immediately preceding and the immediately succeeding segment a suggestion of a tooth may be found. My figure (fig. 43) represents *T. bispinosa*, but the teeth have almost the same development as in *T. compressa*. The first suggestion of teeth comes as a rule when the animals are about 9 mm long, but they are rarely quite distinct in individuals of less than 10—11 mm. In large individuals they are as rule very large and (often) with a strong upward bend.

Vosseler (l. c. p. 82) is right in saying that during their growth no essential change takes place in the two "species" (except as regards the dorsal teeth, which are not mentioned), as individuals of about 5 mm have already fully developed specific characters. This agrees extremely well with the "Thor" material; much greater variety is possible among individuals of the same size than between small and large specimens.

[1] Shortly before this work was ready for press my attention was drawn to the fact that Chevreux 1911 (Bull. Inst. Océanogr. Monaco, No. 204, p. 13) had already observed the same in a *T. compressa* female with ova, 23 mm, from the Bay of Biscay. He says that these processes are not to be found on Norwegian specimens, which, it is true, do not exceed 12 mm, and are thus only about half as large as the specimen in question. In consequence of this remark I have examined specimens from various regions of the North Atlantic, and all specimens exceeding 8—9 mm have these processes, but they are greatest and most pronounced in large individuals. It thus seems as if they develope fairly simultaneously and together with the dorsal teeth.

Vosseler is also right in saying that there is no great sexual difference; but there are differences also in other respects than as regards the length of the antennæ (see the two "species" separately).

Though it must be considered an absolute fact that the two "species" are in reality only one; they will, for

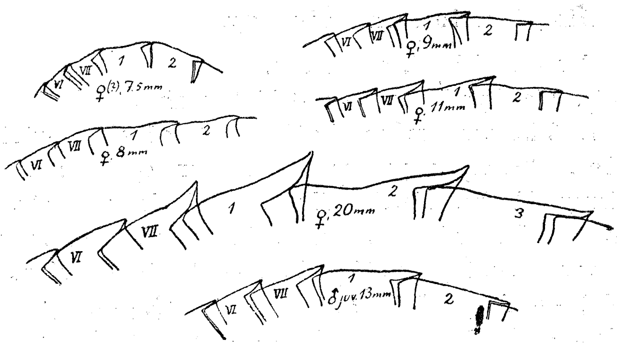

Fig. 43. *Themisto bispinosa*, dorsal line of some of the segments of specimens of different sizes (7.5—20 mm). All figures drawn to the same scale. VI—VII: 6.—7. mesosome segments. 1—3: 1.—3. metasome segments.

clearness' sake, be treated separately, first on the strength of the material of the "Thor", secondly as regards literature and synonymy, and last of all the intermediary forms will be dealt with. I propose to call them *Th. compressa* Goës forma *compressa* n. n. and *Th. compressa* Goës forma *bispinosa* Boeck n. n. respectively.

3 A. THEMISTO COMPRESSA Goës forma COMPRESSA Goës (K. St.) (Figs. 45—46).

Themisto compressa forma *compressa* K. Stephensen 1923, p. 27 (lit.). — ??*Euthemisto Thomsoni* Stebbing 1888, p. 1414, Pls. 174—75.

[**Mediterranean.**

St. 18. 30-12-1908. 300 m.w., 9^{30} pm.(?), 60 min.(?). 1 ♀ jun. 8 mm.]

Atlantic.

? **St. 90.** 47°47′ N, 8°00′ W. 21 (22)-6-1905. 300 m.w. 7 ♀ (1 with embryos) 6—8 mm. — **St. 124.** 61°04′ N, 4°33′ W. 23-7-1905. 1000 m.w. 2 ♀ 11 mm. — **St. 162.** 63°42′ N, 13°02′ W. 27-8-1905. 65 m.w. 3 ♀ (1 with ova) 7—10 mm. — **St. 164.** 61°21′ N, 11°00′ W. 29-8-1905. 65 m.w. 2 ♀ 12—14mm. — **St. 179.** 47°20′ N, 12°23′ W. 3-9-1906. 300 m.w. 1 ♀ 13 mm. — ? **St. 1.** 28-11-1908. 25 m.w., 2^{50} am., 30 min. 1 ♀ jun. ? 6 mm. — **St. 73.** 8-3-1909. 65 m.w., 3^{30} pm., 30 min. 14 spec.: 10 ♂ ad. 8—9 mm, 4 ♀ with ova 9—11 mm. — **St. 74.** 9-3-1909. 65 m.w., 1^{30} am., 60 min. 1 ♀ with ova 20 mm. — **St. 74.** ibid. 300 m.w., 10^{50} pm., 60 min. 35 spec.: 15 ♂ ad. 16—18 mm, 20 ♀ 18—22 mm (4 with ova 19 mm). — **St. 74.** ibid. 600 m.w., 0^{10} am., 60 min. 7 ♂ ad. 16—19 mm. — **St. 75.** 9-3-1909. 65 m.w., 9^{00} pm., 60 min. 2 spec.: 1 ♂ ad. 21 mm, 1 ♀ with ova 21 mm. — **St. 75.** ibid. 300 m.w., 7^{45} pm., 60 min. 32 spec.:

17 ♂ ad. 17—22 mm, 1 ♂ juv. 16 mm, 3 ♀ with ova or embryos 18—22 mm, 11 ♀ without ova 17—20 mm. — **St. 75.** ibid. 600 m.w., 6^{30} pm., 60 min. 3 spec.: 2 ♂ 18—19 mm, 1 ♀ 19 mm. — **St. 76.** 10-3-1909. 25 m.w., 7^{15} pm., 30 min. 2 ♂ (1 ad., 1 jun.) 12 mm. — **St. 76.** ibid. 300 m.w., 11^{30} am., 60 min. 6 spec. 9—10 mm: 4 ♂ jun., 2 ♀. — **St. 80.** 13-6-1910. 25 m.w., 10^{45} pm., 15 min. 3 ♀ (1 with ova 14 mm) 12—14 mm. — **St. 80.** ibid. 65 m.w., 10^{00} pm., 30 min. 7 ♀ 10—14 mm. — **St. 80.** ibid. 300 m.w., 10^{05} pm., 30 min. 168 spec.: 45 ♂ ad. 10—14 mm, 6 ♂ jun. 12 mm, 117 ♀ (3 with ova 11—13 mm) 11—15 mm. — **St. 81.** 15-6-1910. 300 m.w., 10^{05} pm., 30 min. 75 spec.: 66 ♂ ad. (9)10—14 mm, 4 ♀ 7—7.5 mm, 4 ♀ 11—15 mm, 1 ♀ with great embryos 12 mm. — **St. 81.** ibid. 500 m.w. (5^{00} pm.?) 8 ♂ ad. 11—13 mm. — **St. 240.** 15-9-1910. 300 m.w., 9^{00} pm., 15 min. 4 spec.: 2 ♂ ad. 12—16 mm, 2 ♀ with ova 18.5—20 mm. — **St. 240.** ibid. 1000 m.w., 9^{40} pm., 30 min. 3 spec.: 2 ♂ ad. 12—14 mm, 1 ♀ 17 mm. — **St. 242.** 16-9-1910. 4350 m.w. (Y. 330), 7^{00} pm., 60 min. 10 spec.: 1 ♂ jun. 14 mm, 9 ♀ (4 with ova 16—21 mm) 16—21 mm. — **St. 244.** 17-9-1910. 1000 m.w., 10^{35} am., 30 min. 13 spec.: (3 ♀ 7—10 mm?), 3 ♀ 13—14 mm, 1 ♀ 17 mm, 4 ♀ with ova 16—19 mm, 2 ♂ ad. 8—12 mm. — **St. 245.** 17-9-1910. 65 m.w., 9^{55} pm., 15 min. 4 spec.: 2 ♂ ad. 14—16 mm, 1 ♂ jun. 13 mm, 1 ♀ 16 mm. — **St. 245.** ibid. 150 m.w., 8^{55} pm., 15 min. 22 spec.: 1 ♂ ad. 10 mm, 4 ♂ ad. 15—18 mm, 6 ♀ with ova or embryos 16—19 mm, 3 ♀ without ova 8—13 mm, 8 ♀ without ova 16—18 mm. — **St. 245.** ibid. 182 m. 250 m.w., 4^{20} pm., 30 min. 5 spec.: 3 ♀ 8—11 mm, 2 ♀ 15—17 mm. — **St. 245.** ibid. 300 m. 400 m.w., 5^{15} pm., 120 min. 83 spec.: 35 ♂ ad. 12—18 mm, 2 ♂ ad. 9—10 mm, 7 ♀ with ova 17—21 mm, 2 ♀ 12 mm, 37 ♀ 15—22 mm. — **St. 269.** 46°44′ N, 11°20′ W. 24-3-1911. 47 m.w. (S. 100), 7^{30} pm., 30 min. 1 ♀ 21 mm.

The material contains in all 507 specimens (220 ♂ ad. 14 ♂ juv., 43 ♀ with ova and 230 ♀ without ova) from 16 stations, 27 hauls; only 1 spec. is from the Mediterranean, all the others from the Atlantic.

As regards the individuals themselves there is not much to be added (as to size see below). On an average they agree well with the descriptions and figures given by Sars and Vosseler (l. c.).

The specimens noted in the above lists are fairly typical, but a few deviations are found in some of the specimens.

St. 80, 1910 with 300 m. w. yielded 3 large females (12, 12 and 15 mm) (fig. 44 represents the largest ♀) in which p. 5 is hardly longer than p. 6, and the carpus in p. 3—p. 4 forms a transition to the form in *T. gracilipes.* If there had been no teeth along the dorsal line and on the epimeral parts of p. 5—p. 6, these specimens must, if anything, rather be determined as *T. gracilipes.* The same applies by the way, to the smallest ♀ with ova (16 mm) from St. 242.

A large female with ova (20 mm?, defective) from St. 245, 1910, 150 m. w. like ♂ juv. has an articulated flagellum in ant. 1.

In the one ♂ from St. 81, 1910, 500 m. w. the carpus in p. 3 is far too broad, but p. 5 is typical.

Mediterranean.

Occurence. Only 1 spec. (1 ♀ juv. 8 mm) is on record as having been taken by the "Thor" in the Mediterranean (the Bay of Piræus), and the form *bispinosa* was also taken in the same haul. As the species has

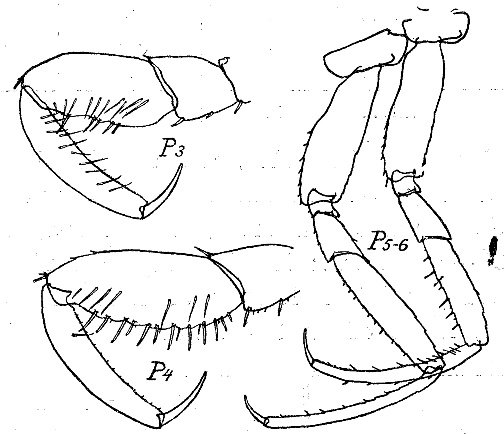

Fig. 44. *Themisto (compressa?)* ♀, 15 mm, st. 80, 1910, 300 m.w.

not been taken for certain in the Mediterranean, and as it is a northerly species, everything points towards a mistake in the label of locality; for the determination is sure enough. Of previous writers, only Steuer (1911)[1] notes the species from the Mediterranean, but his specimens are probably in reality *P. gracilipes* (see this species, p. 102).]

Atlantic.

Occurrence. All the positive stations of the "Thor" lie either to the north of the British Isles (1905: St. 124, 162, 164) or in the Bay of Biscay; St. 81, 1910, however, lies off the coast of Portugal.

The depth of the sea is as shown in the subjoined table; it thus chiefly occurs in depths > 1000 m. Only 2 stations have depths < 500 m (180 and 182—450 m).

Depth of the sea	No. of stations
0— 500 m	2
>500—1000 -	2
> 1000—2000 -	4
> 2000—3000 -	2
> 3000 -	5
Total . . .	15

The species occurs for the most part rather sporadically, so that only few individuals have been taken at a time; sometimes, however, it occurs in shoals, e. g. St. 80, 1910, 300 m. w. which yielded 168 spec.; St. 87, 1910, 300 m. w.: 75 spec.; St. 245, 1910, 400 m. w.: 83 spec.

[1] For recent finds in the Adriatic see Pesta 1920, pp. 32—33.

Vertical occurrence.

m. w.	No. of hauls		
	Night	Day	(N.+D. Day?)
0— 47	3	—	—
65—150	5	1	2
250—400	5	3	1
500—600	2	—	1
> 1000	2	1	1
Total...	17	5	5

As shown by the table, the species has been taken at night from the surface down to the very deep water layers >1000 m. w., chiefly with 65—400 m. w.; in the day, on the other hand, only with a length of line of at least 65 m. w., most often 300 m. w.

m. w.	No. of spec.		Average no. of spec. per haul	
	Night	Day	Night	Day
0—47	6	—	2	—
65—150	36	14	7	14
250—400	314	94	63	31
500—600	10	—	5	—
Total...	366	108	—	—

The greatest numbers per haul were taken during the night at a rather great depth, 250—400 m. w. and during the day at the same depth; but these figures perhaps do not mean very much in a species like this which occurs both in few specimens and in shoals; it is individual hauls, which have yielded the high figures.

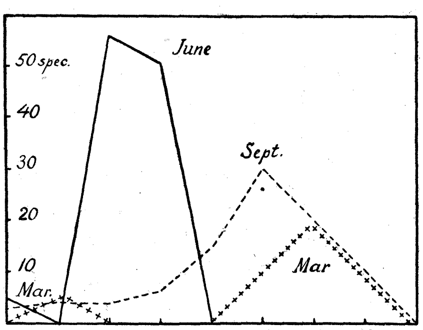

Fig. 45. *Themisto compressa* f. *compressa*, Sizes of ♀.

Size and propagation.

♂ and ♀ are of equal size, up to 22 mm. Specimens were (with a few exceptions) only taken in March, June and September.

♂ jun. Only a few (14) ♂ jun. were secured; the sizes were 9—16 mm.

♂ ad. In March there are two maxima, at 11—12 and 17—18 mm; in June the maximum lies at 11—14 mm, in Sept. at 13—18 mm. For explanation see under ♀.

♀. In March there are some few specimens 9—12 mm; all the other are 17—22 mm with a maximum at 19—20 mm. Abt. 30 % (13 out of 43 spec.) have ova.

In June only 3—4 % (5 out of totally 136) have ova; the sizes are 7—16 mm (spec. with ova 11—14 mm) with maximum of specimens at 11—14 mm.

In Sept. there are abt. 27 % with ova (23 out of totally 84 spec.); the maxima both for ♀ with ova and without ova lie at 17—18 mm.

Thus we learn that the ♀ without ova are very rarely larger than ♀ with ova. The maxima for ♀ with ova lie in March at (9—10 and) 19—20 mm, in June at 11—14 mm and in Sept. at 17—18 mm. When we remember that hardly any of the specimens have ova in June (only 3—4 %), but 27—30 % are found ovigerous in March and Sept. the spawning time may be spring and autumn (and possibly winter; but we have no hauls from this season). It seems evident, then, that the individuals which were small in the spring of 1909 were born in the autumn of 1908 whereas the large specimens were born in spring of 1908, and the latter then die in the course of the early summer so that they would have succumbed before June 1909.

What is said above as to the ♀ would also apply to ♂ as they have quite similar maxima to the ♀.

Literature and synonymy.

With the exception that the two "species" *T. compressa* and *T. bispinosa* ought to be considered synonymous we can on the whole subscribe to the view set forth by Vosseler (1901, p. 81—83, 86) as to the species of the family and the literature.

Vosseler maintains that the genus *Euthemisto* in reality hardly numbers more than 3 species *viz. E. libellula*, *E. compressa* and *E. bispinosa*; the others are only synonyms, perhaps with the exception of *E. australis* Stebbing, the position of which is uncertain.

Vosseler's statements, however, require a few supplementary remarks.

Lestrigonus (*Hyperia*) *spinidorsalis* Sp. Bate (Ann. Mag. Nat. Hist. ser. 5, vol. 1, 1878, p. 411, fig. 2) is on account of its dorsal teeth and its short p. 5 (not longer than p. 6) indubitably *T. compressa*, not *T. bispinosa*; the other species are, from the locality alone (Aberdeen) quite out of the question.

T. Gaudichaudi Stebbing (1888, Pls. 172—73) must no doubt, as far as regards the two forms shown (STEBBING l. c. Pl. 172—173) be determined as *T. bispinosa*, not *T. compressa*; however, it is by no means quite out of the question that the younger specimen (Pl. 173) is *T. gracilipes* (see this species p. 102).

T. Thomsoni Stebbing 1888 is, as far as I know, an intermediary form between *T. compr.* and *T. bisp.* (see later on p. 110).

Distribution.

[Mediterranean, see above.]

Atlantic. The species is very common in the temperate regions of the Northern Atlantic, especially from abt. (40°) 50° N to the ridge from Scotland to Greenland, but it is also found at a few localities in the Southern Atlantic. For special localities see my paper 1923, p. 27, with chart.

3 B. THEMISTO COMPRESSA Goës forma BISPINOSA (Figs. 46—48).

Themisto compressa Goës forma *bispinosa* Boeck (K. St.), K. Stephensen 1923, p. 31 (lit.). — ?*Euthemisto Gaudichaudii* Stebbing 1888, p. 1410, Pl. 172. — ?*E. G.* Guérin, Bovallius 1889, p. 299 (lit. and syn.), Pl. 13 figs. 44—46. — ?*E. antarctica* Dana, Bovallius 1889, p. 294 (lit. and syn.). — ?*E. Thomsoni* Stebbing 1888, p. 1414, Pls. 174—175.

[**Mediterranean.**

St. 18. 30-12-1908. 300 m.w., 9^{30} (pm?), (60 min.?). 8 spec.: 2 ♂ (1 jun.) 5.5—6 mm, 6 ♀ (3 with ova or embryos) 6—8 mm.]

Atlantic.

St. 90. 740—1600 m. 47°47′ N, 8°00′ W. 21(22)-6-1905. 300 m.w. 1 ♀ 9 mm. — **St. 124.** 61°04′ N, 4°33′ W. 23-7-1905. 1000 m.w. 4 ♀ 15—17 mm. — **St. 162.** 63°42′ N, 13°02′ W. 27-8-1905. 65 m.w. 4 ♀: 5, 6, 8, 10 mm. — **St. 73.** 8-3-1909. 65 m.w., 3^{30} pm., 30 min. 2 ♀ 8—12 mm. — **St. 74.** 8-3-1909. 300 m.w., 10^{50} pm., 60 min. 6 ♀ 18—20 mm. — **St. 74.** ibid. 600 m.w., 0^{10} am., 60 min. 1 ♀ 19 mm. — **St. 75.** 9-3-1909. 25 m.w., 10^{15} pm., 30 min. 1 ♀ 8 mm. — **St. 75.** ibid. 65 m.w., 9^{00} pm., 60 min. 46 spec.: 1 ♂ 16 mm, 1 ♂ jun. 13 mm, 1 ♀ 22 mm, 1 ♀ with ova 20 mm, 2 ♀ 15—19 mm, 1 ♀ 12 mm, 39 spec. jun. 7—9 mm. — **St. 75.** ibid. 300 m.w. 7^{45} pm., 60 min. 12 spec.: 3 ♂ 16—19 mm, 7 ♀ (1 with embryos 18 mm) 18—21 mm, 2 ♀ 9—10 mm. — **St. 75.** ibid. 600 m.w. 6^{30} pm., 60 min. 14 spec.: 2 ♂ ad. 18—21 mm, 3 ♂ jun. 14—19 mm, 9 ♀ 18—21 mm. — **St. 75.** ibid. 4300 m.w., 1^{45} pm., 120 min. 7 spec.: 2 ♂ ad. 18—19 mm, 1 ♂ jun. 13 mm, 4 ♀ 17—19 mm. — **St. 76.** 10-3-1909. 25 m.w., 7^{15} pm., 30 min. 45 spec.: 7 ♂ juv. 10—16 mm, 38 ♀ 5—12 mm (+ ?4 ♂ jun. 8—9 mm). — **St. 76.** ibid. 65 m.w., 6^{05} pm., 60 min. 20 spec.: 6 ♂ jun. 9—11 mm, 14 ♀ 5—9 mm (1 ♀ with ova 7 mm). — **St. 76.** ibid. 300 m.w., 11^{30} am., 60 min. 35 spec.: 2 ♂ jun. 8—9 mm, 1♀ with ova 6 mm, 32 ♀ 6—9 mm. — **St. 76.** ibid. 600 m.w., 1^{15} am., 60 min. 27 ♀ 5—7 mm. — **St. 76.** ibid. 1600 m.w. 2^{40} pm., 60 min. 8 ♀ 5—6 mm. — **St. 77.** 11-3-1909. 65 m.w., 3^{15} pm., 30 min. 1 ♀ 5 mm. — **St. 79.** 13-6-1910. 65 m.w., 8^{40} am., 15 min. 1 ♀ 7 mm. — **St. 80.** 13-6-1910. 300 m.w., 10^{05} pm., 30 min. 4 ♀ (1 spec. 8 mm, 3 spec. 12—15 mm). — **St. 81.** 15-6-1910. 300 m.w., 10^{05} pm., 30 min. 40 spec.: 7 ♂ jun. 10—12 mm, 9 ♀ 7—9 mm, 24 ♀ 10—16 mm. (7 of them with ova 13—16 mm). — **St. 81.** 500 m.w. (5^{00} pm.?). 18 spec.: 2 ♂ jun. 10—11 mm, 2 ♀ with ova 10—11 mm, 14 ♀ without ova 9—12 mm. — **St. 236.** 13-9-1910. 25 m.w., 11^{00} pm., 15 min. (15×) 4 spec.: 1 ♂ jun. 6 mm, 3 ♀ 7—8 mm. — **St. 245.** 17-9-1910. 65 m.w., 9^{55} pm., 15 min. 1 ♀ with ova 6 mm. — **St. 245.** ibid. 150 m.w., 8^{55} pm., 15 min. 1 ♀ with ova 9 mm. — **St. 245.** ibid. 250 m.w., 4^{20} pm., 30 min. 2 ♀ 5—6 mm. — **St. 245.** ibid. 400 m.w., 5^{15} pm., 120 min. 1 ♀ with ova, 6 mm.

The material contains in all 347 spec. (9 ♂ ad., 46 ♂ jun., 18 ♀ with ova), 274 ♀ without ova, from 14 stations, 26 hauls. As regards the difference from *T. compressa* Goës forma *compressa* see above p. 103; for intermediary forms between the two "species" see below on p. 109.

The specimens noted in the above list of localities are all rather typical; the only slightly deviating specimens are the 8 which (no doubt by mistake) have been noted from the Mediterranean (St. 18), the carpus in p. 3—p. 4 being a little too narrow, but p. 5 rather typical; on a female, 7 mm from St. 236, 1910, 25 m. w. (fig. 46) the carpus in p. 3 is far too broad.

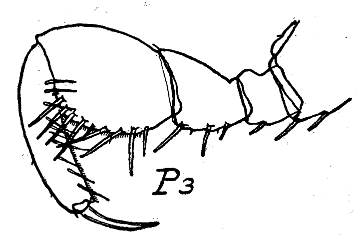

Fig. 46. *Themisto bispinosa*, ♀ 7 mm, st. 236, 1910, 25 m.w.

Sexual difference. VOSSELER says (l. c.) that there is no essential difference between the sexes; this is, however, only partly correct.

The cephalon in ♂ is as a rule nearly as long as the 4 first body segments, in ♀ nearly of the same length as the first $3^1/_2$. As regards the antennæ in ♀ see SARS 1895; in ♂ on the other hand ant. 1 is nearly as long as the cephalon + the 5 first body segments and has about 17 joints in the flagellum, whereas ant. 2 corresponds to the cephalon + all 7 mesosome segments and has about 27 joints in the flagellum. For the metacarpus in p. 5 see above under *T. compressa* forma *compressa*.

The uropoda (fig. 47) agree better with SARS' figure than with that of VOSSELER (l. c. fig. 10, not fig. 17, for in VOSSELER's explanation of figures *E. bispinosa* and *E. compressa* have been exchanged). In the male, both of the rami in up. 1 have, at the proximal end of the median margin a large excavation, which is absent in the female; otherwise there does not seem to be any sexual difference in the 3 pairs of uropoda. All 3 pairs are finely serrated on the median margin of the rami, smooth on the outer margins.

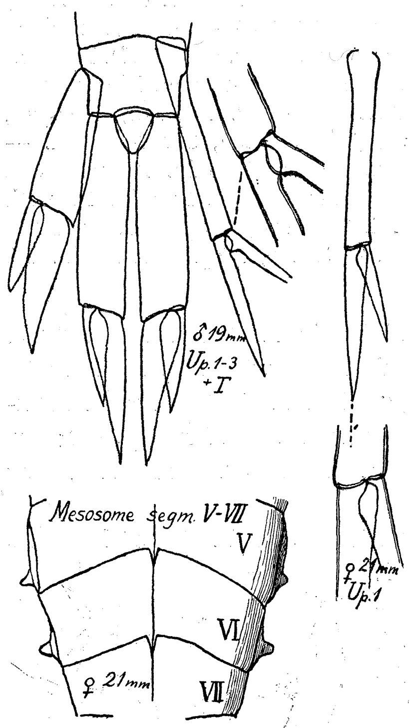

Fig. 47. *Themisto bispinosa*, st. 75, 1909, 300 mm. All figures drawn to the same scale except the detail figure of up. 1.

[Mediterranean.

There are in all 8 spec. from 1 station, in the Bay of Piræus (St. 18). This is curiously enough the same — and only — place in the Mediterranean where the "Thor" found *T. compressa* forma *compressa*. The specimens are slightly divergent, the carpus of p. 3—p. 4 being a little too narrow (fig. 48) but p. 5 is rather typical, so that the determination for all that is hardly doubtful. It has not previously been found in the Mediterranean, and the locality must probably be due to a confusion of labels (see under *T. compressa*, forma *compressa*, p. 105)].

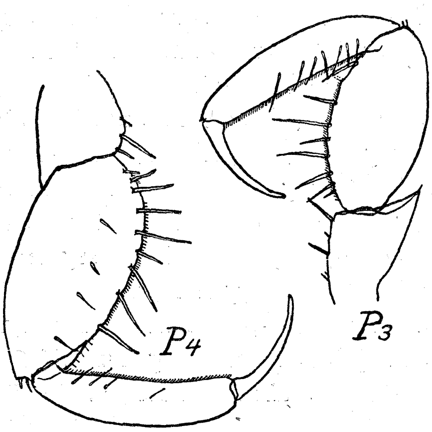

Fig. 48. *Themisto compressa* f. *bispinosa*, ♀ with embryos, 6 mm, st. 18, 1908, 300 mw. (P. 5 is in this spec. as in *T. bispinosa* but it has no dorsal teeth.)

Atlantic.

It has been taken within quite the same area as *T. compressa* forma *compressa*; at a good many stations they have even been taken together. The only important exception is that *T. bispinosa* has not been taken at the two extreme stations in the Bay of Biscay (St. 179, 1906, and St. 269, 1911).

Depth of the sea. It has been found at all depths, particularly 100—500 m (5 stations, *viz.* 100, 130, >150, 180 and 182—460 m) and 1000—2000 m (4 st.). The depth is thus somewhat different from that of *T. compressa* forma *compressa*, the latter form (f. *compr.*) having chiefly been found at greater depths (> 1000 m).

Depth in m.	No. of stations
100— 500	5
> 500—1000	1
> 1000—2000	4
> 2000—3000	1
> 3000	2
total...	13

Vertical occurrence.

m. w.	No. of hauls. Night	Day	N. + D. (Day?)
25........................	3	—	—
65—150..................	4	3	1
250—400..................	4	3	—
500—600..................	3	—	1
>1000..................	—	2	1
total...	14	8	3

The greater part of the hauls were made during the night with 25—600 m. w., during the day chiefly with 65—400 m. w.; this agrees particularly well with *T. compressa* f. *compressa*.

From the table below it appears that during the night the greatest number of specimens per haul was taken close to the surface (25 m. w.), but during the day with 250—400 m. w.

m. w.	No. of spec.		Average no. of spec. per haul	
	Night	Day	Night	Day
25	106	—	35	—
65—150	68	4	17	1
250—400	62	38	15	13
500—600	42	—	14	—

Propagation and size.

Of ♂ juv. (with short antennæ) the "Thor" took in March 1909—Sept. 1910 45 in all, the size varying between 6 and 19 mm. In March the size varies between

8—16 (19) mm, the greater number of spec. being 9—13 mm. In June the size is 10—12 mm and in Sept. the specimens are still smaller, only 6 mm.

♂ ad. was only taken in March (1909) and the size lies between 16 and 21 mm, particularly 16—19 mm.

Of ♀ with ova 3 spec. were taken in March, *viz.* of 7, 18 and 20 mm and in June 9 spec. of 10—16 mm; in September 3 spec., 6 and 9 mm.

Of ♀ without ova by far the greater number are in March only 5—9 mm, a few 10—12 mm. With the exception of 1 spec. of 15 mm there are none of the sizes 13—17 mm but a few specimens are 18—21 mm. In June, the sizes vary between 7 and 16 mm; the greater part are 10—13 mm and in Sept., the size is (5) 7—8 mm. The figures are: March 1909: 192 spec.; June 1910: 32 spec.; Sept. 1910: 47 spec.; total 271 spec. Unfortunately, there are among the 286 ♀ in all, taken in March 1909—Sept. 1910, only 15 ♀ with ova, so that we cannot deduce anything for certain from this as regards the most common spawning season; comparatively the greater number of ♀ with ova were found in June (9 ♀ with ova, as against 32 without ova).

Literature and Synonomy.

My reasons for considering *T. bispinosa* as merely a special form of *T. compressa* will be given below when dealing with the intermediary forms.

Vosseler, 1901, p. 81, 86 in classing *Euth. Gaudichaudi* (♂ juv., Stebbing 1888 Pl. 172) with *T. bispinosa*, is undoubtedly correct, though in spite of its considerable size ("$^3/_5$ of an inch") it lacks dorsal teeth and has a short carpal process in p. 2; on the other hand I cannot see that he is right in classing the specimen shown in Pl. 173 with *T. compressa* f. *compressa*, for the latter may also (from the armature on the metacarpus in p. 5) be a young specimen of *T. bispinosa*. On the other hand, it is true that it also presents certain points of resemblance with *T. gracilipes*, particularly in p. 5.

Both *Themisto antarctica* Dana (Bovallius 1889, p. 294) and *Th. Gaudichaudi* Guérin (see Bovallius ibid. p. 299) are undoubtedly *T. bispinosa*, and this possibly also holds good of *Euth. Thomsoni* Stebbing, which, however, rather stands as an intermediary form between *T. compressa* and *T. bispinosa* (see p. 110).

Distribution.

[Mediterranean, see above.]

1. Atlantic. Has a very wide distribution in the North Atlantic, especially South of abt. 66° N (abt. 80°?); for special localities see above, and my paper 1923, p. 31, with chart.

2. Southern Seas. Of the "species" which are in all probability synonymous with the present species, *T. antarctica* has been taken at the following localities: The Antarctic region: the Southern temperate regions of the Atlantic, of the Indian Ocean and of the Pacific (Bovallius 1889, p. 294). — South Atlantic (*E. Guerini* Bate = *T. antarct.*, *teste* Bovallius 1889). — 68° S, 94° W (Antarctic Sea) (Dana).

T. Gaudichaudii: The Antarctic regions; the Southern temperate regions (Bovallius 1889, p. 299). — Falkland Islands (Guérin). — Patagonia 42°43′ S, 82°11′ W, surf., temp. 12° C.; Cape Virgin to Falkland Islands 51°35′ S, 65°39′ W, surf., temp. 9° C.; NE coast of Kerguelen Island, surf., temp. 5.5° C., many, most of them not full grown, $^3/_5$ inch (Stebbing, "Challenger") — 62°8′ S, 170°45′ E, surf. (?, Stewart 1913, p. 257). — 54°01′ S, 170°49′ E, to 63°4′ S, 175°43′ E, abundant, mostly young; a female with ova 15 mm (Walker 1907).

On this southern area see further below p. 110.

3 C. INTERMEDIATE FORMS BETWEEN THEMISTO COMPRESSA Goës forma COMPRESSA, and T. COMPRESSA forma BISPINOSA Boeck (Fig. 49).

Euthemisto compressa (partim) H. J. Hansen 1887, p. 59. — *E. c.* (partim) Vosseler 1901, p. 81, 86. — *E. bispinosa* (partim) Vosseler 1901, p. 82. — *E. Thomsoni* Stebbing 1888, p. 1414, Pl. 174—75, and *E. T.* ("*E. scabra*") Stebbing, ibid.

Atlantic.

St. 1. 28-11-1908. 25 m.w. 2^{50} am. 30 min. 1 ♀ jun.(?) 6 mm. — **St. 74.** 9-3-1909. 300 m.w., 10^{50} pm., 60 min. 4 ♀ 19-22 mm. — **St. 74.** ibid. 65 m.w., 1^{30} am., 60 min. 1 ♀. — **St. 74.** ibid. 600 m.w., 0^{10} am., 60 min. 2 ♀ 19 mm. — **St. 75.** 9-3-1909. 4300 m.w., 1^{45} pm., 120 min. 3 spec.: 1 ♂ ad. 18 mm, 2 ♀ 18—21 mm. — **St. 73.** 8-3-1909. 65 m.w., 3^{30} pm., 30 min. 30 spec.: 5 ♂ ad. 7—9 mm, 11 ♂ jun. 6—9 mm, 14 ♀ 6—11 mm. — **St. 80.** 13-6-1910. 65 m.w., 10^{00} pm., 30 min. 1 ♀ 13 mm. — **St. 245.** 17-9-1910. 150 m.w., 8^{55} pm., 15 min. 3 ♀: 8, 15, 16 mm. — **St. 124.** 61°04′ N, 4°33′ W. 23-7-1905. 1000 m.w. 5 spec.: 1 ♂ ad. 18 mm, 4 ♀ 14, 15, 18, 21 mm.

As already set forth in the foregoing (p. 103) the distinguishing of the two "species" has at times caused difficulties, as the specific characters mentioned by Sars and Vosseler are by no means always clearly developed.

H. J. Hansen (l. c.) states that they may vary to a certain extent (see above p. 103).

Vosseler (l. c. p. 82) also says that the two "species" can to a certain extent approach each other, but "vollkommene Zwischenformen fand ich nie."

In my list of localities given above I have noted the specimens which do not agree with either of the two "species", but combine the characters of both, and this, it will appear, does not only apply to small specimens of 6—7 mm, but also to large ones of up to 21 mm. The characters which cause difficulties are the very features, emphasized by H. J. HANSEN (p. 3—p. 4, p. 5—p. 6).

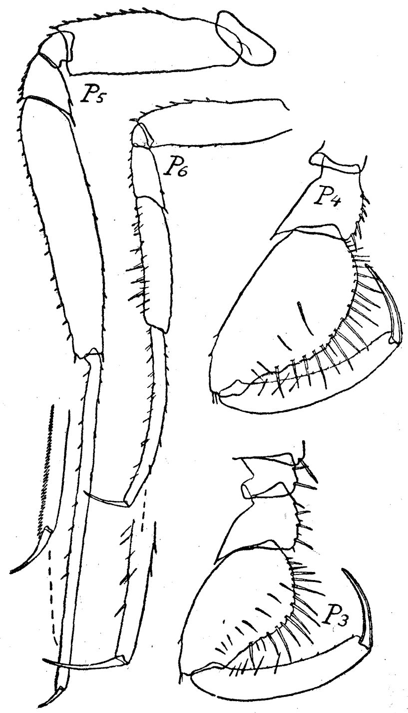

Fig. 49. *Themisto compressa* or *Th. bispinosa*, intermediate form, st. 124, 1905. 1000 m.w. ♀ with ova, 15 mm. P.3—p.4 drawn twice as great as p. 5—p.6

Fig. 49 represents a female with ova, 15 mm from St. 124, 1905, 1000 m. w.; which can be taken as a type though it is nearer to *T. bispinosa* than several of the others. According to the carpus in p. 3—p. 4 it should more particularly be determined as *T. bispinosa,* though the outline of the carpus is by no means particularly typical; but as intermediate characters between the two species must be classed the length of p. 5 in proportion to p. 6 which is nearly 5:3 (according to VOSSELER, this proportion in *T. compr.* is 13:11, in *T. bisp.* 2:1), and the teeth along the front margin of the metacarpus in p. 5 are too small to agree with SARS' fig. of *T. bisp.* but too large for *T. compressa.*

In other specimens the carpus in p. 3—p. 4 actually forms an intermediary stage between the two "species", or p. 6 will, when it and p. 5 are straightened out, extend to the proximal $^1/_3$—$^1/_4$ of the metacarpus of p. 5 i. e. the proportion of these legs as regards length is nearly as 3:4.

Synonymy and Distribution. All the intermediary forms from the "Thor" were taken within the same area of the Atlantic where the two "species" have been found. H. J. HANSEN's specimens are from Greenland; in which locality the specimens mentioned by VOSSELER were really taken, does not appear from his account.

I cannot see but that also *E. Thomsoni* Stebb. belongs here. VOSSELER considers it synomous with *T. compressa,* and to this I can subscribe, as regards the entire animal, drawn by STEBBING, but the longest p. 5 drawn by STEBBING (STEBB.: prp. 3) agrees better with *T. bispinosa.* As p. 3—p. 4 agree best with *T. compr.* and p. 5 best with *T. bisp.*, it must thus be considered an intermediary form between the two "species".

E. Thomsoni has been found in the following localities: Between Marion Island and the Crozet Islands 46°46′ S, 45°31′ E, surf., daytime, 6° C., 14 spec.; off Crozet Islands 46°45′ S, 50°42′ E, surf., 5.5° C., 1 spec.; 50°1′ S, 123°4′ E, surf., 7° C., 3 spec.; S. Australia 48°18′ S, 130°4′ E, surf., 10° C., 6 spec.; ? between Kerguelen Island and Heard Island, surf.; ? 49°28′ S, 70°30′ E, 25 fms. ("*E. scabra*"). —

On the strength of the above it can thus be proved that *T. compressa* (the name taken in the widest sense) is bipolar. The two forms considered separately have the following distribution: *T. compr.* f. *compressa* has been found in the Atlantic north of 40° N (+ ?Mediterranean) and at 35°—36° S; *T. compr.* f. *bispinosa* has been found in the same localities, and also within the antarctic area, and the same holds good of the intermediary forms. Only quite exceptionally have specimens been taken at negative temperatures, and also very few at temperatures > 12° C., but all 3 forms have very wide limits of temperatures. Further, the biology must — in any case, as far as the two principal forms are concerned — be very nearly the same, since they are generally taken together.

This shows that *T. compressa* is bipolar, having been found in the Atlantic, North of 40° N (from the northern Pacific it has not been noted) and in the southern seas south of 35° S, whereas it is altogether lacking in the intervening area (apart from a single find 31.5° N, 45.6° W). This, as far as I know, is the first case of bipolarity proved in a Hyperid.

Genus **Phronimopsis** Claus.

Phronimopsis Claus, Phronimiden 1879, p. 63 (3). — *P.* Stebbing, 1888, p. 1373.— **P.* Bovallius 1889, p. 318 (lit.). — *P.* Vosseler 1901, p. 51. — *P.* H. Vester, Beiträge zur Kenntnis d. Gattung Phronimopsis; Dissertation, Leipzig 1900

1. PHRONIMOPSIS SPINIFERA Claus.

Phronimopsis spinifer Claus l. c. 1879, p. 64 (6), Pl. 1 fig. 1—3. — *P. spinifera* Bovallius 1889, p. 326 (lit.), Pl. 14 figs. 30—35. — *P. s.* Vosseler 1901, p. 52, Pl. 5 figs. 1 — 4.—*P. s.* Vosseler, in Lo Bianco 1903—04,

p. 278. — *P. Sarsii* Bovallius, Syst. list 1887, p. 23. — *P. S.* Bovallius 1889, p. 320, Pl. 14, fig. 1—29. — *P. tenella* Stebbing 1888, p. 1374, Pl. 164. — *P. t.* Bovallius 1889, p. 325. — *P. tumida* Vester, l. c. 1900, p. 9 seq., Pl. 1—2.

It is Vosseler (l. c. 1901) who considers *P. Sarsii* and *P. tenella* synonymous with *P. spinifera*, and I cannot see but that he is right in this.

In 1900 Vester (l. c.) established a new species, *P. tumida*, without knowing the works of Vosseler, or vice versa. This species, of which only females are available (taken at Capri and Ischia 450—1200 m below surf.) must absolutely be considered as older specimens of *P. spinifera*. The specific name refers to the highly inflated pereion but this also applies to *P. spinifera* and is thus no specific character.

From Vester's diagnosis (l. c. p. 9) of *P. spinifera* (quoted from Bovallius) compared with *P. tumida* it looks as if the two species deviate very considerably; but if one examines the figures of Bovallius and Vester it appears that it is principally only a verbal dispute.

The only real difference seems to me to be that in *P. tumida* the ova (according to Vester) are said to develop *within* the pereion, in *P. Sarsii* on the other hand in the usual marsupium *under* the pereion. My own specimens with ova have them within the pereion.

All my ♀ specimens, by the way, correspond quite well with Bovallius l. c. 1889, fig. 30, but are almost entirely devoid of spines on the dorsal side of the tail.

Mediteranean.

St. 141. 20-7-1910. 25 m.w., 10^{35} pm., 15 min. 1 ♂ 3.5 mm. — **St. 143.** 23-7-1910. Surf. (P. 100), 0^{40} am., 10 min. 1 ♂ 3.5 mm. — **St. 156.** 30-7-1910. Surf. (P. 100), 2^{25} am., 10 min. 1 ♂ 4 mm. — **St. 163.** 3-8-1910. 25 m.w., 1^{35} am., 15 min. 1 ♂ 3.5 mm. — **St. 282.** 8-3-1911. 40 m.w. (S. 100), 9^{00} pm., 90 min. 1 ♂ 3.5 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 10^{45} pm., 180 min. 1 ♂ 3.5 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 2 ♂ 3.5—4 mm.

Atlantic.

St. 398. 36°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 12^{40} pm., 30 min. 87 spec.: 82 ♂ 3.5 mm, 5 ♀ (1 with ova) 3.5 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 4 spec.: 3 ♂ 3.5 mm, 1 ♀ with ova 3.5 mm.

The material. In the "Thor" material there are in all 99 spec. *viz.* 93 ♂ and only 6 ♀ from 8 stations, 9 hauls. The number of specimens previously known hardly exceeds 125.

Mediterranean.

Material and occurrence. There are 8 ♂ (no ♀) from 6 stations, 7 hauls. The depth is 530—3200 m., the depth of St. 282 (Messina Strait), however, being only 200 m. All the localities are in the eastern basin, about $13^1/_2$°—27° E; St. 163 lies in the Ægean Sea. The species was previously known from Messina (Claus, Chun) and at Capri (thus in the western basin) (Vester 1900, Lo Bianco, 1902, p. 447 and 1904 ["Maja"] p. 43; Chun: Pelag. Thierwelt 1888, p. 29). Vosseler mentions (l. c. 1903—04) 29 spec. from 11 stations at Capri and 1 station at Salina (Eolian Isles); depth 600—2600 m. — Adriatic (Steuer 1913).

Vertical occurrence. All the "Thor" specimens were taken in March, June, July and November during the night from the surface to 40 m. w.; only the 2 spec. from St. 385 were taken at greater depths (122 m. w.). The result from the "Thor" agrees very well with what Steuer shows in a table from the southern Adriatic (Steuer 1913, p. 567, fig. 14): during the night it decreases evenly from the surface to a depth of 250 m, and then ceases; where it lives during the day is not stated.

The results from the "Thor" and from Steuer l. c. do not agree with the records in literature (Vosseler 1903—04: 500—2500 m. w. and closing net 100, 200—300 m.w. [daytime]; he had 12, it is 27 per cent., positive hauls, the "Thor" only 4 out of 268, it is not 2 per cent. — Lo Bianco (1904): 500—1500 m. w. (fore-noon). — Chun: Closing net 900—1000 m, or open net > 600 m down [day-time]).

Atlantic.

The two finds represented in the "Thor" collections agree quite well in every respect with the results of the "Thor" from the Mediterranean. They are interesting as bringing the species closer to the European coasts of the Atlantic than any previous find, and St. 398 also in showing a much greater number of individuals than any find that I know of; the largest find which I have seen recorded in the literature is 21 spec. from one of the stations in the South Equatorial Current (Vosseler 1901). This find further shows that the males can occur in shoals, for of the 87 spec. 82 were males.

Distribution.

1. Mediterranean see above.

2. Atlantic. The species has been taken at some localities in the northern temperate and tropical regions of the Atlantic, abt. $41^1/_2$° N — abt. 5° S. Most of the localities are from the German Plankton-Exped. (Vosseler; 27 hauls, 72 spec. [26 ♂, 46 ♀], 0—400 [500] m); they are

as follows: Florida Current 2 st.: 41.6° N, 56.3° W, and 40.4° N, 57° W; Sargasso Sea 33.2° N, 63.8° W; N. Equatorial Current and Canarian Current 12 st.: 26.3° N, 32.5° W, to 10.2° N, 22.3° W, and 12° N, 40.3° W; Guinea Current 3 st. 5.3° N, 19.9° W, to 2.9° N, 18.4° W; S. Equatorial Current 9 st.: 1.1° N, 16.4° W, to 5.1° S, 14.1° W, and 1.5° S, 39.2° W. — From the same area it is mentioned by BOVALLIUS from 17°22′ N, 37°33′ W, and 32° N, 77°45′ W (N. of Cuba). — *Ph. Sarsii* was taken in "tropical parts of the Atlantic" (BOVALLIUS). — On the specimens from the "Thor", see above.

3. Pacific. "Lat. 35° N, Japan to Honolulu", surf., 1 spec. (*Ph. tenella*, STEBBING l. c.).

4. Indian Ocean. 4°16′ S, 71°53′ E, depth 2082 fms., 25 fms. below surf., 2^{10}—3^{10} am., 27.8° C. (WALKER 1909—10, p. 51).

Fam. **Dairellidæ** (Bovall.) Vosseler.

Dairellinæ Bovallius, Syst. list 1887, p. 24, and 1889, p. 331. — *Dairellidæ* Vosseler 1901, p. 50.

The family only comprises 1 genus of 2 species, and only the one, *Dairella latissima*, is known from the area of the "Thor".

1. Genus **Dairella** Bovallius.

Dairella Bovallius l. c. 1887, p. 24, and *1889, p. 332 (key to the species). — **D.* Stebbing 1888, p. 1343.

1. DAIRELLA LATISSIMA Bowall.

Dairella latissima Bovallius l. c. 1887, p. 24. — **D. l.* Bovallius 1889, p. 336, Pl. 15 fig. 1—20. — *D. l.* Vosseler 1901, p. 51. — **D. Bovallii* Stebbing 1888, p. 1343, Pl. 158.

Mediterranean.

St. 115. 29-6-1910. 2000 m.w., 60 min., 0^{30} am. 1 ♀ 6.5 mm. — **St. 206.** 28-8-1910. 1000 m.w., 45 min., 1^{40} am. 1 ♀ 6.5 mm. — **St. 209.** 29-8-1910. 1000 m.w., 45 min., 6^{00} am. 1 ♀ 6 mm. — **St. 209.** ibid. 2000 m.w., 7^{25} am. 1 ♀ 6.5 mm.

Atlantic.

St. 82. 51°00′ N, 11°43′ W. 15-6-1905. 800 m.w. 1 ♀ 6 mm. — **St. 167.** 57°46′ N, 9°55′ W. 1-9-1905. 1500 m.w. 2 spec.: 1 ♂ jun. 6.5 mm, 1 ♀ 7 mm.

As will be seen from the above, the "Thor" has taken 7 spec. (1 ♂ juv., 6 ♀) in the western regions of the Mediterranean, and in the Atlantic. West of the British Isles the depth of the sea is everywhere very great, 1020—2800 m, and though several of the specimens, in any case in the Mediterranean, were taken during the night, they were all taken with a great length of wire, (800) 1000—2000 m. w.

All the finds in the Atlantic north of 40° N originate from 1904 and 1905 (see distribution), in which years it is known that there was a particularly strong northgoing current west of the British Isles.

It seems always to have been taken singly, at most 2 at a time, and then always a male and a female. From the literature only some 10 specimens are known.

Colour. The lateral parts of the pereion and p. 3—p. 7 have dark red spots (TATTERSALL 1906 p. 18).

Distribution. 1. Mediterranean. Between Capo Corso and Monaco, 10^{40}—11^{40} am., 2000 m. w. (VOSSELER in LO BIANCO 1903 p. 279), 1 ♂; Gulf of Genova, surf., 1 ♂, and South of Formentera, 0—1000 m, 1 ♂ (CHEVREUX 1913, p. 16). It has thus only been taken in the western basin.

2. Atlantic. The most northerly occurrences are the 2 "Thor" specimens, and a find west of Ireland, 1905, 1150 fms. w. (TATTERSALL 1906); CHEVREUX (l. c. 1913) notes 1 ♂ taken 1904 (St. 1639) at the entrance to the Bay of Biscay 46°15′ N, 7°09′ W, 0—3000 m. Otherwise the species is recorded from between the Azores and Lisbon, surf. 1 ♂ (CHEVREUX l. c. 1913), off St. Vincent 16°49′ N, 25°14′ W, surf. (?), ♂ and ♀ (STEBBING l. c.), 2.6° S, 14.6° W, surf., 1 ♂ (VOSSELER l. c.) and between Tristan da Cunha and Cape of Good Hope 37°33³/₄′ S, 6°09′ E, 1 ♀ (STEWART 1913). BOVALLIUS' type-specimen originated from "temperate and tropical parts of the Atlantic", without further particulars; but in spite of BOVALLIUS' remarks that he borrowed the specimen from the Copenhagen Zoological Museum, we have no specimen which he can have seen.

Fam. **Phronimidæ** Dana.

Phronimidæ K. Stephensen 1923, p. 34 (lit.).

All the 8 known species are to be found in the "Thor" material with the exception of two i. e. *Phronima affinis* Voss. and *P. Stebbingi* Voss. The first-mentioned species is only known through a single specimen (from the Atlantic). *P. Stebbingi* on the other hand is rather widely distributed, in particular in the Atlantic, where, however, it has never been found within the area of the "Thor"; but it is recorded by CHEVREUX (1913) from the Mediterranean, *viz.* Monaco (0—140 and 0—250 m) and Cabo de Gata (E of Almeria, Spain), 0—1300 m, 2 ♀.

Of this family the "Thor"-Exp. has in all about 9150 spec., of which more than half, i. e. 4863, represent a single species (*Phronimella elongata*) (in these figures, as well as in the figures given below from the German Plankton-Exp. the non free-living young are not included)

The only large expeditions from which we have reports of this family are the "Challenger" and the German Plankton-Exp. The "Challenger" had from 40 stations some 50 larger and a number of quite small spec. as well as a few houses. The greater part could not be determined. After deducting synonyms, the remainder only represent 3 species + 1 variety. The German Plankton-Exp. had 8 species (+ 1 var.), 883 spec.

Number of males and females.

From the "Thor" there are 5 species + 1 variety of *Phronima*, in all > 4300 spec. *viz.* 1140 ♂, > 3100 ♀, abt. 80 jun. There are very often at least twice as many ♀ as ♂, and the German Plankton-Exped., which alone of all other expeditions has procured a large material of this family, gives very nearly the same result. —

The species are oceanic and several of them probably cosmopolitans; but in the literature they have been very much confused so that it is not always possible to see which species is meant.

1. Genus Phronima Latr.

Phronima Stebbing 1888, p. 1346 (lit. and syn.). — *P.* Bovallius 1889, p. 342 (lit. and syn.). — *P.* Chun, Das Männchen d. Phronima sedent. nebst Bemerkungen üb. die Phronima-Arten; Zool. Anzeiger, 12. Jahrg., 1889, p. 378. — *P.* Chun, Atlantis. Biolog. Studien üb. pelag. Organismen IV, Die sekundären Geschlechts-char. d. Männchen von Phronima; Bibl. Zool., Heft 19, 1895, p. 109, Pl. 7—8. — *P.* Vosseler, Ueber d. Männchen von Phr. u. ihre sekundären Geschlechtsmerkmale; Zool. Anz. vol. 23, No. 620, 1900, p. 392. — **P.* Vosseler 1901, p. 1. — *P.* Woltereck, 2. Mitt. üb. Hyper. d. Deutsch. Tiefsee-Exped.: Physosoma, nebst Bemerk. zur Biol. von Thaumatops u. Phronima; Zool. Anz. vol. 27, No. 18, 1904, p. 560. — *P.* Woltereck, 3. Mitt. ....: Ergänzenden Bemerk. zur Biol. von Phronima u. Mimonectes; ibid. vol. 27, No. 20, 1904, p. 626.

As the species vary a good deal according to size, and as there is also a very considerable sexual difference, it is not strange that there should be a rather complex literature and synonomy; this applies in particular to the two first established species, *P. sedentaria* and *P. atlantica*. The difficulties are increased, because the same haul may at times contain several species. Reference may be made to Bovallius 1889, containing very detailed lists of literature, which, however, are not correct all through (his *P. sedentaria*, for instance, too comprehensive), but more especially to Vosseler 1901, to whom is due the honour of having fully elucidated the complicated problem, particularly as regards the males.

The genus comprises 7 species + 1 variety, which are all, with the exception of 2 species, represented in the "Thor" material.

In the subsequent lists, an attempt has been made to separate the species by means of simple characters. The characteristics, however, do not apply to quite small individuals.

♂. (♂ is not known of *P. atlantica* var. *solitaria*, *P. curvipes* and (?)*P. pacifica*. The references are to Vosseler 1901).

1. Ant. 2 rudimentary 2
1. — well developed 3
2. Carpus in p. 5 (apart from the carpal process and the notch inside this) in the distal end cut right off........ *P. affinis* (Vosseler Pl. 1, fig. 12, 15).
2. Carpus in p. 5 has inside the notch at the carpal process two separate teeth .. *P. sedentaria* (Vosseler Pl. 1, fig. 7, 10).
3. The distal edge of carpus of p. 5 has inside the carpal process 3—4 separate teeth, but no large process; metacarpus not longer than the breadth of carpus ....*P. Colletti* (Vosseler Pl. 4. fig. 1).
3. The distal end of carpus of p. 5 has inside the carpal process a tooth and a longer process with small excavations in the hind edge 4
4. Metacarpus not much longer than the breadth of carpus; inner ramus of up. 1 much longer than outer ramus, not much shorter than peduncle *P. Stebbingi* (Vosseler Pl. 4, figs. 8, 10).
4. Metacarpus somewhat longer than the breadth of carpus; inner ramus of up. 1 not longer than outer ramus, abt. half as long as the peduncle *P. atlantica* (Vosseler Pl. 2, fig. 6).

♀. (♀ of *P. affinis* is not known).

1. 1. metasome segment longer than 7. mesosome segment. Length 7 (10?) mm.. *P. Stebbingi* (Vosseler Pl. 4. fig. 4).
1. 1. metasome segment as long as or shorter than 7. mesosome segment 2
2. 1. metasome segment about as long as 7. mesosome segment 3
2. 1. metasome segment distinctly shorter (often only $^3/_4$ as long) than 7. mesosome segment.. 5
3. Carpus of p. 5 much longer than broad; metacarpus much longer than the distal edge of carpus; hind corners of metasome segments (especially no. 3) drawn out into a long point.

Length 36 (40) mm.. *P. sedentaria* (VOSSELER Pl. 1 figs. 1—2).

3. Carpus of p. 5 not much longer than broad; metacarpus extends only a little beyond the carpal process; the hind corners of metasome are not drawn out into a long (but sometimes into a short) point 4
4. P. 5 much shorter than p. 4; the distal edge of carpus of p. 5 has besides the carpal process 3—4 other teeth. Length 9 (18?) mm.. *P. Colletti* (VOSSELER Pl. 3 figs. 8, 10).
4. P. 5 not much shorter than p. 4; the distal edge of carpus of p. 5 has besides the carpal process another tooth and a curved process with small excavations in the hind edge. Length 11 mm *P. pacifica* (VOSSELER Pl. 3 fig. 4.)
5. The process inside the carpal process of p. 5 is bifid. Length 17—25 mm.. *P. atlantica* (VOSSELER Pl. 2 fig. 1).
5. The process inside the carpal process is single, not bifid 6
6. Hind edge of femur of p. 5 almost straight. Length 22 mm.. *P. atlantica* var. *solitaria* (VOSSELER Pl. 2 fig. 5).
6. Hind edge of femur of p. 5 strongly curved almost as S. Length 11—17 mm.. *P. curvipes* (VOSSELER Pl. 3 fig. 1, and the present paper fig. 52).

Propagation and vertical migrations.

The peculiar symbiosis, or rather parasitism, in different oceanic animals of tube-like shape, early aroused an interest in this genus, which interest is of course further stimulated by the comparatively considerable size of at any rate the one species (*P. sedentaria*). It is therefore one of the very few genera within the Hyperiidea, where mention has been made of biology, but the value of the information given on this point is often very much discounted by the fact that we cannot as a rule see which is the species in question.

In cases where the name of the species is not mentioned, one may say, with a fair degree of certainty, that the data given refer to *P. sedentaria* and *P. atlantica*, as these are the most abundant species in the waters from which information is available (Mediterranean and Northern Atlantic). Of the remaining species, *P. Colletti* and *P. Stebbingi* may perhaps be taken into consideration, these also being fairly numerous, in any case in parts of these waters. As to what is mentioned below, we may, I think, take it for granted, that it applies to *P. sedentaria* and *P. atlantica*.

One common feature appears over and over again in the literature *viz.* that propagation takes place at the surface, and that the young when they have left the house of the mother, seek the deep, in order to migrate to the upper layers, when they are full-grown and are going to propagate (CHUN, Bibliotheca Zoologica 19, 1895, p. 110—11; WOLTERECK, Zool. Anzeiger, 27, 1904, p. 561 & 626; ?TATTERSALL 1906 as to *P. sedentaria*). The only fact to substantiate this theory is that WOLTERECK (p. 561) has seen in aquaria that the young ones actively seek the darkness, while larger animals actively seek the light, and that at the surface (at Villafranca during the spring only, at the Canaries as early as Jan. [CHUN]) only the adults are to be found. As will appear from the following, this was not corroborated by the "Thor", the collections of which in several cases even seem to prove the contrary.

WOLTERECK records that at Villafranca, adult *Phronima* (♂, ♀) are to be found at the surface during the spring only, whereas deep down they are to be found all the year round. Also, ♂ are said to haunt the surface for a much shorter period than ♀. Nevertheless the "Thor" did not take any ♂ of *P. sedentaria* and *P. atlantica* at the surface during the winter, but during the summer not so very few. W.s record on the vertical distribution of ♀ (and young) agrees with *P. atlantica*, not with *P. sedentaria*.

CHUN 1895 makes a similar statement to that of WOLTERECK, and adds that off the Canaries, the ascent to the surface is already taking place in January.

STEUER (1913, table p. 567) shows that in the southern Adriatic the *Phronima* (specific name not given) at the end of August are most abundant during the night at about 250 m below the surface.

1. PHRONIMA SEDENTARIA Forskål (Figs. 50—51, Chart 15).

Phronima sedentaria Bovallius 1889, p. 354 (partim, lit.), Pl. 16 figs. 1—3. — **P. s.* Vosseler 1901, p. 14 (lit.), Pl. 1 figs. 1—11. — *P. s.* Tattersall 1906, p. 18. — *P. s.* R. Minkiewicz, Mémoire sur la biologie du Tonnelier de Mer (*Phronima sedentaria*); Bull. Inst. Océanogr. Monaco, Nos. 146 and 152, 1910. — *P. s.* K. Stephensen 1923, p. 34 (lit.). — non *P. s.* Claus, Zeitschr. Wiss. Zool., vol. 22. 1872, p. 331, Pl. 26—28 (♂ = *P. Colletti*, ♀ = *P. atlantica*). — non *P. s.* Chun, Zool. Anzeiger vol. 12, 1889, p. 378 (= *P. atlantica*). — *P. custos* Risso 1816, p. 121, Pl. 2 fig. 2.

P. custos is no doubt correctly ascribed by BOVALLIUS to the present species on the strength of the shape of the carpus in p. 5, and the extension of the hindmost lateral corners of the metasome segments (Risso Pl. 2 fig. 3); by Vosseler, on the other hand, with ? ascribed to *P. atlantica* var. *solitaria.* —

The Copenhagen Zoological Museum possesses one of Forskål's type-specimens, which measures 26 mm and has kept its house; it originates from the old Museum Academicum.

Mediterranean.

St. 10. 15-12-1908. 65 m.w., 6^{10} am., 60 min. 2 ♀ 8 mm. — **St. 10.** ibid. 300 m.w., 8^{10} am., 30 min. 1 ♀ 31 mm. — **St. 10.** ibid. 600 m.w., 3^{45} pm., 60 min. 1 ♀ 19 mm. — **St. 11.** 16-12-1908. 65 m.w., 5^{25} am., 60 min. 1 ♀ 12 mm. — **St. 11.** ibid. 300 m.w., 7^{00} am., 120 min. 2 ♀ 13—19 mm. — **St. 12.** 19-12-1908. 65 m.w., 1^{00} pm., 30 min. 1 ♀ 16 mm. — **St. 12.** ibid. 300 m.w., 11^{40} am., 60 min. 1 ♀ 16 mm. — **St. 24.** 16-1-1909. 300 m.w. (hour?). 1 ♀ 30 mm in the house with young 1.5—3 mm. — **St. 25.** 17-1-1909. 65 m.w., 4^{40} pm., 30 min. 1 ♂ (ad.?) 7 mm; 1 ♀ 10 mm. — **St. 26.** 19-1-1909. 25 m.w., 4^{20} am, 120 min. 2 ♀ 17—19 mm. — **St. 26.** ibid. 150 m.w., 0^{50} am., 180 min. 5 spec.: 1 ♂ ad. 8 mm, 4 ♀ 12, 13, 14, 21 mm. — **St. 26.** ibid. 300 m.w., 6^{40} am., 180 min. 8 ♀: 8, 10, 10, 10, 13, 17, 18, 24 mm. — **St. 28.** 19-1-1909. 400 m.w., 6^{40} pm., 30 min. 2 ♀ 33—36 mm, in their houses, with embryos 2 mm. — **St. 28.** ibid. 65 m.w., 11^{00} pm., 120 min. 2 ♀ 12 mm. — **St. 29.** 20-1-1909. 600 m.w., 9^{30} pm., 60 min. 1 ♀ 12 mm. — **St. 31.** 22-1-1909. 200 m.w., 3^{15} am., 30 min. 14 spec: 3 ♂ jun. 5—7 mm, 9 ♀ 5—7 mm, 2 ♀ 9—13 mm. — **St. 33.** 22-1-1909. 65 m.w., 6^{30} pm., 30 min. 5 ♀: 5, 7, 7, 10, 18 mm. — **St. 34.** 23-1-1909. 25 m.w., 4^{35} am., 30 min. 1 ♀ abt. 12 mm. — **St. 34.** ibid. 200 m.w., 6^{35} am., 30 min. 3 spec.: 1 ♂ jun. 8 mm, 2 ♀ 9-11 mm. — **St. 35.** 29-1-1909. 25 m.w., 9^{10} pm., 60 min. 24 ♀: 1 ♀ 8 mm, 22 ♀ 9—19 mm, 1 ♀ 24 mm. — **St. 35.** ibid. 200 m.w., 6^{40} pm., 60 min. 2 ♀ 19—21 mm. — **St. 35.** ibid. 300 m.w., 9^{40} pm., 120 min. 3 spec.: 1 ♂ jun. 7 mm, 1 ♂ ad. 7 mm, 1 ♀ 15 mm. — **St. 35.** ibid. 700 m.w., 11^{25} am., 120 min. 1 ♀ 22 mm. — **St. 36.** 30-1-1909. 65 m.w., 5^{35} am., 60 min. 12 ♀ 11—24 mm. — **St. 36.** ibid. 300 m.w., 6^{50} am., 60 min. 7 ♀: 5 ♀ 9—14 mm, 2 ♀ 18—19 mm. — **St. 38.** 31-1-1909. 25 m.w., 7^{10} pm., 30 min. 4 ♀ 9—12 mm. — **St. 38.** ibid. 150 m.w., 8^{20} pm., 30 min. 1 ♀ 12 mm. — **St. 40.** 1-2-1909. 65 m.w., 9^{30} pm., 30 min. 12 spec.: 3 ♂ jun. 7 mm, 5 ♀ 9—10 mm, 4 ♀ 11—13 mm. — **St. 46.** 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 6 ♀: 2 ♀ 9—11 mm, 4 ♀ 26, 27, 28, 30 mm. — **St. 47.** 10-2-1909. 300 m.w., 11^{05} pm., 30 min. 7 spec.: 1 ♂ jun. 7 mm, 1 ♀ 8 mm, 4 ♀ 13—14 mm, 1 ♀ 17 mm. — **St. 50.** 17-2-1909. 25 m.w., 1^{20} am., 30 min. 2 ♀ 13—17 mm. — **St. 50.** ibid. 600 m.w., 3^{25} am., 30 min. 1 ♀ 28 mm. — **St. 51.** 18-2-1909. 300 m.w., 0^{50} am., 30 min. 7 ♀: 8, 9, 10, 11, 13, 13, 22 mm. — **St. 53.** 18-2-1909. 2600 m.w., 5^{15} pm. 4 ♀ 13—16 mm. — **St. 55.** 19-2-1909. 65 m.w., 7^{40} am., 60 min. 1 ♀ 18 mm. — **St. 57.** 20-2-1909. 200 m.w., 6^{35} am., 30 min. 3 ♀ 8, 10, 13 mm. — **St. 58.** 20-2-1909. 65 m.w., 3^{00} p.m, 30 min. 1 ♀ 13 mm. — **St. 58.** ibid. 100 m.w., 2^{00} pm., 30 min. 3 spec.: 1 ♂ jun. 7 mm, 2 ♀ 5—10 mm. — **St. 59.** 21-2-1909. 500 m.w., 1^{40} am., 30 min. 3 ♀ 13, 17, 18 mm. — **St. 59.** ibid. 1200 m.w., 2^{30} am., 60 min. 30 spec.: 1 ♂ jun. 7 mm, 2 ♀ 8—9 mm. — **St. 106.** 25-6-1910. 300 m.w., 1^{45} am., 30 min. 1 ♀ 10 mm. — **St. 106.** ibid. 1200 m.w., 0^{20} am., 60 min. 4 spec.: 1 ♂ jun. 7 mm, 3 ♀ 11, 15, 21 mm. — **St. 112.** 27-6-1910. 25 m.w., 1^{30} am., 15 min. 1 ♀ 6 mm. — **St. 115.** 29-6-1910. 65 m.w., 1^{20} am., 15 min. 1 ♀ 7 mm. — **St. 115.** ibid. 300 m.w., 11^{20} pm., 30 min. 5 spec.: 1 ♂ jun. 8 mm, 3 ♀ 8, 12, 19 mm, 1 ♀ with ova 26 mm. — **St. 115.** ibid. 2000 m.w., 0^{30} am., 60 min. 1 ♀ 8 mm, 1 ♀ with its house 27 mm. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 15 spec.: 1 ♂ ad. 8(?) mm, 5 ♂ jun. 5—7 mm, 9 ♀ 5—6 mm. — **St. 116.** ibid. 65 m.w., 2^{20} am., 30 min. 14 spec.: 5 ♂ jun. 5—6 mm, 8 ♀ 6—9 mm. 1 ♀ 19 mm. — **St. 116.** ibid. 300 m.w., 1^{40} am., 30 min. 9 spec.: 2 ♂ jun. 6 mm, 7 ♀ 18, 18, 21, 25, 26, 28, 30 mm. — **St. 118.** 1-7-1910. 25 m.w., 0^{20} am., 15 min. 7 spec.: 2 ♂ jun. 6—7 mm, 5 ♀ 9, 10, 12, 13, 13 mm. — **St. 118.** ibid. 65 m.w., 11^{35} pm., 30 min. 7 spec.: 2 ♂ jun. 7 mm, 5 ♀ 8, 8, 9, 9, 14 mm. — **St. 118.** ibid. 300 m.w., 10^{55} pm., 30 min. 14 spec.: 1 ♂ jun. 7 mm, 1 ♂ ad. 8 mm, 10 ♀ 5—14 mm, 2 ♀ 22—29 mm (the greater one with ova) with their houses. — **St. 120.** 1-7-1910. 300 m.w., 8^{50} pm., 30 min. 11 spec.: 1 ♂ ad. 9 mm, 2 ♀ 8—10 mm, 8 ♀ 18, 19, 22, 25, 25, 28, 29, 30 mm (with ova in marsupium), 3 houses, in one of them two groups (each abt. 100 spec.) of small embryos, 1 mm in length. — **St. 121.** 2-7-1910. 25 m.w., 3^{35} am., 30 min. 5 spec. abt. 7 mm: 2 ♂ (ad.?), 2 ♂ jun., 1 ♀. — **St. 122.** 2-7-1910. 600 m.w., 10^{00} pm., 60 min. 2 ♀ 21—26 mm, one of them with its house. — **St. 122.** ibid. 1200 m.w., 5^{30} pm., 60 min. 2 ♂ jun. 7 mm, 3 ♀ 13, 20, 25 mm. — **St. 123.** 3-7-1910. 10 m.w. 2^{30} am., 15 min. 1 ♀ 11 mm. — **St. 123.** ibid. 25 m.w., 1^{50} am., 15 min. 14 spec.: 1 ♂ ad. 7 mm, 5 ♂ jun. 5—7 mm, 6 ♀ 8—9 mm, 2 ♀ 9—10 mm. — **St. 123.** ibid. 65 m.w., 0^{55} am., 30 min. 7 spec.: 2 ♂ jun. 7 mm, 5 ♀ 6—9 mm. — **St. 123.** ibid. 300 m.w. 0^{05} am., 30 min. 7 spec.: 2 ♂ ad. 8—9 mm, 2 ♂ jun. 6—7 mm, 3 ♀ 9, 11, 28 mm. — **St. 125.** 9-7-1910. 25 m.w., 10^{30} pm., 30 min. 1 ♀ 14 mm. — **St. 125.** ibid. 300 m.w., 9^{45} pm., 30 min. 4 ♀: 10, 11, 18, 20 mm. — **St. 126.** 10-7-1910. 300 m.w., 9^{30} pm., 30 min. 11 spec.: 4 ♂ ad. 8 mm, 2 ♂ jun. 6 mm, 4 ♀ 14, 16, 17, 18 mm, 1 ♀ in its house 29 mm, with embryos (3—4 mm). — **St. 129.** 12-7-1910. 25 m.w., 3^{00} am., 30 min. 1 ♀ 6 mm. — **St. 129.** ibid. 300 m.w., 3^{40} am., 30 min. 4 spec.: 2 ♂ jun. 6 mm, 2 ♀ 8—11 mm. — **St. 129.** ibid. 3500 m.w., 3^{00} pm., 120 min. 1 ♀ 7 mm. — **St. 131.** 13-7-1910. 300 m.w., 10^{35} am., 30 min. 1 ♀ 16 mm. — **St. 132.** 14-7-1910. 25 m.w., 3^{05} am., 30 min. 1 ♂ jun. 6 mm. — **St. 132.** ibid. 300 m.w., 3^{45} am., 30 min. 46 spec.: 2 ♂ ad. 7 mm, 11 ♂ jun. 7 mm, 32 ♀ 7—13 mm, 1 ♀ 16 mm. — **St. 132.** ibid. 600 m.w., 4^{50} am., 30 min. 13 spec.: 3 ♂ jun. 5—7 mm, 7 ♀ 5—8 mm, 3 ♀ 10—12 mm. — **St. 133.** 14-7-1910. 300 m.w., 10^{15} pm., 30 min. 4 ♀: 7, 7, 10, 12 mm. — **St. 133.** ibid. 600 m.w., 9^{20} pm., 30 min. 2 spec.: 1 ♂ jun. 8 mm, 1 ♀ 7 mm. — **St. 134.** 15-7-1910. 300 m.w., 5^{40} am., 30 min. 4 spec.: 1 ♂ jun. 7 mm, 3 ♀ 8, 9, 11 mm. — **St. 137.** 19-7-1910. 250 m.w., 9^{05} am., 30 min. 1 ♀ 9 mm. — **St. 138.** 19-7-1910. 300 m.w., 9^{10} pm., 30 min. 5 ♀ 5—14 mm. — **St. 139.** 20-7-1910. 25 m.w., 1^{40} am., 30 min. 2 ♀ 4—6 mm. — **St. 143.** 23-7-1910. 300 m.w., 0^{30} am., 30 min. 1 ♀ 20 mm. — **St. 144.** 24-7-1910. 2000 m.w., 3^{45} am., 60 min. 1 ♀ 23 mm. — **St. 145.** 25-7-1910. 300 m.w., 4^{10} am., 30 min. 9 spec.: 3 ♂ jun. 5 mm, 6 ♀ 5, 7, 7, 9, 12, 13 mm. — **St. 147.** 25-7-1910. 25 m.w., 11^{35} pm., 30 min. 4 ♀: 7, 8, 13, 17 mm. — **St. 147.** ibid. 300 m.w., 0^{20} am., 30 min. 1 ♂ ad. 7 mm, 1 ♂ jun. 6 mm. — **St. 147.** ibid. 1000 m.w., 1^{10} am., 60 min. 2 ♂ ad. 8 mm, 1 ♂ jun. 7 mm. — **St. 154.** 29-7-1910. 300 m.w., 4^{30} am., 30 min. 1 ♀ 7 mm. — **St. 156.** 30-7-1910. 300 m.w., 3^{50} am., 30 min. 3 spec.: 1 ♂ jun. 7 mm, 2 ♀ 8—12 mm. — **St. 160.**

1-8-1910. 1000 m.w., 3^{35} am., 60 min. 7 spec.: 4 ♂ ad. 7—8 mm, 1 ♂ jun. 7 mm, 2 ♀ 8—11 mm. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 5 spec.: 1 ♂ jun. 5 mm, 4 ♀ 8, 16, 17, 17 mm. — **St. 163.** 3-8-1910. 300 m.w., 1^{05} am., 15 min. 2 ♀ 6—7 mm. — **St. 182.** 13-8-1910. 600 m.w., 11^{40} pm., 30 min. 1 ♂ ad. 8 mm. — **St. 186.** 17-8-1910. 10 m.w., 11^{30} pm., 15 min. 5 ♀ 9, 10, 12, 13, 14 mm. — **St. 186.** ibid. 300 m.w., 8^{15} pm., 15 min. 3 spec.: 1 ♂ jun. 7 mm, 2 ♀ 9—23 mm. — **St. 187.** 18-8-1910. 25 m.w., 7^{45} pm., 15 min. 12 spec.: 2 ♂ jun. 5—7 mm, 5 ♀ 6 mm, 5 ♀: 11, 12, 12, 14, 17 mm. — **St. 187.** ibid. 300 m.w., 0^{55} pm., 30 min. 1 ♀ 11 mm. — **St. 187.** ibid. 1000 m.w., 6^{40} pm., 30 min. 3 ♀ 12, 14, 16 mm. — **St. 192.** 20-8-1910. 25 m.w., 9^{40} pm., 15 min. 3 spec.: 1 ♂ jun. 4 mm, 2 ♀ 7 mm. — **St. 192.** inid. 300 m.w., 10^{10} pm., 15 min. 3 spec.: 1 ♂ ad. 8 mm, 1 ♂ jun. 4 mm, 1 ♀ 8 mm. — **St. 193.** 21-8-1910. 10 m.w., 0^{50} am., 15 min. 4 spec.: 1 ♂ jun. 4 mm, 3 ♀ 4—6 mm. — **St. 194.** 21-8-1910. 25 m.w., 5^{00} am., 15 min. 4 ♂ jun. 5—6 mm. — **St. 194.** ibid. 1200 m.w., 6^{00} am., 30 min. 3 spec.: 2 ♂ ad. 7 mm, 1 ♀ 5 mm. — **St. 195.** 21-8-1910. 65 m.w. 6^{50} pm., 15 min. 3 ♂ jun. 5, 6, 7 mm. — **St. 196.** 22-8-1910. 25 m.w., 2^{40} am., 30 min. 3 spec.: 2 ♂ jun. 5—6 mm, 1 ♀ 6 mm. — **St. 197.** 24-8-1910. 25 m.w., 7^{45} pm., 15 min. 12 spec.: 3 ♂ jun. 5-8 mm, 7 ♀ 6—8 mm, 2 ♀ 9—11 mm. — **St. 199.** 25-8-1910. 25 m.w., 9^{00} pm., 15 min. 8 spec.: 5 ♂ jun. 5—7 mm, 3 ♀ 6—8 mm. — **St. 199.** ibid. 300 m.w., 9^{25} pm., 20 min. 20 spec.: 1 ♂ ad. 7 mm, 5 ♂ jun. 6—7 mm, 14 ♀: 11, 11, 12, 12, 15, 18, 19, 20, 20, 21, 24, 24, 27, 28 mm. — **St. 199.** ibid. 1000 m.w., 10^{10} pm., 30 min. 4 spec.: 1 ♂ jun. 7 mm, 3 ♀ 6, 8, 9 mm. — **St. 200.** 26-8-1910. 25 m.w., 3^{45} am., 30 min. 1 ♀ 13 mm. — **St. 202.** 26-8-1910. 300 m.w., 5^{05} pm., 15 min. 9 spec.: 1 ♂ ad. 7 mm, 4 ♂ jun. 6—7 mm, 4 ♀ 8—10 mm. — **St. 204.** 27-8-1910. 65 m.w., 4^{30} am., 15 min. 3 ♀: 6, 9, 15 mm. — **St. 204.** ibid. 300 m.w., 5^{00} am., 30 min. 2 spec.: 1 ♂ jun. 7 mm, 1 ♀ 12 mm. — **St. 204.** ibid. 1000 m.w., 5^{55} am., 30 min. 2 ♀ 8—14 mm. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 2 ♀ 6 mm. — **St. 206.** 28-8-1910. 300 m.w., 1^{05} am., 15 min. 7 spec.: 2 ♂ ad. 8 mm, 1 ♂ jun. 7 mm, 4 ♀ 6, 11, 18, 18 mm. — **St. 206.** ibid. 1000 m.w., 1^{40} am., 45 min. 3 spec.: 1 ♂ ad. 8 mm, 2 ♀ 8—19 mm. — **St. 207.** 29-8-1910. 1000 m.w., 6^{00} am., 45 min. 3 spec.: 2 ♂ ad. 8 mm, 1 ♀ 15 mm, with its house. — **St. 208.** 29-8-1910. 25 m.w., 1^{40} am., 15 min. 3 ♀ 4, 6, 6mm. — **St. 209.** 29-8-1910. Vertical net 75—35 m, 4^{10} pm. 1 ♀ 4 mm. — **St. 209.** ibid. 100 m.w., 3^{45} am., 20 min. 1 ♀ 29 mm, in its house, with abt. 200 young, 4 mm. — **St. 209.** ibid. 150 m.w., 4^{25} am., 20 min. 1 ♀ 5 mm. — **St. 209.** ibid. 300 m.w., 5^{25} am., 15 min. 9 spec.: 3 ♂ jun. 6—7 mm, 2 ♀ 6 mm, 4 ♀ 9—10 mm. — **St. 209.** ibid. 1000 m.w., 6^{00} am., 41 min. 1 ♀ 31 mm, with small embryos (0.75 mm) in the marsupium. — **St. 209.** ibid. 2000 m.w., 7^{25} am., 45 min. 1 ♀ 14 mm. — **St. 210.** 30-8-1910. Surf. (P. 100), 2^{50} am., 10 min. 1 ♀ 7 mm. — **St. 210.** ibid. 25 m.w., 2^{45} am., 30 min. 1 ♀ 18 mm. — **St. 210.** ibid. 600 m.w., 3^{35} am., 30 min. 3 spec.: 1 ♂ ad. 8 mm, 2 ♀ 23—26 mm. — **St. 218.** 2-9-1910-. 300 m.w., 2^{45} am., 30 min. 1 ♀ 18 mm. — **St. 222.** 4-9-1910. 300 m.w., 11^{20} pm., 30 min. 1 ♂ jun. 7 mm. — **St. 223.** 5-9-1910. 25 m.w., 4^{35} am., 15 min. 1 ♀ 12 mm. — **St. 275.** 39°5′ N, 14°50′ E. 3-4-1911. 94 m.w. (S. 200), 8^{30} pm., 30 min. 6 spec.: 4 ♂ jun. 5—6 mm, 2 ♀ 6—7 mm. — **St. 276.** 36°30′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200), 11^{20} pm., 35 min. 2 ♀ 11—16 mm. — **St. 277.** 33°20′ N, 27°30′ E. 6-4-1911. 132 m.w. (S. 200), 11^{00} pm., 35 min. 32 ♀: 2 ♀ 5—9 mm, 8 ♀ 13 mm, 1 ♀ 18 mm, 21 ♀ 20—30 mm. — **St. 282.** 9-3-1911. 40 m.w. (S. 100), 3^{30} am., 90 min. 1 ♀ 5 mm. — **St. 297.** 33°10′ N, 25°35′ E. 25-6-1911. 28 m.w. (S. 200), 11^{30} pm., 30 min. 9 spec.: 2 ♂ jun. 5—6 mm, 5 ♀ 5 mm, 2 ♀ 8—9 mm. — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 min. 13 spec.: 3 ♂ jun. 6 mm, 10 ♀ 8—11 mm. — **St. 339.** 40°30′ N, 3°10′ E. 20-8-1911. 28 m.w. (S. 200), 3^{00} am., 30 min. 2 ♀ 7—8 mm. — **St. 340.** 35°50′ N, 21°30′ E. 26-8-1911. 108 m.w. (S. 150), 9^{00} pm., 2 ♂ jun. 4—7 mm. — **St. 341.** 34°00′ N, 26°20′ E. 27-8-1911. 28 m.w., (S. 200), 11^{00} pm., 30 min. 1 ♀ 7 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 3 spec.: 2 ♂ jun. 7 mm, 1 ♀ 6 mm. — **St. 410.** 37°12′ N, 1°18′ W. 29-12-1911. 112 m.w. (S. 150), 7^{00} pm., 4 ♂ jun. 4—6 mm. — **St. 412.** 34°33′ N, 24°15′ E. 7-1-1912. 112 m.w. (S. 150). 2 spec.: 1 ♂ jun. 4 mm, 1 ♀ 7 mm. **St. 730.** 38°26′ N, 13°27′ E. 16-4-1913. 2^{00} pm. 1 ♀ 30 mm, in the house, with ova.

Atlantic.

St. 72. 57°52′ N, 9°53′ W. 8-6-1905. 1500 m.w. 2 spec.: 1 ♂ jun. 7 mm, 1 ♀ 26 mm. — **St. 70.** 57°45′ N, 9°57′ W. 7-6-1905. 65 m.w. 2 ♀ 17—19 mm. — **St. 81.** 51°32′ N, 12°3′ W. 13(14)-6-1905. 300 m.w. 11^{45} pm. 14 ♀, all with houses: 17 (2 spec.), 26, 27, 28, 29 (3 spec., 1 with ova), 30 (with embr. 4 mm), 31 (4 spec., 2 with ova), 35 mm; besides several small, 4—5 mm. — **St. 82.** 51°00′ N, 11°45′ W. 14-6-1905. 300 m.w. 1^{35} am., 1 ♂ jun. 6 mm. — **St. 82.** ibid. 300 and 600 m.w. Abt. 75 spec. 5 mm. — **St. 82.** ibid. 800 m.w. 3^{45} pm., 18 spec.: 2 ♂ (ad.?) 7—8 mm, 4 ♀ 10—11 mm, 6 ♀ 14—19 mm, 6 ♀ 23—30 mm. — **St. 82.** ibid. 800 and 1200 m.w. 24 spec.: 3 ♂ ad. 7—8 mm, 3 ♂ jun. 5—7 mm, 2 ♀ 8 mm, 1 ♀ 11 mm, 1 ♀ 16 mm, 9 ♀ 26—28 mm, 5 ♀ 20—24 mm; 2 houses. — **St. 82.** ibid. 1200 m.w., 0^{45} pm., 120 min. 5 ♀: 1 ♀ 21 mm, 3 ♀ 24 mm, 1 ♀ 29(?) mm. — **St. 88.** 48°09′ N, 8°30′ W. 20-6-1905. 300 m.w., 8^{45} pm. 13 ♀: 7 ♀ 18—21 mm. 3 ♀ 22—24 mm, 2 ♀ 26 mm, 1 ♀ with ova 28 mm. — **St. 90.** 47°47′ N, 8°00′ W. 21(22)-6-1905. 300 m.w. 2^{15} am., 9 ♀: 4 ♀ 16—20 mm, 2 ♀ 22—23 mm, 3 ♀ 28—30 mm. — **St. 164.** 61°20′ N, 11°00′ W. 29-8-1905. 65 m.w. 2 ♀: 1 ♀ 27 mm with a group of small embryos (1.25 mm) in the house, 1 ♀ 28 mm with its house. — **St. 165.** 60°00′ N, 10°35′ W. 29-8-1905. 1600 m.w. 1 ♀ 28 mm, with several hundred embryos (2 mm) in the house. — **St. 167.** 57°46′ N, 9°55′ W. 31-8-1905. 300 m.w. 3 ♀: 4, 17, 23 mm. — **St. 167.** ibid. (m.w.?). 2 spec.: 1 ♂ jun. 5 mm, 1 ♀ 11 mm. — **St. 167.** ibid. 1500 m.w. 8 ♀: 2 ♀ 4 mm, 6 ♀ 11, 16, 16, 21, 22, 23 mm. — **St. 36.** 44°27′ N, 2°37′ W. 10-5-1906. 800 m.w., 9^{05} am. 1 ♀ 24 mm. — **St. 37.** 44°01′ N, 2°49′ W. 11-5-1906. 300 m.w. 7^{05} pm. 1 ♀ 30 mm. — **St. 52.** 48°42′ N, 12°20′ W. 21-5-1906. 300 m.w., 6^{10} am. 3 ♀: 29, 31, 33 mm (the last one with ova). — **St. 62.** 50°25′ N, 12°44′ W. 5-6-1906. 1500 m.w., 2^{45} am. 10 ♀: 12, 19, 22, 24, 24, 25, 26 mm (4 spec.; 1 with ova). — **St. 63.** 49°27′ N, 13°22′ W. 5-6-1906. 300 m.w. 5^{30} pm. 2 ♀ 17 mm. — **St. 72.** 48°40′ N, 11°30′ W. 8-6-1906. 300 m.w. 9^{00} pm. 1 ♀ 19 mm. — **St. 74.** 49°23′ N, 12°13′ W. 10-6-1906. 2000 m.w., 6^{35} am. 4 ♀: 20, 22, 26, 29 mm (the last one with ova). — **St. 74.** ibid. Eel seine 2000 m.w., 1^{20} pm. 1 ♀ 25 mm, with its house. — **St. 74.** ibid. Eel seine 2500 m.w., 9^{50} pm. 1 ♀ 31 mm. — **St. 76.** 49°27′ N, 13°33′ W. 11-6-1906. 2800 m.w., 3^{00} pm. 3 ♀: 21, 25, 25 mm. — **St. 176.** 49°31′ N, 11°25′ W. 31-8-1906. 300 m.w., 9^{30} pm., 120 min. 5 ♀: 25, 26, 27 (2 spec., 1 with ova), 30 mm. — **St. 178.** 48°04′ N, 12°40′ W. 2-9-1906. 300 m.w., 3^{15} am., 120 min. 1 ♀ 30 min. — **St. 178.** ibid. 1800 m.w., 9^{05} am. 2 ♀ 25 mm. — **St. 179.** 47°20′ N, 12°23′ W. 3-9-1906. 600 m.w., 0^{00} am. 2 ♀ 27—30 mm. — **St. 180.** 48°19′ N, 13°53′ W. 3-9-1906. 300 m.w., 3^{00} pm., 60 min. 1 ♀ with small embryos (abt. 1 mm). 28 mm. — **St. 190.** 46°30′ N, 7°00′ W. 11-9-1906. 2700 m.w., 8^{25} am. 1 ♀ 21 mm. — **St. 4.** 1-12-1908. 1500 m.w., 11^{45} am., 60 min. 2 ♀ 16—19 mm. — **St. 65.** 24-2-1909. 65 m.w., 6^{30} pm., 60 min. 2 ♀ 14—25 mm. — **St. 65.** ibid. 300 m.w., 7^{45} am., 120 min. 2 ♀ 7—8 mm. — **St. 65.** ibid. 600 m.w., 10^{00} am., 120 min. 41 spec.: 1 ♂ ad. 8 mm, 1 ♂ jun. 7 mm, 38 ♀: 1 ♀ 7 mm, 3 ♀ 8—9 mm, 28 ♀ 11—22 mm, 5 ♀ 24—25 mm, 1 ♀ 27 mm, 1 ♀ with ova 28 mm; 1 house. — **St. 66.** 25-2-1909. 65 m.w., 1^{45} am., 60 min. 3 ♀: 12, 15, 15 mm. — **St. 66.** ibid. 300 m.w., 2^{55} am., 120 min. 1 ♀ 28 mm. — **St. 69.** 1-3-1909. 25 m.w., 0^{30} am., 30 min. 6 spec.: 2 ♂ jun. 7 mm, 4 ♀: 8, 9, 14, 15 mm. — **St. 69.** ibid. 65 m.w., 10^{45} pm., 30 min. 15 spec.: 3 ♂ jun. 7 mm, 12 ♀: 2 ♀ 7 mm, 1 ♀ 10 mm, 6 ♀ 15—17 mm, 2 ♀ 19 mm, 1 ♀ with ova 30 mm. — **St. 69.** ibid. 300 m.w., 3^{05} pm., 30 min. 1 ♀ with ova 28 mm. — **St. 69.** ibid. 300 m.w., 11^{10} pm., 30 min. 33 spec.: 6 ♂ ad. 8 mm, 3 ♂ jun. 7 mm, 24 ♀: 4 ♀ 6—7 mm, 7 ♀ 8—10 mm, 6 ♀ 15 mm, 3 ♀ 20 mm, 4 ♀: 26, 27, 28, 30 mm (the last one with ova). — **St. 69.** ibid. 600 m.w., 9^{00} pm., 60 min. 3 ♀: 8, 21, 21 mm. — **St. 69.** ibid. 3000 m.w., 6^{30} pm., 60 min. 6 ♀: 14, 14, 16, 18, 23, 26 mm. — **St. 74.** 8-3-1909. 300 m.w., 10^{50} pm., 60 min. 1 ♀ 23 mm. — **St. 75.** 9-3-1909. 65 m.w., 9^{00} pm., 60 min. 1 ♀ 18 mm. — **St. 76.** 10-3-1909. 65 m.w., 6^{45} pm., 60 min. 1 ♀ 16 mm. — **St. 76.** ibid. 1600 m.w., 2^{40} pm., 60 min. 1 ♀ with ova 27 mm. — **St. 80.** 13-6-1910. 25 m.w., 11^{30} pm., 15 min. 1 ♀ 25 mm. — **St. 80.** ibid. 65 m.w., 10^{00} pm., 30 min. 1 ♀ 20 mm. — **St. 89.** 18-6-1910. 65 m.w., 3^{00} am., 15 min. 2 ♀ 11—17 mm. — **St. 89.** ibid. 300 m.w., 3^{25} am., 30 min. 4 spec.: 1 ♂ jun. 6 mm, 3 ♀: 10, 16, 21 mm. — **St. 89.** ibid. 1000 m.w., 4^{10} am., 30 min. 1 ♀ 31 mm, with embryos (2 mm) in its house. — **St. 91.** 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 3 ♂ 7 mm: 1 jun., 2 ad. — **St. 91.** ibid. 1600 m.w., 5^{25} pm., 60 min. 2 spec.: 1 ♂ ad. 6 mm, 1 ♀ 24 mm. — **St. 95.** 23-6-1910. 300 m.w., 5^{10} am., 30 min. 1 ♀ 9 mm. — **St. 96.** 23-6-1910. 65 m.w., 9^{30} am., 30 min. 1 ♀ 8 mm. — **St. 240.** 15-9-1910. Surf. (P. 100), 9^{05} pm., 10 min. 1 ♀ 10 mm. — **St. 240.** ibid. 25 m.w., 8^{30} pm., 15 min. 11 ♀: 10 mm (3 spec.), 14, 16, 16, 17, 18 (3 spec.), 20 mm. — **St. 240.** ibid. 1000 m.w., 9^{40} pm., 30 min. 1 ♀ 26 mm. — **St. 242.** 16-9-1910. 65 m.w., 10^{55} pm., 30 min. 115 spec.: 1 ♂ ad. 8 mm, 27 ♂ jun. 7 mm., 64 ♀ 6—11 mm, 11 ♀ 14—16 mm, 10 ♀ 18—23 mm, 2 ♀ 24—25 mm. — **St. 244.** 17-9-1910. 1000 m.w., 10^{25} am., 30 min. 1 ♀ 28 mm. — **St. 245.** 17-9-1910. 65 m.w., 9^{55} pm., 15 min. 3 ♀: 23, 27, 27 mm. — **St. 245.** ibid. 150 m.w., 8^{55} pm., 15 min. 1 ♀ 28 mm. — **St. 245.** ibid. 400 m.w., 5^{15} pm., 120 min. 2 ♀ 28—30 mm, 3 houses and a few embryos (2 mm). — **St. 264.** 38°14′ N, 24°35′ W. 19-3-1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 2 ♀ 6—13 mm. — **St. 265.** 39°22′ N, 22°49′ W. 20-3-1911. 25 m.w. (S. 150), 7^{30} pm., 30 min. 1 ♂ jun. 7 mm. — **St. 265.** ibid. 47 m.w. (S. 100), 7^{00} pm., 30 min. 1 ♀ 13 mm. — **St. 267.** 42°37′ N, 18°06′ W. 22-3-1911. 47 m.w. (S. 100), 7^{00} pm., 30 min. 6 spec.: 2 ♂ jun. 5—7 mm, 4 ♀ 7, 7, 12, 14 mm. — **St. 268.** 45°44′ N, 13°20′ W. 24-3-1911. 25 m.w. (S. 150), 4^{30} am., 30 min. 1 ♂ jun. 6 mm. — **St. 268.** ibid. 47 m.w. (S. 100), 4^{30} am., 30 min. 2 spec.: 1 ♂ jun. 5 mm, 1 ♀ 8 mm. — **St. 376.** 34°41′ N, 16°41′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min. 13 spec.: 4 ♂ jun. 6—7 mm, 9 ♀: 6 ♀ 7—9 mm, 3 ♀ 12, 13, 18 mm. — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 12 spec.: 6 ♂ jun. 6—7 mm, 6 ♀: 8, 12, 15 (3 spec.), 18 mm. — **St. 382.** 34°21′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 1 ♀ 14 mm. — **St. 398.** 36°48′ N. 14°22′ W. 26-10-1911. 56 m.w. (S. 150), 12^{40} am., 30 min, 2 spec.: 1 ♂ jun. 5 mm, 1 ♀ 22 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1910. Surf. (S. 200), 9^{10} pm., 30 min. 10 spec.: 1 ♂ jun. 5 mm, 9 ♀ 5—7 mm. — **St. 399.** ibid. 56 m.w. (S. 150), 9^{10} pm., 30 min. 4 ♀: 5, 6, 13, 13 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 10^{05} pm., 30 min. 1 ♂ jun. 7 mm. — **St. 400.** ibid. 56 m.w. (S. 150), 9^{35} pm., 30 min. 2 ♀ 5—16 mm.

The material from the "Thor" Exp. contains 1204 spec. (241 ♂, 888 ♀, about 75 jun.) from 134 st., 217 hauls. Somewhat more than half the specimens and nearly the two thirds of stations and hauls are from the Mediterranean.

A. Mediterranean.

	Stat.	Hauls	Specimens[1] ♂	♀	total
"Thor" Dec. 1908....	3	7	—	9	9
Jan. 1909....	11	20	8	92	100
Feb. —	10	13	6	45	51
June 1910....	4	9	15	36	51
July —	21	35	60	145	205
Aug. —	22	39	55	109	164
Sept. —	3	3	1	2	3
"Thor" total........	74	126	145	438	583
other vessels........	13	13	18	60	78
total...	87	139	163	498	661

Depths of the sea and occurrence.

The frequency of stations in percentage increases with the depth, and it has chiefly been taken at depths

Depths in w.	Total no of posit. st.	No. of posit. st. of the "Thor" alone	Total no. of st. of the "Thor"	Percentage of posit. st.
0— 500 ...	12	11	67	16.4
> 500—1000 ...	14	14	31	45.2
>1000—2000 ...	23	20	41	48.8
>2000—3000 ...	28	22	35	62.9
>3000 ...	10	7	10	70.0
total...	87	74	184	

of the sea > 500 m. The 12 stations of < 500 m have the

[1] The young found in the house of the mother are not included in these figures.

This is the second greatest number of stations and hauls for any kind of Hyperiidea from the "Thor" (only *Phrosina semilunata* has still higher figures).

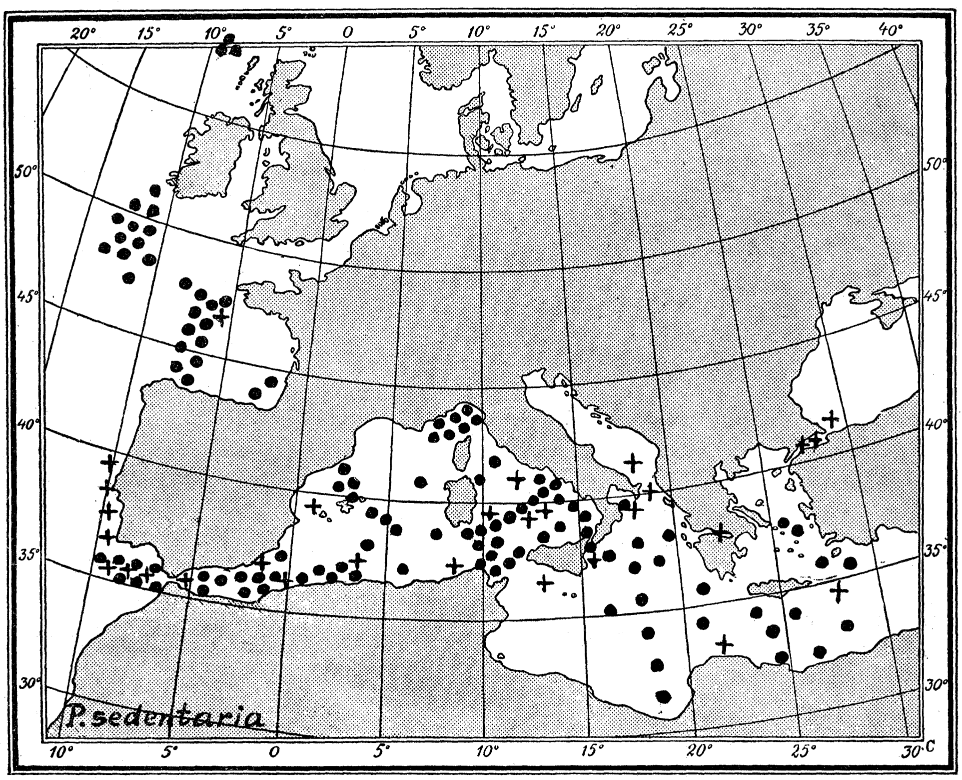

Chart 15. *Phronima sedentaria.* ● positive stations, + negative stations (> 500 m, night, 10—300 m.w.). St. 165 and 167 (1905) lie outside the chart to the N., stations posteriorly to st. 264 (1911) lie outside to the S.W. Some of the stations lie so close to each other that it was impossible to note them all.

During the winter (Dec.—Feb.), night, males were not taken at all at the very surface: 2 ♂ ad. 65 and 300 m.w. respectively, 9 (14) ♂ jun. 65—> 400 m.w.

During the summer, night, (June 25—Sept. 5) the young ♂ live both at the surface and deeper down, but the fullgrown ♂ were almost exclusively taken with 300—400 m. w., only exceptionally at the surface.

As to females (night) it appears that both in winter and summer the young specimens (5—20 mm) live both at the surface and deeper down; but the larger ones were nearly all taken with 300—400 m. w. The smallest (4—7 mm) were found chiefly at the very surface. What is here shown for ♀ is absolutely at variance with existing literature (see above p. 114). For ♀ with ova or embryos see under Propagation.

following depths: 75 m (2 times), 85, > 100, 105, 150, 175—195, 200, 235, 365, 400, 450 m.

As regards the distribution, the 74 positive stations of the "Thor" itself lie 57 in the western, 17 in the eastern basin; the supplementary 13 stations are to be divided into 4 and 9 respectively, so that there are in all 61 stations in the western, 26 stations in the eastern basin. Reckoning only with depths > 500 m the figures for the "Thor" only become 50 and 16 respectively. Of negative stations (> 500 m, night-hauls 10—300 m. w.) there are 13 (it is abt. 20 per cent.) in the western, 12 (it is abt. 40 per cent.) in the eastern basin. In the western basin, the negative stations are evenly distributed among the positive ones, in the eastern there are in the Adriatic and inside the Dardanelles only negative stations.

Vertical occurrence. In winter it was taken at night at all depths, from the surface to > 400 m. w. during the day only with 65 m. w. or deeper down.

In summer, the depths at night are the same as in winter, but especially 300 m. w. (51 per cent. of all hauls on a depth of the sea of > 500 m); in the daytime only 300 m. w. or deeper down.

If, however, we look at the two sexes separately, the result is somewhat different.

Size and propagation. ♂ ad. are as a rule 8 mm, rarely only 7 mm (Vosseler: 8—10 mm). In the Mediterranean, 3 times as many females as males were taken (498 and 163 respectively).

Females grow to 36 mm (Chun: 40 mm). Females of < 25 mm have as a rule no marsupial plates; large plates are as a rule only to be found on animals > 28 mm, the intermediary sizes have small marsupial plates. The strong spine on the end of the hind margin of the femur in p. 3—p. 5 becomes much smaller when the animals are about 15—20 mm long, and on p. 5 it projects in a sharp point; this Vosseler considers the chief character of the age of maturity, apart from the form of the chela in p. 5. On p. 19 he even says: "Die Weibchen besitzen alle Merkmale der Geschlechtsreife etwa bei 16 mm Körperlänge". Females of > 21 mm are most often a little harder-skinned than the smaller ones. The large ♀ (> ca. 20 mm) are comparatively much rarer in the Mediterranean than in the Atlantic.

It is only the large ♀, which are to be found in houses (see Minkiewicz l. c. No. 152, 1909). In the material of the "Thor" there are from the Mediterranean 13 spec. in houses; 1 spec. is 15 mm, the others (21) 22—36 mm; 6 of these females have neither ova nor embryos.

From the Mediterranean there are only 10 females with ova or young, and they have a size of 26—36 mm. ♀ with ova were found 6. April and 22. June—1. Aug.; ♀ with young 16. and 19. Jan. (the young 2—3 mm), 1. Aug. (the young 1 mm), 10. Aug. (the young 3—4 mm) and 29. Aug. (the young 0,75 mm [in the marsupium] or 3—4 mm [in the house]). When the young are 1 mm long they leave the marsupium and are fixed in two groups of about 100 each inside the house of the mother (see Minkiewicz l. c. 1909 (no. 152) fig. 22 p. 2), where they remain until they are about 4 mm long. The smallest free-living young are 4—5 mm. The old ♀ with young keep on a level answering at night to about 300 (400) m. w. (only one spec. 1000 m. w.); when the

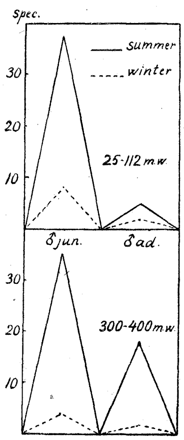

Fig. 50. ♂

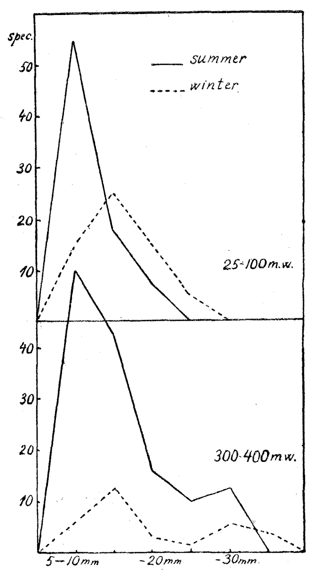

Fig. 51. ♀

Phronima sedentaria. Vertical occurence of ♂ (Fig. 50) and ♀ (Fig. 51) in the Mediterranean, night, summer (June 25th—Sept. 5th) and winter (Dec. 16th—Feb. 21st).

young leave the house of the mother, they rise, and during the night they are to be found at or rather near the surface; gradually they descend deeper and deeper. This is altogether at variance with the view current in literature (see above p. 114).

Lo Bianco records (1904 p. 43) that at Naples it is common at the surface, during the winter and the spring, in particular ♀ ad.; ♂ is much rarer, though it occurs all the year round, but only deeper down than 50 m (I suppose he means during the day?).

All the authors who have described *Phronima* (*sedentaria*) from the Mediterranean agree that the spawning season is the winter and spring (Lo Bianco 1909, p. 596: Nov.—April [Naples]; Woltereck, see p. 114), though it may also occur at other seasons (August; Lo Bianco 1909). Though the "Thor"-collections nevertheless seem to show that the season of propagation chiefly occurs during the summer, one must not overlook the fact, as also stated elsewhere, that the "Thor" itself made no collections at all in the Mediterranean from the end of February to the end of June. Therefore, the collections of the "Thor" do **not** signify that it does not propagate during the spring, but **only** that it **can** propagate during the summer (for the rest there are some single ♀ with ova or young from 16. and 19. Jan. and 6. April, the latter date is from one of the supplementary collections).

That the winter and spring constitute the proper season of propagation in the Mediterranean also seems probable an account of the distribution of the species, it being one of the species belonging to this family which penetrates furthest north in the Atlantic, as far as about 60° N. In spite of apparent contradiction one may safely specify **the time of propagation in the following manner: South-west Ireland: summer and autumn; Bay of Cadiz and Mediterranean: winter and early spring; the Canaries: January** (Chun), though it appears that the species can also propagate at other seasons. (It must be noted that the sizes of the specimens from the "Thor" tell us nothing as to growth and spawning time).

B. Atlantic.

From the Atlantic there are some 543 spec. (78 ♂, 390 ♀, about 75 juv.) from 47 stations, 78 hauls.

		St.	Hauls	Specimens			
				♂	♀	jun.	total
N. of 40° N	"Thor" June 1905	6	10	10	78	abt. 75	abt. 160
	Aug. —	3	5	1	15	—	16
	May 1906	3	3	—	5	—	5
	June —	5	7	—	21	—	21
	Aug. —	1	1	—	5	—	5
	Sept. —	4	5	—	7	—	7
	Dec. 1908	1	1	—	2	—	2
S. of 40° N	Feb. 1909	2	5	2	46	—	48
	March —	1	6	14	49	—	63
N of 40° N	— —	3	4	—	4	—	4
	June 1910	5	9	5	12	—	17
	Sept. —	4	8	28	106	—	134
	total	38	64	60	350	abt. 75	abt. 485
	other vessels	9	14	18	40	—	58
	total ...	47	78	78	390	abt. 75	abt. 543

Depths of the sea and occurrence.

The depth of the sea is on an average very great, > 1000 m; but the species can exceptionally be encountered at much smaller depths. The 3 stations 0—500 m have the following depths: 190, 182—330 and 275 m.

The distribution is as follows: West of Shetland 2 stations (1905: St. 164—165) and 3 stations west of the Hebrides (1905: St. 70, 72, 167); the other stations from 1905—06 are off south-west Ireland or in the Bay of Biscay.

Depths in m	No. of posit. st.
0—500	3
> 500—1000	3
> 1000—2000	18
> 2000—3000	7
> 3000	16
total...	47

The stations of the "Thor" itself from 1908—10 are in the Bay of Biscay or in the Bay of Cadiz; the supplementary collections originate from the waters south-west of the Bay of Cadiz.

Vertical occurrence.

M. w.	No. of hauls.							
	"Thor" 1905—06			"Thor" 1908—10				other vessels
				Winter 1908—09		Summer 1910		
	Night	Day	Hour not noted	Night	Day	Night	Day	Night
10—35(47)....	—	—	—	1	—	3	—	11
50—100	—	—	2	5	—	4	1	3
150	—	—	—	—	—	1	—	—
300—400	7	4	1	3	2	3	—	—
500—800	1	2	—	1	1	—	1	—
> 800........	3	5	2	1	2	2	2	—

In the northern waters (from 61° N to the Bay of Biscay) there are 2 hauls (hour not recorded) with 65 m. w.; otherwise it has not been taken, either day or night, nearer the surface than with 300 m. w.; it has also been taken very deep down (up to 2500 m. w.). From the Bay of Biscay to the Bay of Cadiz (there does not seem to be any difference between summer and winter) it has been taken during the night from the very surface to the greatest depths, during the day, with a single exception, (65 m. w., summer) not nearer the surface than with 300 m. w. In the southernmost area (south-west of the Bay of Cadiz) it has only been taken quite near the surface (night, 15—56 m. w.).

Size and propagation. The sizes are as in the Mediterranean (see p. 119).

In the northern area (from South-west Ireland and further north) apart from a number of quite small spec. (4—5 mm) hardly any spec. of less than 20 mm have been caught. During the period between 21. May—3. Sept. 12 ♀ with ova or young have been found within this area, sizes 26—33 mm and length of line 65—2000 m. w., most often 300 m. w. ♀ with ova alone have been found 21. May—10. June, and a single spec. 31. Aug. ♀ with embryos were found 13. June (embryos 4 mm) and 29. Aug.—3. Sept. (embryos 1—1,25 mm and 2 mm). The quite small specimens (4 mm) have been found 14. June, 300—600 m. w. From this it appears that it these waters the species propagates during the summer and early autumn. TATTERSALL (1906, p. 20) mentions from these waters some adult ♀ and several small specimens taken in Nov. with 75 fms. wire.

In the Bay of Biscay the "Thor" found on 17-9-1910 (St. 245) 400 m.w., day, a house with embryos (2 mm).

In the Bay of Cadiz, 1908—09 (but not 1910) from 24. Febr.—10. March, and with 65—300 m. w. night, 300—1600 m.w. daytime, 5 ♀ with ova have been taken, 27—31 mm; but 18-6-1910 with 1000 m. w. night, 1 ♀ has been taken, 31 mm, with embryos of 2 mm. In this southern area the spawning season thus probably occurs during the winter.

From the supplementary collections south-west of the Bay of Cadiz there are no females with ova or embryos; CHUN (1895) gives the spawning season off the Canaries as January.

Distribution.

The distribution is given by BOVALLIUS (Monograph: *P. sedentaria + P. spinosa*) as the Mediterranean, besides the temperate, subtropical and tropical regions of the three main Oceans. Apart from the northern regions of the Atlantic, the available data are in reality very insufficient.

1. Mediterranean, see above p. 117.

2. Atlantic. "Thor" see above. It is recorded from the northern Atlantic by a great number of writers. Apart from the "Thor" collections, the largest hitherto known material is from the German Plankton-Exp. (VOSSELER 1901). From this there are 129 spec. (44 ♂, 85 ♀) from 49 hauls between 43,6° N (in the Gulf Current, 17.9° W) and 7.3° S; the length of wire is as a rule 400 m and the depth is otherwise between the surface and 700 m. A detailed list of additionary Atlantic localities see my paper l. c. 1923, p. 35. — The south limit in the Atlantic can not be given, it is hardly noted south of 7.3° S, 21.4° W (German Plankton-Exp.).—

3. Indian Ocean. Lion's Head (British S. Africa) SE$^1/_2$E distant 42 miles, 285 m (STEBBING, Ann. S. Afr. Mus., vol. 6, pt. 4, 1910, p. 475). — 5 miles NW of Des-

roches Island (Amirante); 10°27′ S, 51°17′ E; 8°16′ S, 51°26′ E; S. of Alphonse Island (abt. 7° S, 53° E); 4°16′ S, 71°53′ E; 3°31′ S, 72°27′ E; Salomon Atoll (abt. 7° S, 72° E) (WALKER 1909). — Borneo (*P. Borneensis*; BATE 1862). — 50°1′ S, 123°4′ E, 1800 fms., 1 ♀ with ova (*P. novæ zealandiæ*?, STEBBING 1888).

4. Pacific. 36°23′ N, 174°31′ E ("*P. atlantica*" ♀), and 13°11′ N, 139°28′ E (STEBBING 1888). — 3°48′ S, 152°56′ W, surf.; ♂ (*P. tenella*, STEBBING 1888). — Common on east coast of Otago, New Zealand; Wellington (*P. neozelanica*; THOMSON & CHILTON, Trans. & Proc. New Zealand Inst. vol. 18, 1885 (1886), p. 150). — Sumner, New Zealand (*P. novæ-zealandiæ*; POWELL, ibid. vol. 7, 1874 (1875), p. 294).

2 a. PHRONIMA ATLANTICA Guérin (Chart 16).

Phronima atlantica Bovallius 1889, p. 374 (lit.), Pl. 16 figs. 19—26. — **P. a.* Vosseler 1901, p. 21, Pl. 2 (lit.). — *P. sedentaria* ♀ Claus, Zur Naturgesch. von P. sedent. Forsk.; Zeitschr. Wiss. Zool. vol. 22, 1872, p. 331, text-figs. 2—3, Pl. 26, fig. 1, ♀ (not ♂; ♂ = *P. Colletti*) — ♂ ad. Chun, Das Männchen d. P. sedentaria, nebst Bemerkungen über die Phronima-Arten; Zool. Anzeiger vol. 12, 1889, p. 378 (not ♂ jun.; ♂ jun. = *P. sedentaria*). — *P. s.* ♂ ad. Chun, Bibliotheca Zoologica vol. 7, 1895, p. 111 seq., Pl. 7 fig. 1 etc. (not fig. 2), Pl. 8 fig. 7—9 (not ♂ jun.; ♂ jun. = *P. sedentaria*).

Mediterranean.

St. 10. 15-12-1908. 600 m.w., 3^{45} pm., 60 min. 1 ♂ jun. 5 mm. — **St. 11.** 16-12-1908. 65 m.w., 5^{25} am., 60 min. 3 spec.: 2 ♂ ad. 8 mm, 1 ♀ 9 mm. — **St. 11.** ibid. 300 m.w., 7^{00} am., 120 min. 1 ♂ ad. 8 mm. — **St. 13.** 19-12-1908. 15 m.w. 10^{15} pm., 60 min. 2 ♀ 11—13 mm. — **St. 26.** 19-1-1909. 300 m.w., 6^{40} am., 180 min. 1 ♂ jun. 8 mm. — **St. 39.** 1-2-1909. 1000 m.w. 0^{30} pm., 120 min. 1 ♀ 12 mm. — **St. 42.** 2-2-1909. 300 m.w., 9^{40} pm., 30 min. 1 ♀ 16 mm. — **St. 46.** 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 1 ♂ jun. 6 mm. — **St. 59.** 21-2-1909. 500 m.w., 1^{40} am., 30 min. 1 ♂ jun. 6 mm. — **St. 99.** 23-6-1910. 300 m.w., 11^{25} pm., 30 min. 5 spec.: 2 ♂ jun. 6 mm, 3 ♀ 6—7 mm. — **St. 107.** 25-6-1910. 65 m.w., 9^{50} am., 15 min. 4 spec.: 3 ♂ jun. 6—7 mm, 1 ♀ 6 mm. — **St. 107.** ibid. 2000 m.w., 7^{30} am., 60 min. 1 ♂ jun. 6 mm. — **St. 112.** 27-6-1910. 25 m.w., 1^{30} am., 15 min. 1 ♀ 11 mm. — **St. 113.** 28-6-1910. 300 m.w., 3^{25} am., 30 min. 2 ♀ 6—14 mm. — **St. 115.** 29-6-1910. 65 m.w., 1^{20} am., 15 min. 1 ♂ jun. 6 mm. — **St. 115.** ibid. 300 m.w., 11^{20} pm., 30 min. 3 spec.: 1 ♂ jun. 6 mm, 2 ♀ 8—11 mm. — **St. 115.** ibid. 2000 m.w., 0^{30} am., 60 min. 1 ♀ 5 mm. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 13 spec.: 3 ♂ jun. 5 mm, 10 ♀ 5—6 mm. — **St. 116.** ibid. 300 m.w., 4^{05} pm., 30 min. 1 ♂ jun. 5 mm. — **St. 118.** 1-7-1910. 25 m.w., 0^{20} am., 15 min. 8 spec.: 4 ♂ jun. 5—6 mm, 4 ♀ 5 mm. — **St. 118.** 65 m.w., 11^{35} pm., 30 min. 32 spec.: 6 ♂ jun. 5 mm, 26 ♀ 5—6 mm. — **St. 118.** ibid. 300 m.w., 5^{55} pm., 30 min. 11 spec.: 5 ♂ jun, 5—6 mm, 6 ♀ 4—7 mm. — **St. 121.** 2-7-1910. 25 m.w., 3^{35} am., 30 min. 1 ♀ 6 mm. — **St. 123.** 3-7-1910. 25 m.w., 1^{50} am., 15 min. 2 spec.: 1 ♂ jun. 6 mm, 1 ♀ 10 mm. — **St. 123.** ibid. 65 m.w., 0^{55} am., 30 min. 43 spec.: 3 ♂ ad. 8 mm, 15 ♂ jun. 5—7 mm; 25 ♀: 6 ♀ 6 mm, 10 ♀ 8 mm, 9 ♀ 10—12 mm. — **St. 123.** ibid. 300 m.w., 0^{05} am., 30 min. 4 spec.: 2 ♂ jun. 7—8 mm, 2 ♀ 7—16 mm. — **St. 124.** 3-7-1910. 65 m.w., 3^{30} am., 90 min. 1 ♂ jun. 6 mm, 1 ♀ 13 mm. — **St. 129.** 12-7-1910. 25 m.w., 3^{00} am., 30 min. 1 ♂ jun. 5 mm, 1 ♀ 4 mm. — **St. 129.** ibid. 300 m.w., 3^{40} am., 30 min. 4 spec.: 1 ♂ jun. 7 mm, 3 ♀ 7, 7, 11 mm. — **St. 129.** ibid. 600 m.w., 8^{00} pm., 30 min. 4 spec.: 2 ♂ jun. 5—6 mm, 2 ♀ 8 mm. — **St. 129.** ibid. 3500 m.w., 3^{00} pm., 120 min. 4 ♀: 6, 6, 7, 10 mm. — **St. 130.** 13-7-1910. 25 m.w., 0^{50} am., 30 min. 4 spec.: 2 ♂ jun. 5 mm, 2 ♀ 4—7 mm. — **St. 131.** 13-7-1910. 300 m.w., 10^{35} am., 30 min. 6 spec.: 1 ♂ ad. 8 mm, 5 ♀ 7—11 mm. — **St. 131.** ibid. 1000 m.w., 11^{40} am., 60 min. 1 ♂ jun. 7 mm. — **St. 132.** 14-7-1910. 300 m.w., 3^{45} am., 30 min. 31 spec.: 3 ♂ ad. 7—8 mm, 6 ♂ jun. 5—7 mm, 22 ♀: 16 ♀ 6—7 mm, 6 ♀ 8—11 mm. — **St. 132.** ibid. 600 m.w., 4^{50} am., 30 min. 4 spec.: 2 ♂ jun. 5—7 mm, 2 ♀ 6—9 mm. — **St. 133.** 14-7-1910. 25 m.w., 11^{00} pm., 30 min. 1 ♀ 7 mm. — **St. 133.** ibid. 300 m.w., 10^{15} pm., 30 min. 43 spec.: 2 ♂ ad. 7 mm, 16 ♂ jun. 5—7 mm, 25 ♀: 21 ♀ 7—8 mm, 3 ♀ 9—10 mm, 1 ♀ with ova 12 mm. — **St. 133.** ibid. 600 m.w., 9^{20} pm., 30 min. 8 spec.: 1 ♂ ad. 7 mm, 2 ♂ jun. 6—7 mm, 5 ♀: 4 ♀ 8 mm, 1 ♀ 12 mm. — **St. 134.** 15-7-1910. 300 m.w., 5^{40} am., 30 min. 1 ♂ ad. 8 mm. — **St. 137.** 19-7-1910. 25 m.w., 8^{15} am., 30 min. 5 spec.: 3 ♂ jun. 5—7 mm, 2 ♀ 5 mm. — **St. 137.** ibid. 250 m.w., 9^{05} am., 30 min. 4 spec.: 1 ♂ ad. 7 mm, 3 ♀ 5—7 mm. — **St. 138.** 19-7-1910. 25 m.w., 9^{50} pm., 30 min. 5 spec.: 3 ♂ jun. 5—7 mm, 2 ♀ 4—7 mm. — **St. 138.** ibid. 300 m.w., 9^{10} pm., 30 min. 14 spec.: 2 ♂ ad. 7 mm, 5 ♂ jun. 5—6 mm, 3 ♀ 6 mm, 4 ♀ 8—11 mm. — **St. 138.** ibid. 1000 m.w., 7^{40} pm., 60 min. 1 ♀ 13 mm. — **St. 139.** 20-7-1910. 300 m.w., 2^{35} am., 30 min. 1 ♂ jun. 5 mm. — **St. 143.** 23-7-1910. 25 m.w., 1^{20} am., 30 min. 18 spec.: 2 ♂ jun. 6 mm, 2 ♂ ad. 7 mm, 14 ♀ 6—15 mm. — **St. 143.** ibid. 300 m.w., 0^{30} am., 30 min. 4 ♀ 12—15 mm. — **St. 144.** 24-7-1910. 25 m.w., 2^{00} am., 30 min. 10 spec.: 1 ♂ jun. 5 mm, 9 ♀: 3 ♀ 6—9 mm, 6 ♀ 11—15 mm. — **St. 144.** ibid. 300 m.w., 2^{45} am., 30 min. 1 ♀ 10 mm. — **St. 145.** 25-7-1910. 25 m.w., 3^{30} am., 30 min. 6 spec.: 2 ♂ ad. 7 mm, 4 ♀ 5—8 mm. — **St. 145.** ibid. 300 m.w., 4^{10} am., 30 min. 1 ♀ with ova 12 mm. — **St. 147.** 25-7-1910. 25 m.w., 11^{25} pm., 30 min. 7 spec.: 1 ♂ ad. 7 mm, 2 ♂ jun. 6 mm, 3 ♀ 6—8 mm, 1 ♀ with ova 14 mm. — **St. 147.** ibid. 300 m.w., 0^{20} am., 30 min. 1 ♂ jun. 5 mm. — **St. 147.** ibid. 1000 m.w., 1^{10} am., 60 min. 3 ♀: 7, 10, 17 mm. — **St. 152.** 27-7-1910. 25 m.w., 10^{50} pm., 15 min. 2 ♂ ad. 7 mm. — **St. 152.** ibid. 300 m.w., 11^{35} pm., 30 min. 1 ♀ 11 mm. — **St. 156.** 30-7-1910. 25 m.w., 2^{15} am., 30 min. 21 spec.: 7 ♂ ad. 7 mm, 3 ♂ jun. 6 mm, 11 ♀: 8 ♀ 7—10 mm, 3 ♀ 12, 14, 14 mm. — **St. 156.** ibid. 1000 m.w., 0^{40} am., 60 min. 4 ♀ 5, 7, 9, 12 mm. — **St. 160.** 1-8-1910. 25 m.w., 2^{00} am., 30 min. 1 ♂ jun. 5 mm, 1 ♀ 10 mm. — **St. 160.** ibid. 300 m.w., 2^{45} am., 30 min. 1 ♀ 10 mm. — **St. 160.** ibid. 1000 m.w., 3^{35} am., 60 min. 1 ♀ 9 mm. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 5 spec.: 1 ♂ ad. 7 mm, 3 ♂ jun. 5—6 mm, 1 ♀ 6 mm. — **St. 163.** 3-8-1910. 300 m.w., 1^{05} am., 15 min. 4 ♀ 6—9 mm. — **St. 178.** 12-8-1910. 65 m.w., 0^{20} am., 15 min. 6 spec.: 2 ♂ jun. 6 mm, 4 ♀ 6—11 mm. — **St. 181.** 13-8-1910. 300 m.w.,

1^{25} pm., 20 min. 1 ♀ 6 mm. — **St. 182.** 13-8-1910. 10 m.w., 11^{00} pm., 15 min. 3 spec.: 2 ♂ ad. 6—7 mm, 1 ♀ 9 mm. — **St. 183.** 16-8-1910. 65 m.w., 5^{10} pm., 15 min. 1 ♀ jun. 3 mm. — **St. 183.** ibid. 300 m.w., 4^{25} pm., 15 min. 8 spec.: 4 ♂ ad. 7 mm, 1 ♂ jun. 5 mm, 2 ♀ 10—14 mm. 1 ♀ 7 mm. — **St. 186.** 17-8-1910. 10 m.w., 11^{30} pm., 15 min. 10 spec.: 4 ♂ ad. 7 mm, 2 ♂ jun. 5—6 mm, 4 ♀ 7, 7, 8, 12 mm. — **St. 187.** 18-8-1910. 25 m.w., 7^{45} pm., 30 min. 7 spec.: 2 ♂ jun. 6—7 mm, 5 ♀: 6, 6, 8, 9, 12 mm. — **St. 190.** 19-8-1910. 25 m.w., 8^{15} pm., 15 min. 1 ♀ 11 mm. — **St. 193.** 21-8-1910. 10 m.w., 0^{50} pm., 30 min. 1 ♀ 10 mm. — **St. 194.** 21-8-1910. 10 m.w., 4^{30} am., 15 min. 4 spec.: 2 ♂ ad. 7 mm, 2 ♀ 6—7 mm. — **St. 194.** ibid. 25 m.w., 5^{00} am., 15 min. 4 spec.: 2 ♂ jun. 5—6 mm, 2 ♀ 6—8 mm. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 1 ♂ ad. 7 mm. — **St. 196.** 22-8-1910. 25 m.w., 2^{40} am., 30 min. 9 spec.: 1 ♂ ad. 7 mm, 5 ♂ jun. 6—7 mm, 3 ♀ 6—7 mm. — **St. 197.** 24-8-1910. 25 m.w., 7^{45} pm., 15 min. 6 spec.: 1 ♂ ad. 7 mm, 1 ♂ jun. 6 mm, 4 ♀ 6—10 mm. — **St. 199.** 25-8-1910. 1000 m.w., 10^{10} pm., 30 min. 2 ♀ (1 with ova) 13 mm. — **St. 200.** 26-8-1910. 25 m.w., 3^{45} am., 30 min. 12 spec.: 4 ♂ ad. 7 mm, 2 ♂ jun. 6—7 mm, 6 ♀: 4 with ova 11—14 mm, 1 with embryos 12 mm, 1 without ova or embr. 10 mm. — **St. 202.** 26-8-1910. 300 m.w., 5^{05} pm., 15 min. 1 ♂ ad. 7 mm. — **St. 204.** 27-8-1910. 25 m.w., 4^{00} am., 15 min. 8 spec.: 2 ♂ jun. 6 mm, 6 ♀: 6, 6, 8, 11, 11, 15 mm. — **St. 204.** ibid. 65 m.w., 4^{30} am., 15 min. 6 spec.: 3 ♂ jun. 5—6 mm, 3 ♀ 7—9 mm. — ? **St. 204.** ibid. 300 m.w., 5^{00} am., 30 min. 1 ♂ ad. 7 mm. — **St. 206.** 28-8-1910. 25 m.w., 0^{30} am., 15 min. 1 ♀ with ova 14 mm. — **St. 206.** ibid. 1000 m.w., 1^{45} am., 45 min. 2 ♀ 6 mm. — **St. 207.** 29-8-1910. 1000 m.w., 6^{00} am., 45 min. 1 ♀ 8 mm. — **St. 208.** 29-8-1910. 25 m.w., 1^{40} am., 15 min. 5 spec.: 1 ♂ ad. 8 mm, 1 ♂ jun. 6 mm. 3 ♀ 6—8 mm. — **St. 209.** 29-8-1910. 25 m.w., 4^{55} am., 15 min. 1 ♂ jun. 5 mm, 1 ♀ 4 mm. — **St. 209.** ibid. 100 m.w., 3^{45} pm., 20 min. 9 spec.: 2 ♂ ad. 7—8 mm, 4 ♂ jun. 6—7 mm, 3 ♀ 6 mm. — **St. 209.** ibid. 150 m.w., 4^{25} pm., 20 min. 6 spec.: 1 ♂ ad. 7 mm, 3 ♂ jun. 6—7 mm, 2 ♀ 6—7 mm. — **St. 209.** ibid. 2000 m.w., 7^{25} am., 45 min. 2 ♀ 6 mm. — **St. 210.** 30-8-1910. 25 m.w., 2^{45} am., 30 min. 7 spec.: 3 ♂ jun. 6—7 mm, 4 ♀ 6—14 mm. — **St. 210.** ibid. 600 m.w., 3^{35} am., 30 min. 6 spec.: 1 ♂ ad. 7 mm, 1 ♂ jun. 7 mm, 2 ♀ 8—11 mm, 2 ♀ with ova 14 mm. — **St. 215.** 31-8-1910. 25 m.w., 9^{20} pm., 30 min. 3 spec.: 1 ♂ jun. 5 mm., 2 ♀ 7—9 mm. — **St. 223.** 5-9-1910. 25 m.w., 4^{25} am., 15 min. 1 ♀ 9 mm. — **St. 227.** 6-9-1910. 25 m.w., 5^{35} pm., 30 min. 1 ♀ 7 mm. — **St. 276.** 36°30′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200), 11^{20} pm., 35 min. 13 spec.: 2 ♂ jun. 5 mm, 10 ♀ 4—6 mm, 1 ♀ 8 mm. — **St. 277.** 33°20′ N, 27°30′ E. 6-4-1911. 132 m.w. (S. 200), 11^{00} pm., 35 min. 11 spec.: 1 ♂ ad. 7 mm, 4 ♂ jun. 6—7 mm, 5 ♀ 5—7 mm, 1 ♀ 10 mm. — **St. 278.** 38°11.5′ N, 15°37.5′ E. 22-2-1911. 15 m.w. (S. 100), 1^{00} pm., 140 min. 3 spec.: 1 ♂ jun. 6 mm, 2 ♀ 4 mm. — **St. 281.** 38°15′ N, 15°37.5′ E. 1-3-1911. 10 m.w. (S. 100), 4^{55} pm., 60 min. 1 ♀ 12 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 6^{10} pm., 60 min. 1 ♀ 5 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 7^{50} pm., 60 min. 1 ♀ 8 mm. — **St. 282.** 38°12′ N, 15°37′ E. 8-3-1911. 40 m.w. (S. 100), 1^{45} am., 180 min. 5 spec.: 3 ♂ jun. 5 mm, 2 ♀ 8—16 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 2^{00} pm., 90 min. 1 ♂ ad. 8 mm, 2 ♂ jun. 6—7 mm. — **St 282** ibid. 40 m.w. (S. 100), 5^{30} pm., 90 min. 1 ♀ 16 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 7^{15} pm., 90 min. 7 spec.: 2 ♂ jun. 5—6 mm, 3 ♀ 4—5 mm, 2 ♀ 10—11 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 8^{45} pm., 90 min. 2 ♀ 5—7 mm. — **St. 282.** ibid. 40 m.w. (S. 100) 9^{00} pm., 90 min. 11 spec.: 1 ♂ ad. 8 mm, 6 ♂ jun. 5—7 mm, 4 ♀: 5, 11, 14, 16 mm. — **St. 283.** (= 282). 12-3-1911. 40 m.w. (S. 100), 6^{30} pm., 180 min. 7 spec.: 1 ♂ ad. 7 mm, 6 ♂ jun. 6—7 mm. — **St. 283.** ibid. 40 m.w. (S. 100), 9^{30} pm., 180 min. 6 spec.: 1 ♂ jun. 5 mm, 5 jun. 2—4 mm. — **St. 283.** ibid. 40 m.w. (S. 100), 0^{45} am., 180 min. 3 spec.: 1 ♂ ad. 8 mm, 1 ♂ jun. 7 mm, 1 ♀ 7 mm. — **St. 297.** 33°10′ N, 25°35′ E. 25-6-1911. 25 m.w. (S. 200), 11^{30} pm., 30 min. 55 spec.: 1 ♂ ad. 6 mm, 14 ♂ jun. 6—7 mm, 40 ♀ 7—13 mm (2 with ova, 1 with embryos 11 mm). — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 mm. 92 spec.: 7 ♂ ad. 7 mm, 33 ♂ jun. 6—7 mm, 52 ♀ 7—13 mm (3 with ova 12 mm). — **St. 339.** 40°30′ N, 3°10′ E. 20-8-1911. 28 m.w. (S. 200), 3^{00} am., 30 min. 3 spec.: 1 ♂ jun. 5 mm, 2 ♀ 6 mm. — **St. 340.** 35°50′ N, 21°30′ E. 26-8-1911. 28 m.w., 9^{00} pm. 5 spec.: 2 ♂ jun. 5 mm, 3 ♀ 6—10 mm. — **St. 340.** ibid. 108 m.w., 9^{00} pm., 30 min. 13 spec.: 4 ♂ jun. 5—6 mm, 7 ♀ 4—6 mm, 2 ♀ 8—9 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 6 spec.: 2 ♂ jun. 6 mm, 3 ♀ 5, 5, 10 mm, 1 ♀ with ova 13 mm. — **St. 412.** 34°33′ N, 24°15′ E. 7-1-1912. 112 m.w. (S. 150), 2 ♂ jun. 5—6 mm. — **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5^{00} am. 6 spec.: 1 ♂ jun. 5 mm, 3 ♀ 16—18 mm, 2 ♀ with ova 14 mm. — **St. 699.** 36°00′ N, 18°58′ E. 7-2-1913. 5^{00} am. 1 ♀ 6 mm. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 8 spec.: 3 ♂ jun. 4—6 mm, 3 ♀ 4—8 mm, 2 ♀ 10—14 mm.

Atlantic.

St. 4. 1-12-1908. 1500 m.w., 11^{45} am., 60 min. 1 ♀ 8 mm. — **St. 62.** 22-2-1909. 25 m.w., 9^{10} pm., 30 min. 1 ♀ 11 mm. — **St. 65.** 24-2-1909. 25 m.w., 5^{50} am., 30 min. 1 ♀ 15 mm. — **St. 65.** ibid. 65 m.w., 6^{30} am., 60 min. 8 ♀: 11, 11, 13, 15, 16, 16; 2 with ova 15—17 mm. — **St. 65.** ibid. 600 m.w., 10^{00} am., 120 min. 1 ♂ ad. 9 mm, 1 ♂ jun. 7 mm. — **St. 65.** ibid. 1600 m.w., 0^{30} pm., 120 min. 3 spec.: 1 ♂ jun. 7 mm, 2 ♀ 7—15 mm. — **St. 66.** 25-2-1909. 1200 m.w., 8^{30} am., 120 min. 2 spec.: 1 ♂ jun. 6 mm, 1 ♀ 16 mm. — **St. 69.** 1-3-1909. 25 m.w., 0^{30} am., 30 min. 2 spec.: 1 ♂ jun. 7 mm, 1 ♀ 12 mm. — **St. 69.** ibid. 65 m.w., 10^{45} pm., 30 min. 11 spec.: 2 ♂ ad. 8—9 mm, 4 ♂ jun. 7 mm, 5 ♀: 7, 7, 11, 11, 13 mm. — **St. 69.** ibid. 300 m.w., 11^{40} pm., 30 min. 12 ♀: 9 ♀ 6—12 mm, 1 ♀ 15 mm, 2 ♀ with ova 15—16 mm. — **St. 69.** ibid. 300 m.w., 3^{05} pm., 30 min. 5 spec.: 1 ♂ ad. 9 mm, 1 ♂ jun. 9 mm, 2 ♀ 7—12 mm. — **St. 69.** ibid. 600 m.w., 9^{00} pm., 60 min. 12 spec.: 2 ♂ jun. 7 mm, 9 ♀ 5—8 mm, 1 ♀ 13 mm. — **St. 87.** 17-6-1910. 65 m.w., 4^{40} pm., 15 min. 1 ♂ ad. 6 mm. — **St. 89.** 18-6-1910. 65 m.w., 3^{00} am., 15 min. 3 spec.: 1 ♂ jun. 5 mm, 2 ♀ 7—8 mm. — **St. 91.** 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 3 spec.: 1 ♂ jun. 5 mm, 2 ♀ 4—8 mm. — **St. 92.** 19-6-1910. 65 m.w., 3^{40} am., 30 min. 1 ♀ 8 mm. — **St. 232.** 9-9-1910. 25 m.w., 8^{50} pm., 30 min. 2 ♀ 10—13 mm. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min. 33 spec.: 2 ♂ ad. 8 mm, 7 ♂ jun. 5—7 mm, 24 ♀ 6—12 mm. — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 43 spec.: 3 ♂ ad. 8 mm, 12 ♂ jun. 6—7 mm, 27 ♀ 5—12 mm, 1 ♀ with ova 16 mm. — **St. 377.** 31°23′ N. 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. 15 spec.: 6 ♂ jun. 6—7 mm, 1 ♂ ad. 8 mm, 1 ♀ 5 mm, 7 ♀ 8—10 mm. — **St. 382.** 34°21′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 15 spec.: 1 ♂ ad. 8 mm, 4 ♂ jun. 7—8 mm, 10 ♀ 8—9 mm. — **St. 383.**

37°16′ N, 14°09′ W. 23-10-1911. 300 m.w. (S. 100), 6^{30} pm., 30 min. 4 ♀ 8—10 mm. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. 56 m.w. (S. 100), 12^{40} am., 30 min. 1 ♀ 12 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 18 ♀ 5—9 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 10^{05} pm., 30 min. 6 ♀ 13—15 mm. — **St. 400.** ibid. 56 m.w. (S. 150), 9^{35} pm., 30 min. 2 ♀ 6—10 mm.

The "Thor" material comprises 992 spec. (368 ♂, 619 ♀, 5 jun.) from 92 stations, 147 hauls; four-fifths of the yield is from the Mediterranean.

A. Mediterranean.

As appears from the subjoined table, it belongs to the most frequently occurring species, even though the individual hauls have upon the whole not yielded particularly large numbers (on an average 6—7 spec. per haul). A number of hauls have, however, yielded about 25—55 spec., a single one even 92.

	No. of stat.	No. of hauls	No. of specimens ♂	♀	jun.	total
"Thor" Dec. 1908...	3	4	4	3	—	7
Jan. 1909...	1	1	1	—	—	1
Feb. — ...	4	4	2	2	—	4
June 1910...	6	10	12	20	—	32
July — ...	19	40	116	209	—	325
Aug. — ...	25	36	67	82	—	149
Sept. — ...	2	2	—	2	—	2
"Thor" total	60	96	212	308	—	520
other vessels	15	25	103	158	5	266
total...	75	121	315	466	5	786

Depths of the sea and occurrence.

Depths in m.	Total no. of posit st.	No. of posit. st. of the "Thor" alone	Total no. of st. of the "Thor"	Percentage of posit st.
0— 500...	14	10	67	14.4
> 500—1000...	15	13	31	41.9
> 1000—2000...	16	16	41	39.0
> 2000—3000...	19	14	35	40.0
> 3000...	11	7	10	70.0
total...	75	60	184	

Through the species chiefly keeps to depths > 500 m it is, however, comparatively frequent at much smaller depths: in the Straits of Messina it has been taken once at 5—8 m but otherwise the depths on less than 500 m vary between 68—480 m.

In the western basin the "Thor" itself has 41 stations (with the supplementary collections 43 stations); for

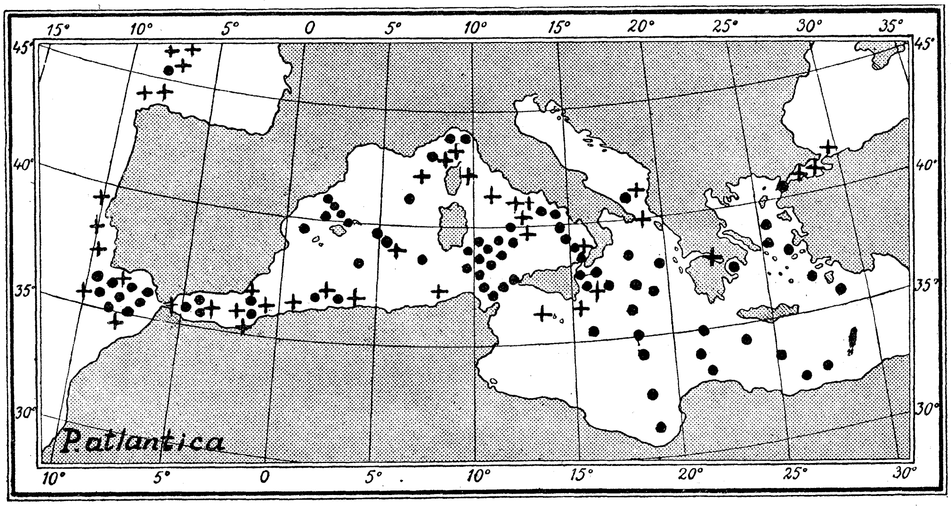

Chart 16. *Phronima atlantica.* ● positive, + negative stations. St. 376—400 lie outside the chart to the South West. Several of the stations lie so close to each other that it was impossible to note them all.

the eastern basin, the figures are 19 and 32. Reckoning only depths of the sea > 500 m the "Thor" itself in has the western basin 36 positive stations against 23 negative ones (night, 0—300 m. w., > 500 m), in the eastern basin 15 positive against 10 negative; there are thus in both basins about $1^1/_2$ times as many positive as negative stations. The numerous occurrences in the eastern basin are quite unexpected; the distribution in the Mediterranean can indeed hardly be determined from the literature owing to the confusion with *P. sedentaria* and perhaps with still more species. Vosseler (in Lo Bianco 1903—04, p. 278) records it from 16 hauls 6. Feb.—8. April during the day, only at Naples with the exception of 1 haul between Capo Corso and Monaco, and 1 haul at Salina (Æolian Isles); the length of line is (100) 500—2500 m. w. but 2 hauls are made with a closing net 50 and 1000 m. w.

Vertical occurrence. In winter it was taken during the night in 5 hauls in all, 15—500 m. w., during the day in 4 hauls 300—1000 m. w.; in all only in 12 spec., thus only 1.3 spec. per haul.

In summer it has not been taken by day nearer the surface than with 65 m. w. At night, on the other hand, it was taken in 31 hauls, at the very surface; taking the average number of individuals per normal haul (of 30 min.) it appears that it is practically only found from the surface to a depth answering to 300—400 m. w., thus the deeper hauls are nearly all from stations where the species was also taken nearer the surface, so that they undoubtedly result from the hauling in. The greatest

M. w.	Summer 1910, depths > 500 m					
	Night					Day
	No. of posit. hauls	Total no. of hauls "Thor"	Percentage of posit. hauls	No. of spec. (normal hauls of 30 min.)	Average no. of spec. (normal hauls of 30 min.)	No. of posit. hauls
10— 35	31	67	41.7	254	8.3	—
50—100..........	6	35	11.4	93	15.5	2
150—250	—	6	0	—	—	1
300—400	17	49	34.7	124	7.3	4
>400	12	46	26.1	34	2.8	4
total...	66	203	—	—	—	11

number of individuals per haul was taken with a length of wire of 50—100 m; but as there are in all only 6 hauls at this depth, the figure is perhaps accidental.

Taking each sex by itself, the "Thor" has not taken ♂ ad. in summer, day, nearer the surface than with 100 m. w, ♂ juv. on the other hand up to the very surface. For ♂ ad. the prevailing depth seems to be 300 m. w., for ♂ juv. 65 m. w.

In the summer at night, on the other hand, ♂ ad. seems most numerous at the very surface, while ♂ juv. has the greatest average per haul with 50—100 m. w., both occur very sparsely deeper down than at a depth answering to 300—400 m. w.

During the summer (night) the larger ♀ seem to prefer the deeper water layers; the day hauls are too few to indicate anything. As to ♀ with ova or young see under "Propagation".

Size and propagation. ♂ ad. is as a rule 8 mm, and there are $1^1/_2$ times as many ♀ as ♂ (466 and 315 respectively).

♀ is up to 17 mm, rarely more than 15 mm (Vosseler records 19 mm, Bovallius 25 mm). During the summer (25. June—30. Aug.) 16 ♀ with ova were found, 11—14 mm, all taken at night. The depths are 25—38 m. w. (11 spec.), 300 m. w. (2 spec.), 600 m. w. (2 spec.) and 1000 m. w. (1 spec.). Further, on 9. Nov. 1 ♀ (13 mm) with ova was taken with 122 m. w. night, and 25. Feb. 2 spec. (14 mm; m. w.?). There are in all only 2 ♀ with embryos, 11—12 mm long, both taken at night with 25 m. w.; the one specimen was taken on 25. June; the other on 26. Aug. ♀ with ova and young thus chiefly keep near the surface, in contrast to *P. sedentaria* (p. 109).

Vosseler gives it as mature on attaining a size of 14—15 mm, which agrees very well with the "Thor" collections. ♀ in houses were not found.

Though the species, as will be seen, can propagate during the winter, the greater number of females with ova and young have, however, been taken during the summer, but in spite of that it must not be considered a foregone conclusion that the summer is the proper spawning season. (The sizes of the "Thor" specimens indicate nothing as to growth and propagation.) Data as to the season of propagation which can with absolute certainty be referred to this species I have not been able to find in existing literature, apart from the statement of Vosseler (l. c. p. 26) of having found 8 ♀ (16—19 mm) with strongly developed marsupiums at Naples on 24. March (his statement on Chun 1895 is erroneous). The most likely supposition is, I presume, that it propagates all the year round, though hardly as much in winter as during the other seasons; this would in any case agree very well with its distribution in the Atlantic, where it has only been encountered a few times north of 36° N (see under "Distribution"), and it would correspond well with *P. sedentaria*, which, being a more northerly species, hardly propagates as strongly during the summer, as during the winter and spring. However, as far as both of those species are concerned, a much more extensive material is required in order to give a definite result.

B. Atlantic.

	Stat.	Hauls	No. of specimens		
			♂	♀	total
"Thor" Dec. 1908.........	1	1	—	1	1
Jan. 1909.........	3	6	3	13	16
March—	1	5	11	31	42
June —	4	4	3	5	8
Sept. —	1	1	—	2	2
"Thor" total	10	17	17	52	69
other vessels.............	7	9	36	101	137
total...	17	26	53	153	206

On an average, only a few specimens per haul have been taken, but as in the Mediterranean larger shoals, 33—43 spec., have been found. The supplementary collections south-west of the Bay of Cadiz yielded much larger results (137 spec., 9 hauls) than the collections of the "Thor" itself in the Bay of Cadiz (69 spec., 17 hauls).

Depths of the sea and occurrence. The depth is as in the Mediterranean. All the stations of the "Thor" itself lie in the Bay of Cadiz, with the exception of St. 4 (Bay of Biscay), all the supplementary stations further towards the south-west. The normal northern limit seems to lie in the Bay of Cadiz; north of this it has only been taken 3 times in all *viz.* 52°27′ N, 15°40′ W, 1170 fms. and 52°4.5′ N, 12°27′ W, 376 fms. and ?620 fms. (WALKER 1903, p. 230) and "Thor" Station 4 (in the Bay of Biscay). It is not recorded by TATTERSALL from SW. Ireland, and it is evidently a more southerly species than *P. sedentaria.*

Vertical occurrence. At night, the species has chiefly been taken at the surface, the hauls decreasing downward; only 1 haul is deeper than 300 m. w. During the day, it has not been taken nearer the surface than with 65 m. w.

m. w.	No. of hauls Night	Day
10—35	10	—
56—65	5	2
300	3	1
> 400	1	4
	19	7

Propagation. 5 ♀ with ova (15—17 mm) have been found: 2 specimens with 65 m. w. day time, 24. Feb. 1 spec. with 30 m. w. night, 22. July, and 2 spec. with 300 m. w. 1. March. It can thus propagate both during summer and winter. Reliable data as to time of propagation are not to be found in extant literature; the German Plankton-Exp. gives no actual information, though VOSSELER quotes some reflections on the subject.

Distribution.

1. Mediterranean, see above.

2. Atlantic. On the "Thor" and the northern limit at Europe, see above. The northern limit in the middle of the Atlantic is 41.6° N, 56.3° W (VOSSELER l. c. 1901); the southern limit is abt. 40° S (the collections in our Museum).

The German Plankton-Exped. (VOSSELER 1901) has taken 107 spec. (38 ♂ of which 5 ad., and 69 ♀, of which 5 ad.), at the following 33 st.: Florida-Current 2 st. 41.6° N, 56.3° W, 0—200 m and surf.; Sargasso-Sea 4 st.: 34.7° N, 62.4° W to 31.2° N, 56.4° W, surf., and 31.5° N, 40.7° W, 0—400 m; N. Equatorial-Current 7 st.: 28.9° N, 35° W, to 18.9° N,26.4° W, and 10.2° N, 22.2° W, surf. or 0—400 m; Guinea-Current 4 st.: 7.9° N, 21.4° W to 2.9° N, 18.4° W, and 9.4° N, 41.9° W, 0—400 (0—200) m; S. Equatorial-Current 16 st.: 1.7° N, 17.3° W to 5.1° S, 14.1° W, 6.8° N, 14.2° W to 7.5° S, 20.3° W, and 5.3° S, 27 6° W to 0.4° S, 42.4° W, surf., 0—200 to 0—600 m.

Our Museum possesses specimens from the following localities: 35° N, 27° W, HYGOM 1860; 27° N, 27° W and 26° N, 28° W, ANDREA 1864; 24°—25° N, 31°—33° W, IVERSEN 1871; 18°—21° N, 36°—30° W, ANDREA 1872; 7°37′ N, 22°26′ W, REINHARDT; 34° S, 36° W, ANDREA; 34°20′—40° S, 5°30′—8°50′ W, and 37°30′ S, 10°40′ E, ANDREA 1864; 38° S, 12° E, ANDREA 1872; 38°20′ S, 30° W, ANDREA 1864. — 7°—8° N, 24° W (DANA 1852).

3. Indian Ocean. I have not found localities in the literature, but our Museum has specimens from the following localities: 37° S, 29° E; 38°20′ S, 30° E; 39°56′ S, 40°26′ E; 39°50′ S, 41°30′ E; 36°50′ S, 50°30′ E; 28°16′ S, 97°30′ E—29°40′ S, 96°20′ E; all were collected by Capt. ANDREA.

4. Pacific. China Sea (VOSSELER l. c. 1901, p. 26). — 16° N, 115°20′ E, ANDREA 1869 (our Zool. Mus.). — 37° N to 30°42′ S, 81°40′ to 160°25′ W (STREETS 1882—83). — Chile ("*P. sedentaria*" ♀, CLAUS 1872).

2. b. PHRONIMA ATLANTICA Guér. var. SOLITARIA Guér.

Phronima solitaria Guérin-Méneville, Iconographie du Règne Animal de Cuvier, Crust., 1836, p. 21. — **P. megalodous* Stebbing, 1888, p. 1353, Pl. 162 fig. A. — *P. solitaria* Bovallius, 1889, p. 372, Pl. 16 fig. 4—7. — **P. atlantica* var. *solitaria* Guér. Vosseler, 1901, p. 23, Pl. 2 fig. 5.

Mediterranean.

St. 115. 1800 m. 29-6-1910. 25 m.w., 1⁴⁰ am., 15 min. 1 ♀ jun. 10 mm.

P. custos Risso 1816 is by VOSSELER with a ? considered synonymous with this species, but by BOVALLIUS 1889 synonymous with *P. sedentaria.* BOVALLIUS seems to be right, on account of the long carpal process in p. 5 and the large prolongation of the hind corners of the epimeral parts of the metasome segments (RISSO Pl. 2 fig. 3). Only ♀ is known.

Distribution. "The subtropical and tropical regions of the Atlantic; the Indian Ocean" (BOVALLIUS l. c.).

1. Mediterranean. "Thor" st. 115; the species is new to this Sea.

2. Atlantic. Our Zool. Mus. has specimens from the following localities: 18°—21° N, 36°30′ W, ANDREA 1872; 15°19′ N, 24°54′ W, REINHARDT; 13°10′ N, 27°03′ W, ANDREA 1869 (BOVALLIUS det.); 1° N, 29° W, ANDREA 1866 (BOVALLIUS det.); 8° S, 13°20′ W, ANDREA 1864 (BOVALLIUS det.). — 16°49′ N, 24°14′ W, surf., night, 1 ♀ (STEBBING l. c.). — The German Plankton Exped. (VOSSELER 1901) had 4 ♀ from the following 3 localities, 0—400 m: 2.9° N, 18.4° W; 1.1° N, 16.4° W, and 4.1° S,

14.2° W. — "Assez loin de l'embouchure de la Plata" (GUÉRIN l. c.).

3. Indian Ocean. Without special locality (BOVALLIUS l. c.).

4. Pacific. ?17°29′ N, 141°21′ E, 1 ♀ (STEBBING, l. c.).

3. PHRONIMA CURVIPES Voss.

(Fig. 53, chart 17).

?*Phronima curvipes* Vosseler, 1901, p. 27, Pl. 3 fig. 1—3.

Mediterranean.

St. 46. 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 1 ♀. — **St. 47.** 10-2-1909. 300 m.w., 11^{05} pm., 30 min. 1 ♀. — **St. 50.** 7-2-1909. 1600 m.w., 5^{30} am., 60 min. 1 ♀. — **St. 52.** 18-2-1909. 300 m.w., 7^{25} am., 30 min. 2 ♀. — **St. 59.** 21-2-1909. 500 m.w., 1^{40} am., 30 min. 1 ♀. — **St. 59.** ibid. 1200 m.w., 2^{30} am., 60 min. 4 ♀. — **St. 61.** 21-2-1909. 600 m.w., 3^{25} pm., 60 min. 1 ♀. — **St. 98.** 23-6-1910. 65 m.w., 6^{35} pm., 15 min. 3 ♀ (1 with ova 10 mm). — **St. 99.** 24-6-1910. 65 m.w., 0^{10} am., 15 min. 1 ♀. — **St. 99.** ibid. 300 m.w., 11^{25} pm., 30 min. 2 ♀. — **St. 106.** 25-6-1910. 1200 m.w., 0^{20} am., 60 min. 4 ♀. — **St. 107.** 25-6-1910. 2000 m.w., 7^{30} am., 60 min. 1 ♀. — **St. 108.** 25-6-1910. 300 m.w., 10^{30} pm., 30 min. 1 ♀. — **St. 108.** ibid. 2000 m.w., 0^{40} am., 60 min. 6 ♀. — **St. 112.** 27-6-1910. 300 m.w., 0^{15} am., 30 min. 3 ♀. — **St. 115.** 28-6-1910. 300 m.w., 11^{20} pm., 30 min. 3 ♀. — **St. 115.** ibid. 2000 m.w., 0^{30} am., 60 min. 2 ♀. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 1 ♀. — **St. 116.** ibid. 300 m.w., 4^{05} pm., 30 min. 3 ♀. — **St. 118.** 30-6-1910. 300 m.w., 5^{55} pm., 30 min. 6 ♀. — **St. 118.** ibid. 300 m.w., 10^{55} pm., 30 min. 3 ♀ (1 with ova 10 mm). — **St. 133.** 14-7-1910. 25 m.w., 11^{00} pm., 30 min. 2 ♀ (1 with ova 10 mm). — **St. 133.** ibid. 300 m.w., 10^{15} pm., 30 min. 2 ♀ (1 with ova 10 mm). — **St. 133.** ibid. 600 m.w., 9^{20} pm., 30 min. 2 ♀. — **St. 138.** 19-7-1910. 300 m.w., 9^{10} pm., 30 min. 1 ♀. — **St. 138.** ibid. 1000 m.w., 7^{40} pm., 60 min. 1 ♀ with ova 10 mm. — **St. 204.** 27-8-1910. 25 m.w., 4^{00} am., 15 min. 2 ♀. — **St. 204.** ibid. 65 m.w., 4^{30} am., 15 min. 2 ♀. — **St. 204.** ibid. 300 m.w., 5^{00} am., 30 min. 5 ♀ (1 with ova 11 mm). — **St. 204.** ibid. 1000 m.w., 5^{55} am., 30 min. 1 ♀. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 15 ♀. — **St. 206.** 28-8-1910. 300 m.w., 1^{05} am., 15 min. 4 ♀ (1 with ova 10 mm). — **St. 206.** ibid. 1000 m.w., 1^{45} am., 45 min. 3 ♀. — **St. 218.** 2-9-1910. 300 m.w., 2^{45} am., 30 min. 4 ♀ (1 with ova 9 mm). — **St. 222.** 4-9-1910. 300 m.w., 11^{20} pm., 30 min. 3 ♀. — **St. 224.** 5-9-1910. 300 m.w., 7^{20} pm., 15 min. 2 ♀.

Atlantic.

St. 91. 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 1 ♀.

The determination of the material given above has caused some difficulty. The species (there are only females) does not quite agree with any of those hitherto described, but is very closely allied to *P. curvipes* Voss., and the difference seems to me so slight as not to be sufficient for the establishing of a new species. VOSSELER's description of the said species is based upon an ovigerous ♀ of 17 mm, whereas the largest specimens from the "Thor" only measure 11 mm. This difference in size is in itself sufficient to explain the deviations, of which the most striking is that the femur in p. 5 is not so strongly curved in the "Thor" specimen (VOSSELER mentions having found the same characters in the smaller specimens of 11,5—5 mm as in large ones, only less pronounced, and this agrees very well with the "Thor" specimens; but he does not say wherein the deviations consist).

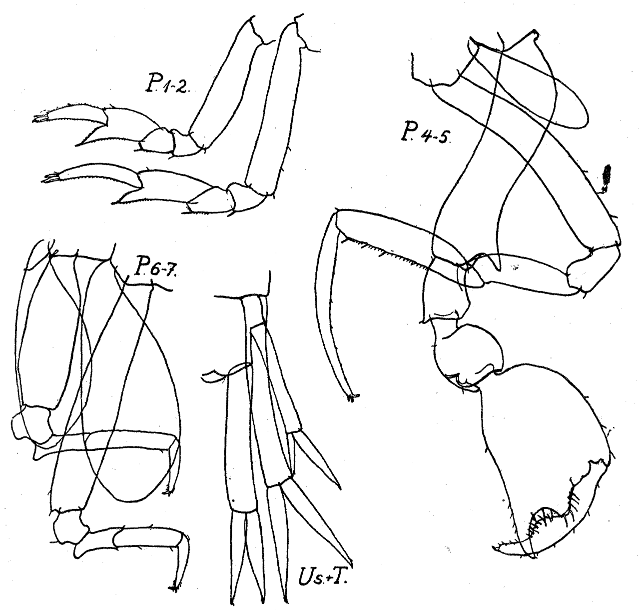

Fig. 52. *Phronima curvipes*.

The subjoined figures and the remarks below are based on a ♀ with ova, 11 mm, from St. 204; point by point it has been compared with the figures and descriptions of VOSSELER, but only the deviations are mentioned.

The posterior lateral corners of 1.—3. metasome segments are produced not quite as much as shown by VOSSELER. The carpus of p. 1—p. 2 of the same length, not shorter than the metacarpus. P. 3—p. 4 a little longer, not somewhat shorter than p. 5, which is due to the fact that the femur (of p. 3—p. 4) is a good deal longer than shown by V. P. 5 deviates in having the femur a little longer, but not quite so strongly curved; the femur has exactly the same shape in all the specimens at hand, irrespective of size, also in the ovigerous females. The carpus deviates in having the greatest width nearly at the distal, not at the proximal third. P. 6—p. 7 agree very well in shape and relative length with VOSSELER's fig. but differ from it in the following points: the femur of p. 6 somewhat broader in the ovigerous specimens than in the younger ones, terminating like the femur of p. 7 in a little spine.

The femur of p. 7 of the same length as the femur of p. 3—p. 5; the branchia on p. 7 of the same length, but not longer than the femur.

The uropoda show the following deviations: In up. 2 the inner ramus is half as long as the outer ramus, not less than half as long. In up. 3 the outer ramus is of the same length, not shorter than the inner ramus.

The material contains 100 spec. (only females) from 24 stations, 37 hauls; all the specimens are from the Mediterranean, except one single specimen from the Atlantic just outside Gibraltar. From the literature, we know only 7 specimens (all females), but I have found 2 spec. in the Copenhagen Zool. Mus.

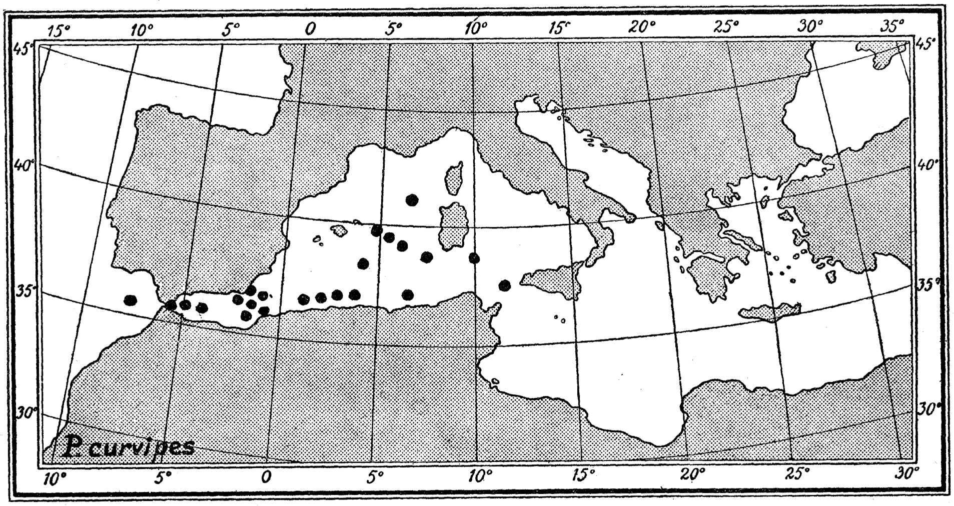

Chart 17. *Phronima curvipes*, positive stations.

Mediterranean.

	No. of stat.	No. of hauls	No. of spec.
Feb. 1909	6	7	11
June 1910	9	14	38
July —	2	5	9
Aug. —	3	7	32
Sept. —	3	3	9
total...	23	36	99

As a rule, only a few specimens were taken at a time, at most 5; on one occasion, however, 15 spec. (St. 205).

Depths of the sea and occurrence. The species has only been found at depths answering to 500—3000 m. w. It keeps exclusively to the southern part of the western basin, Alboran and Balearic Sea.

Depths of the sea	No. of stations
0— 500	—
> 500—1000	6
> 1000—2000	7
> 2000—3000	10
> 3000	—
total...	23

m. w.	No. of hauls	
	Night	Day
25	4	—
65	3	—
300	14	3
> 300	10	2
total	31	5

Vertical occurrence. During the night it was taken in 4 hauls with 25 m. w., but nearly half the hauls have a length of line of 300 m and many hauls a still greater length of line. It thus lives deeper down than most of the other Hyperiidea. During the day it has not been taken nearer the surface than with 300 m. w.

Size and propagation. (Males are not known at all.) The largest females are 10—11 mm and this also holds good of the few ♀ with ova (7 in all); these have only been found during the period 23. June—2. Sept. Vosseler's type-specimen was an ovigerous ♀ of 17 mm. One specimen in the Copenhagen Zool. Museum measures 15 mm.

Distribution.

1. Mediterranean, see above.

2. Atlantic. "Thor" St. 91. — The German Plankton-Exped. (Vosseler 1901) had 6 spec. from 6 stations, 0—400 m: N. Equatorial Current 1 st. 18.9° N, 26.4° W; S. Equatorial Current 5 st.: 0.1° N, 15.2° W to 7.5° S, 20.3° W, and 5.3° S, 27.6° W. — In our Museum I have found 2 ♀, 11—15 mm from 24°—25° N, 31°—33° W, Iversen ded. 1871, along with 2 *Ph. atlantica.*

3. Indian Ocean. 4 miles NW of Entrance into Desroches Atoll (Amirante), 1 ♀ (Walker 1909)

4. PHRONIMA COLLETTI Bovall. (Chart 18).

Phronima Colletti, Bovallius 1889, p 378, Pl. 16 figs. 27—47. — **P. C.* Vosseler 1901, p. 32 (lit.), Pl. 3 figs. 8—10, Pl. 4 figs. 1—3. — *P. C.* Chun 1895, p. 109, Pl. 8 figs. 1 (cold. fig.)—6. — *P. sedentaria* ♂ Claus, Zeitschr. Wiss. Zool. vol. 22, 1872, p. 334, textfig. 1, Pl. 26—27, figs. 2—12 (not ♀; ♀ = *P. atlantica*).

The peculiar shape of the carpus in p. 5 seems to preclude any confusion with other species.

The Copenhagen Zoological Museum has some specimens determined by Bovallius; they must thus be types or co-types (see Distribution). Some specimens determined as the present species have, however, turned out to belong to quite other species.

Mediterranean.

St. 50. 7-2-1909. 1600 m.w., 5^{30} am., 60 min. 1 ♂ ad. 7 mm. — **St. 98.** 23-6-1910. 65 m.w., 6^{35} pm., 15 min. 4 ♀: 5, 5, 7, 7 mm. — **St. 99.** 23-6-1910. 300 m.w., 11^{25} pm., 30 min. 1 ♀ 7 mm. — **St. 108.** 25-6-1910. 25 m.w., 11^{55} pm., 15 min. 1 ♂ jun. 4 mm. — **St. 112.** 27-6-1910. 25 m.w., 1^{30} am., 15 min. 1 ♀ 7 mm. — **St. 112.** ibid. 300 m.w., 0^{15} am., 30 min. 3 ♂ ad. 7 mm. — **St. 115.** 29-6-1910. 65 m.w., 1^{20} am., 15 min. 1 ♀ 7 mm. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 1 ♂ ad. 6 mm. — **St. 116.** ibid. 65 m.w., 2^{20} am., 30 min. 1 ♂ jun. 4 mm. — **St. 118.** 1-7-1910. 25 m.w., 0^{20} am., 15 min. 2 ♂ ad. 6 mm. — **St. 118.** ibid. 300 m.w., 5^{55} pm., 30 min. 1 ♂ ad. 6 mm. — **St. 121.** 2-7-1910. 25 m.w., 3^{35} am., 30 min. 1 ♂ ad. 7 mm. — **St. 133.** 14-7-1910. 300 m.w., 10^{15} pm., 30 min. 1 ♂ ad. 7 mm. — **St. 134.** 15-7-1910. 300 m.w., 5^{40} am., 30 min. 2 ♂ ad. 7 mm, 1 ♂ jun. 7 mm. — **St. 137.** 19-7-1910. 250 m.w., 9^{05} am., 30 min. 1 ♂ ad. 7 mm. — **St. 204.** 27-8-1910. 1000 m.w., 5^{55} am., 30 min. 1 ♂ ad. 6 mm. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 7 spec.: 4 ♂ ad. 6 mm, 3 ♀ 6—7 mm. — **St. 206.** 28-8-1910. 300 m.w., 1^{05} am., 15 min. 1 ♂ ad. 7 mm.

Atlantic.

St. 63. 22-2-1909. 25 m.w., 0^{05} am., 30 min. 1 ♀ 7 mm. — **St. 65.** 24-2-1909. 25 m.w., 5^{50} am., 30 min. 6 ♀ 7—8 mm. — **St. 65.** ibid. 65 m.w., 6^{30} am., 60 min. 5 spec. 8 mm: 1 ♂ jun., 4 ♀. — **St. 65.** ibid. 300 m.w., 7^{45} am., 120 min. 5 spec.: 1 ♂ ad. 7 mm, 4 ♀ 8 mm. — **St. 65.** ibid. 600 m.w., 10^{00} am., 120 min. 10 spec.: 1 ♂ ad. 7 mm, 9 ♀ 7—9 mm. — **St. 65.** ibid. 1600 m.w. 0^{30} pm., 120 min. 1 ♀ 6 mm. — **St. 66.** 25-2-1909. 1200 m.w., 8^{30} am., 120 min. 2 spec. 7 mm: 1 ♂ ad., 1 ♀. — **St. 69.** 1-3-1909. 25 m.w., 0^{30} am., 30 min. 12 spec.: 1 ♂ ad. 7 mm, 11 ♀ (4 with embryos, 1 with ova) 8—9 mm. — **St. 69.** ibid. 65 m.w., 10^{45} pm., 30 min. 32 spec.: 1 ♂ ad. 8 mm, 2 ♂ jun. 6—7 mm, 26 ♀ (3 with ova, 2 with embr.) 7—8 mm, 3 ♀ 5—6 mm. — **St. 69.** ibid. 300 m.w., 3^{05} pm., 30 min. 9 spec.: 2 ♂ ad. 8—9 mm, 2 ♂ jun. 5 mm, 5 ♀ (1 with ova) 7 mm. — **St. 69.** ibid. 300 m.w., 11^{40} pm., 30 min. 34 spec.: 7 ♂ ad. 7 mm, 3 ♂ jun. 5—6 mm, 24 ♀ (2 with ova) 6—8 mm. — **St. 69.** ibid. 600 m.w., 9^{00} pm., 60 min. 25 spec.: 1 ♂ ad. 8 mm, 8 ♀ with ova 7 mm, 16 ♀ without ova 5—7 mm. — **St. 69.** ibid. 3000 m.w., 6^{30} pm., 60 min. 3 spec.: 1 ♂ ad. 7 mm, 2 ♀ 7—8 mm. — **St. 87.** 17-6-1910. 300 m.w., 4^{00} pm., 30 min. 1 ♀ with embryos 7 mm. — **St. 89.** 18-6-1910. Surf. (P. 100), 3^{30} am., 10 min. 1 ♂ ad. 7 mm. — **St. 89.** ibid. 300 m.w., 3^{25} am., 30 min. 1 ♂ ad. 7 mm. — **St. 91.** 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 30 spec.: 4 ♂ ad. 7 mm, 2 ♂ jun. 6 mm, 4 ♀ with ova 8 mm, 20 ♀ without ova 7—8 mm. — **St. 91.** ibid. 1600 m.w., 5^{25} pm., 60 min. 1 ♀ with ova 8 mm. — **St. 92.** 19-6-1910. 65 m.w., 3^{40} am., 30 min. 2 ♀ 8 mm. — **St. 95.** 23-6-1910. 25 m.w., 6^{35} am., 15 min. 2 ♀ 8 mm. — **St. 95.** ibid. 65 m.w., 5^{50} am., 30 min. 2 ♀ 8 mm. — **St. 232.** 9-9-1910. 25 m.w., 8^{50} pm., 30 min. 34 spec.: 2 ♂ ad. 7 mm, 6 ♂ jun. 6—8 mm, 26 ♀ 6—8 mm. — **St. 233.** 10-9-1910. 25 m.w., 5^{05} am., 15 min. 8 spec.: 1 ♂ ad. 7 mm, 7 ♀ 6—8 mm. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min.: abt. 435 spec.: 35 ♂ ad. 7 mm, 75 ♂ jun. 6—7 mm, abt. 325 ♀ 5—7 mm (10 with ova 7 mm). — **St. 376.** ibid. 30 m.w., 8^{10} pm., 30 min. 51 spec.: 7 ♂ ad. 7—8 mm, 10 ♂ jun. 6—7 mm, 34 ♀ (5 with ova, 1 with embr. 8 mm). 5—7(8) mm. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 8^{05} pm., 30 min. abt. 500 spec.: 40 ♂ ad. 7—8 mm, 85 ♂ jun. 6—7 mm, abt. 375 ♀ (8 with ova, 2 with) embryos 8 mm) 6—8 mm. — **St. 382.** 34°21′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 76 spec.: 27 ♂ ad. 7—8 mm, 8 ♂ jun. 6—7 mm, 41 ♀ (6)7—8 mm. — **St. 383.** 37°16′ N, 14°09′ W. 23-10-1911. 30 m.w. (S. 100), 6^{30} pm., 30 min. 163 spec.: 74 ♂ ad. 7-8 mm, 29 ♂ jun. 6—7 mm, 60 ♀ (5)6—7(8) mm. — **St. 386.** 36°30′ N, 7°30′ W. 15-11-1911. 122 m.w. (S. 150), 5^{30} am., 30 min. 1 ♀ 7 mm. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 1^{10} am. 30 min. 43 spec.: 1 ♂ ad. 7 mm, 3 ♂ jun. 5 mm, 39 ♀ 4—6 mm. — **St. 398.** ibid. 56 m.w. (S. 150), 12^{40} am., 30 min. 26 spec.: 7 ♂ ad. 7—8 mm, 3 ♂ jun. 6 mm, 16 ♀ (1 with embryos) 7—8 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. abt. 450 spec.: 3 ♂ ad. 7 mm, 50 ♂ jun. 5—6 mm; abt. 400 ♀ 4—6 mm. — **St. 399.** ibid. 56 m.w. (S. 150), 9^{10} pm., 30 min. 41 spec.: 7 ♂ ad. 7 mm, 8 ♂ jun. 4—6 mm, 26 ♀ (1 with ova 8 mm) (4)5—7 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 10^{15} pm., 30 min. 6 spec.: 2 ♂ ad. 8 mm, 1 ♂ jun. 7 mm, 3 ♀ 6—8 mm. — **St. 400.** ibid. 56 m.w. (S. 150), 9^{35} pm., 30 min. 8 spec.: 3 ♂ ad. 8 mm, 1 ♂ jun. 7 mm, 4 ♀ (1 with ova) 8 mm.

The "Thor" material contains > 2000 spec. (541 ♂, > 1500 ♀), from 34 stat., 53 hauls; the greater part of the yield originates from the Atlantic.

A. Mediterranean.

	No. of stat.	No. of hauls	No. of specimens ♂	No. of specimens ♀
Feb. 1909	1	1	1	—
June 1910	6	8	6	7
July —	5	6	9	—
Aug. —	3	3	7	3
total...	15	18	23	10

Depths of the sea and occurrence. Of the 15 stations in all there are only two with a depth < 500 m *viz.* 175—195 and 400 m; the greater part (9 in all) have a depth of 2000—3000 m. The species is only to be found in the western basin, but is entirely lacking in the Tyrrhenian Sea. The only mention in literature as to occurrence in the Mediterranean is Algiers, without further data (Chevreux, 1900).

Depths in m	No. of stations
0— 500	2
> 500—1000	3
> 1000—2000	1
> 2000—3000	9
> 3000	—
total...	15

Vertical occurrence. At night it has hardly been taken except with 25—300 m. w.; only two hauls have a greater length of wire (1000—1600 m. w.). During the day there are two hauls with 250—300 m. w.

m. w.	No. of hauls	
	Night	Day
25	6	—
65	3	—
250	—	1
300	5	1
> 300	2	—
total...	16	2

Size and propagation. Both sexes seem to attain the same size, 7 mm. The most peculiar thing is that there are more males (23) than females (10) whereas in the case of *Phronima* the proportion is otherwise, usually the reverse. No females with ova or young have been found.

B. Atlantic.

There are 35 hauls from 19 stations, about 2000 spec. (518 ♂, about 1500 ♀). As contrasted with the Mediterranean, where only a single or very few specimens have been taken, at most 7 per haul, the hauls in the Atlantic have in many cases given many specimens, 25—50 spec. per haul; in a few cases even 163, 435 or 500 spec.

	No. of stat.	No. of hauls	No. of specimens		
			♂	♀	total
"Thor" Feb. 1909....	3	7	4	26	30
March —	1	6	20	95	115
June 1910....	5	8	8	32	40
July —	2	2	9	33	42
total ...	11	23	41	186	227
other vessels........	8	12	477	>1300	abt.1800
total ...	19	35	518	abt.1500	abt.2000

Depths of the sea and occurence. The depth of the sea is nearly as in the Mediterranean; most often 1000—3000 m; 2 stations are less than 500 m (275 and 490 m), 2 stations > 4000 m.

All the stations of the "Thor" itself lie in the Bay of Cadiz, the rest to the south-west of the latter. The species has previonsly only been caught at the limit of the "Thor" area: 38°06′ N, 29°18′ W. (Chevreux 1900) and Canaries (Chun l. c.).

Vertical occurrence. Nearly all the night hauls were made quite close to the surface; 10—65 m. w. During the day, on the other hand, it has been taken with 300 m.w. or more; but there are two hauls with 25—65 m. w. There does not seem to be any difference between the two sexes as regards depth.

m. w.	No. of hauls	
	Night	Day
10—35	14	1
56—65	6	1
122	1	—
300	3	3
> 400	2	4
total...	26	9

Size and propagation. The size is, for both sexes, 7—8 mm, ♀, however, at times 9 mm. Vosseler gives for ♂ ad. 7—7.5 mm, for ♀ 7.5—8 mm; Chun gives 11 mm and Bovallius even 12—18 mm which figure must doubtless be taken with due reservation. As contrasted with the Mediterranean there are about 3 times as many females as males.

There are altogether 43 ♀ with ova caught on the following dates: 1. March (14 spec. 4 hauls), 18. June (5 spec. 2 hauls), 22.—23. July (23 spec. 3 hauls) and 26.—30. Oct. (2 spec. 2 hauls). The length of wire is at night 15—600 m, during the day 300—1600 m. There are 7 females with embryos, caught on nearly the same dates, with 15—65 m.w. at night and 300 m. w. during the day.

As to the colour see Chun 1889, p. 528, Pl. 3 fig. 5 = Chun 1895 fig. 1 (cold. fig.).

Symbiosis: The "Thor" collections give no information as to this, but Vosseler has found 2 females in *Diphyes*, and Chun (1889) records it from *Abyla*.

Distribution.

1. Mediterranean, see above.
2. Atlantic. "Thor" see above. — 3 stations

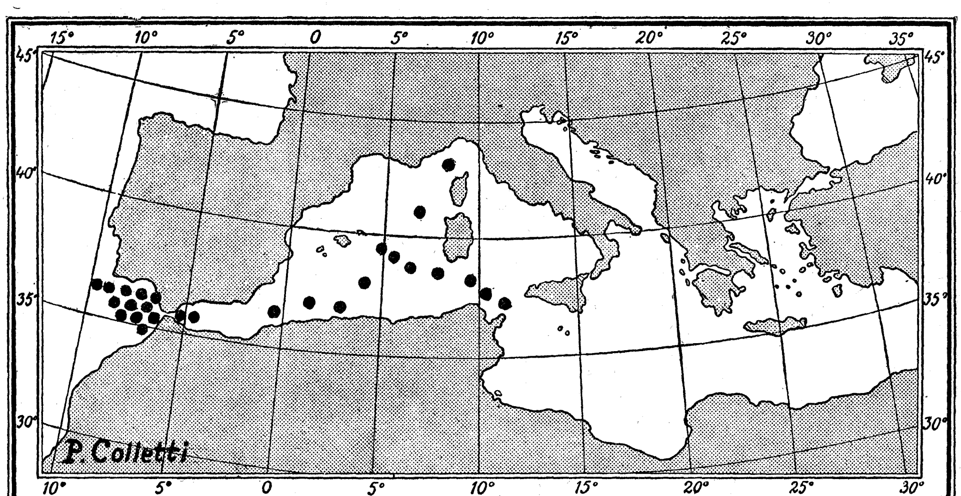

Chart 18. *Phronima Colletti*, positive stations. (St. 376 and following stations [except st. 386] lie outside the map to the S.W.)

41°39½′ N, 41°41½′ W, to 40°28¾′ N, 38°53′ W, and 38°06′ N, 29°18′ W; surf., night, 5 ♂, 16 ♀ (CHEVREUX, 1900). — From Bay of Biscay to Canaries, Dec., 0—450 m (CHUN 1895, p. 109, *Ph. Diogenes*). — Canaries, "vereinzelt in allen Tiefennetzen von 350—1500 m" (CHUN 1889, *Ph. Diogenes*). — 4° N, 6° W, PROSCH ded. 1847, BOVALLIUS det., 1 ♂ jun. (Zool. Museum).

The German Plankton-Exped. (VOSSELER 1901) had 40 spec. (15 ♂, 25 ♀) from 23 stations. Florida Current 2 st.: 40.4° N, 57° W, 0—200 m, and 37.9° N, 59.1° W, surf. N Equatorial Current 10 st.: 3 st. 25.1° N, 31.5° W to 24.6° N, 31° W, 0—400 (0—100) m; 5 st. 20.7° N, 28.1° W to 13.3° N, 22.7° W, 0—400 (0—200) m; 2 st. 10.2° N, 22.2° W. Guinea Current 7.9° N, 21.4° W, 0—200 m and 9.4° N, 41.9° W, 0—400 m. S Equatorial Current 7 st. from 1,7° N, 17.3° W to 7.8° S, 17.3° W; besides 3.8° S, 32.6° W and 3.6° S, 33.2° W; 0—400 (600) m or surf.

3. Indian Ocean. Bay of Bengal (GILES 1888, *Ph. bucephala*). — 22°44′ S, 86° E, ANDREA ded. 1869, 1 ♀ (BOVALLIUS det.; Zool. Museum).

4. Pacific. 4°—21° N, 127°—151° W (STREETS 1877—1878; *P. pacifica* jun.) — Chile (CLAUS 1872, *Ph. sedentaria* ♂). — 40° N—30°41′ S, 97°14′ W—157°37′ W (STREETS 1882—83, *P. pacifica* jun.). The two areas given by STREETS 1877—78 and 1882—83 are perhaps too large, as *P. pacifica* Streets comprises both the real *P. pacifica* and *P. Colletti* (by STREETS called *P. pacifica* jun.).

5. PHRONIMA PACIFICA Streets (non Stebb).

Phronima pacifica ad. (non jun.; jun. = *P. Colletti*) Streets Bull. U. S. Nat. Mus. No. 7 (= Smithson. Miscell. Coll. vol. 13) 1877—78, p. 128. — *P. p.* ad. (non jun.) Streets, Proc. U. S. Nat. Mus. vol. 5, 1882—83, p. 6, Pl. 1 figs. 3, 3 a. — **P. p.* Vosseler, 1901 p. 29, Pl. 3 figs. 4—7. — non *P. p.* Stebbing 1888 and Bovallius 1889 (= *P. Stebbingi* Vosseler 1901).

Atlantic.

St. 69. > 3500 m. 36°13′ N, 9°48′ W. 28-2-1909. 300 m.w., 11⁴⁰ pm., 30 min. 1 ♀ with great marsupial plates 11 mm. — **St. 400.** > 4500 m. 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 10¹⁵ pm., 30 min. 3 ♀ 7—10 mm.

The present specimens agree very well with the descriptions given by STREETS and VOSSELER. The species is new to these regions of the Atlantic.

Only the ♀ is described. (♂ jun. and ♀ jun. described by STEBBING are *P. Colletti*; a ♂ jun. (VOSSELER 1901) may perhaps be referred to this species; WALKER 1909 mentions a ♂, 7 mm, without description).

As to the time of propagation no data are at hand beyond VOSSELER's mention (l. c.) of 2 ♀ with ova and young taken 7.—9. Sept. (5.1° S, 14.1° W, and 0.3° S, 15° W).

Distribution.

1. Mediterranean. This species was not taken by the "Thor" Exped.; but VOSSELER (in LO BIANCO 1903—04, p. 278) enumerates 9 spec. (♂, ♀) from 4 stations, daytime, 0—2000 m. w., Feb. 6 to April 3, from Naples.

2. Atlantic. "Thor" see above. — The German Plankton Exped. (VOSSELER 1901) enumerates 22 spec. (3 ♂ jun., 3 ♀ ad., 16 ♀ jun.) from 13 stations: Florida Current 41.6° N, 53.3°′ W, surf.; Northern Equat. Current and Canarian C. 20.7° N, 28.1° W, 0—200 m, and 10.2° N, 22.2° W, 0—400 m; Guinea Current 7.9° N, 21.4° W, 0—200 m, and 53.° N, 19.9° W, 0—400 m; S. Equat. Current 5 st. 0.1° N, 15.2° W to 5.1° S, 14.1° W, and 3 st. 3.8° S, 32.6° W to 4.4° S, 29.2° W, 0 to 0—600 m.

3. Indian Ocean. 10°27′ S, 51°17′ E, 1000 fms., 1 spec., and 3 miles NE of Desroches Atoll (Amirante), 250—300 fms., 1 jun., 1 ♂ 7 mm (WALKER 1909, p. 51).

4. Pacific. China Sea 1 ♀ (VOSSELER l. c.). — 4°—21° N, 127°—151° W (STREETS 1877—78) and 40° N—30°42′ S, 97°14′ W—157°37′ W (STREETS 1882—83). (The areas given by STREETS are perhaps somewhat too great, as *P. pacifica* jun. Streets is not this species, but *P. Colletti*).

2. Genus Phronimella Claus.

Phronimella Bovallius 1889, p. 386 (lit.). — *P.* Vosseler 1901, p. 39.

1. PHRONIMELLA ELONGATA Claus (Chart 19).

Phronimella elongata Stebbing 1888, p. 1362. — **P. e.* Bovallius 1889, p. 389 (lit. and syn.), Pl. 16 fig. 51—67. — *P. e.* Vosseler 1901, p. 40, textfig. — *P. e.* Pesta 1920, p. 30, fig.

Mediterranean.

St. 12. 19-12-1908. 300 m.w., 11⁴⁰ am., 60 min. 1 ♂ jun. 8 mm. — **St. 15.** 22-12-1908. 1400 m.w. (5²⁰ am.?) 60 min. 1 ♀ 12 mm. — **St. 23.** 15-1-1909. 25 m.w., 11⁵⁰ pm., 30 min. 1 ♀ 12 mm. — **St. 25.** 17-1-1909. 65 m.w., 4⁴⁰ pm., 30 min. 2 ♀ 10—15 mm. — **St. 25.** 17-1-1909. 65 m.w., 4⁴⁰ pm., 30 min. 2 ♀ 10—15 mm. — **St. 26.** 19-1-1909. 150 m.w., 0⁵⁰ am., 180 min. 5 spec.: 1 ♂ ad. 8 mm, 2 ♂ jun. 8 mm, 2 ♀ 10 mm. — **St. 40.** 1-2-1909. 65 m.w., 9³⁰ pm., 30 min. 1 ♀ 8 mm. — **St. 116.** 30-6-1910. 25 m.w., 3⁰⁰ am., 15 min. 6 spec.: 2 ♂ jun. 6—10 mm, 3 ♀ 10—13 mm, 1 ♀ 15 mm. — **St. 118.** 1-7-1910. 25 m.w., 0²⁰ am., 15 min. 1 ♀ 13 mm. — **St. 123.** 3-7-1910. 10 m.w., 2³⁰ am., 15 min. 3 ♀ 10—14 mm. — **St. 123.** ibid.

25 m.w., 1^{50} am., 15 min. 25 spec.: 3 ♂ jun. 5 mm, 2 ♂ jun. 8 mm, 6 ♀ abt. 15 mm, 3 ♀ abt. 11 mm, 11 ♀ 5—10 mm. — **St. 123.** ibid. 65 m.w., 0^{55} am., 30 min. 2 ♀ 14—16 mm. — **St. 124.** 3-7-1910. 65 m.w., 3^{30} am., 90 min. 1 ♀ 14 mm. — **St. 129.** 12-7-1910. 25 m.w., 3^{00} am., 30 min. 41 spec.: 6 ♂ ad. 9 mm, 13 ♂ jun. 4—8 mm, 22 ♀ 6—16 mm. — **St. 129.** ibid. 300 m.w., 3^{40} am., 30 min. 38 spec.: 5 ♂ ad. 8 mm, 5 ♂ jun. 5—8 mm, 4 ♀ 15—16 mm, 19 ♀ 10—14 mm, 5 ♀ 5—9 mm. — **St. 129.** ibid. 600 m.w., 8^{00} pm., 30 min. 22 spec.: 1 ♂ ad. 8 mm, 4 ♂ jun. 8 mm, 9 ♀ 12—16 mm, 2 ♀ 10 mm, 4 ♀ 7—8mm, 2 ♀ 5 mm. — **St. 129.** ibid. 1000 m.w., 4^{20} am., 60 min. 9 spec.: 1 ♂ ad. 8 mm, 5 ♀ 12—14 mm, 1 ♀ 11 mm, 2 ♀ 7—9 mm. — **St. 129.** ibid. 3500 m.w., 3^{00} pm., 120 min. 19 spec.: 4 ♂ jun. 8 mm, 7 ♀ 14—18 mm, 4 ♀ 11—13 mm, 4 ♀ 7—9 mm. — **St. 130.** 13-7-1910. 25 m.w., 0^{50} am., 30 min. 8 spec.: 7 ♀ 11—14 mm, 1 ♀ abt. 7 mm. — **St. 131.** 13-7-1910. 300 m.w., 10^{35} am., 30 min. 3 spec.: 1 ♂ jun. 7 mm, 2 ♀ 9—14 mm. — **St. 132.** 14-7-1910. 25 m.w., 3^{05} am., 30 min. 14 spec.: 6 ♂ ad. 9 mm, 1 ♂ ad. 7 mm, 1 ♂ jun. 8 mm, 5 ♀ 8 mm, 1 ♀ 13 mm. — **St. 132.** ibid. 300 m.w., 3^{45} am., 30 min. 6 spec.: 1 ♂ ad. 9 mm, 1 ♀ 18 mm, 4 ♀ 12—14 mm. — **St. 132.** ibid. 600 m.w., 4^{50} am., 30 min. 2 spec.: 1 ♂ ad. 9 mm, 1 ♀ 13 mm. — **St. 133.** 14-7-1910. 25 m.w., 11^{00} pm., 30 min. 3 spec.: 1 ♂ jun. 8 mm, 2 ♀ 12—13 mm. — **St. 133.** ibid. 300 m.w., 10^{15} pm., 30 min. 1 ♀ 12 mm. — **St. 133.** ibid. 600 m.w., 9^{20} pm., 30 min. 1 ♀ abt. 14 mm. — **St. 137.** 19-7-1910. 25 m.w., 8^{15} am., 30 min. 1 ♂ jun. 8 mm. — **St. 138.** 19-7-1910. 25 m.w., 9^{50} pm., 30 min. 51 spec.: 4 ♂ ad. 8—9 mm, 2 ♂ jun. 7 mm, 10 ♂ jun. 5—6 mm, 1 ♀ 19 mm, 2 ♀ 17 mm, 2 ♀ 16 mm, 1 ♀ 15 mm, 2 ♀ 14 mm, 3 ♀ 13 mm, 11 ♀ 10—11 mm, 13 ♀ 4—9 mm. — **St 138** ibid. 300 m.w., 9^{10} pm., 30 min. 1 ♀ 10 mm. — **St. 138.** ibid. 1000 m.w., 7^{40} pm., 60 min. 1 ♀ 15 mm. — **St. 143.** 23-7-1910. 25 m.w., 1^{20} am., 30 min. 10 spec.: 1 ♂ ad. 9 mm, 1 ♂ jun. 8 mm, 1 ♀ 16 mm, 1 ♀ 15 mm, 3 ♀ 14 mm, 3 ♀ 11—13 mm. — **St. 144.** 24-7-1910. 25 m.w., 2^{00} am., 30 min. 5 spec.: 1 ♂ jun. 6 mm, 1 ♀ 11 mm, 3 ♀ 7—9 mm. — **St. 144.** ibid. 300 m.w., 2^{45} am., 30 min. 1 ♀ 12 mm. — **St 145.** 25-7-1910. 25 m.w., 3^{30} am., 30 min. 6 spec.: 1 ♂ ad. 9 mm, 4 ♀ 12—15 mm, 1 ♀ 10 mm. — **St. 145.** ibid. 300 m.w., 4^{10} am., 30 min. 1 ♀ 12 mm. — **St. 147.** 25-7-1910. 25 m.w., 11^{35} pm., 30 min. 32 spec.: 6 ♂ ad. 8—9 mm, 4 ♂ jun. 5—8 mm, 18 ♀ 12—16 mm, 4 ♀ abt. 8 mm. — **St. 147.** ibid. 300 m.w., 0^{20} am., 30 min. 2 ♀ 13—17 mm. — **St. 147.** ibid. 1000 m.w., 1^{10} am., 60 min. 3 spec.: 1 ♂ ad. 9 mm, 2 ♀ 10 mm. — **St. 152.** 27-7-1910. 25 m.w., 10^{50} pm., 15 min. 11 spec.: 2 ♂ ad. 8—9 mm, 3 ♂ jun. 7—9 mm, 6 ♀ 10—15 mm. — **St. 156.** 30-7-1910. 25 m.w., 2^{55} am., 30 min., 32 spec.: 6 ♂ ad. 9 mm, 18 ♀ 11—15 mm, 6 ♀ 9—10 mm, 6 ♀ 6 mm. — **St. 156.** ibid. 300 m.w., 3^{50} am., 30 min. 1 ♀ 15 mm, 4 ♀ 8—12 mm. — **St. 156.** ibid. 600 m.w., 3^{00} am., 30 min. 8 spec.: 2 ♂ ad. 9 mm, 1 ♂ jun. 7 mm, 5 ♀ 12—14 mm. — **St. 156.** ibid. 1000 m.w., 0^{40} am., 60 min. 11 spec.: 1 ♂ ad. 8 mm, 2 ♂ jun. 6 mm, 6 ♀ 11—13 mm, 2 ♀ 6—7 mm. — **St. 158.** 31-7-1910. 300 m.w., 7^{30} am., 30 min. 67 spec.: 16 ♂ ad. 8—9 mm, 11 ♂ jun. 7—8 mm, 37 ♀ 11—13 mm, 3 ♀ 7—9 mm. — **St. 160.** 1-8-1910. 25 m.w., 2^{00} am., 30 min. 34 spec.: 2 ♂ ad. 9 mm, 8 ♂ jun. 7—8 mm, 3 ♂ jun. 4—5 mm, 9 ♀ 12—14 mm, 2 ♀ 10 mm, 6 ♀ 7 mm, 4 ♀ 4—5 mm. — **St. 160.** ibid. 300 m.w., 2^{45} am., 30 min. 8 spec.: 2 ♂ ad. 8 mm, 5 ♀ 12—14 mm, 1 ♀ 8 mm. — **St. 160.** ibid. 1000 m.w., 3^{35} am., 60 min. 6 spec.: 1 ♂ ad. 9 mm, 1 ♂ jun. 8 mm, 2 ♀ 14 mm, 2 ♀ 12—13 mm. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 242 spec.: 26 ♂ ad. 8—9 mm, 22 ♂ jun. 6—7 mm, 2 ♂ jun. 5 mm, 66 ♀ 11—15 mm, 86 ♀ 7—10 mm, 40 ♀ 5—6 mm. — **St. 163.** 3-8-1910. 25 m.w., 1^{05} am., 15 min. 5 spec.: 2 ♂ jun. 7—8 mm, 3 ♀ 7 mm. — **St. 163.** ibid. 300 m.w., 1^{05} am., 15 min. 6 spec.: 1 ♂ jun. 7 mm, 4 ♀ 13 mm, 1 ♀ 5 mm. — **St. 163.** ibid. 1000 m.w., 0^{05} am., 30 min. 2 ♀ 12 mm, 1 ♀ 10 mm. — **St. 182.** 13-8-1910. 10 m.w., 11^{00} pm., 15 min. 2 ♀ 12 mm. — **St. 182.** ibid. 65 m.w., 10^{30} am., 15 min. 1 ♀ 12 mm. — **St. 187.** 18-8-1910. 25 m.w., 7^{45} pm., 15 min. 7 spec.: 1 ♂ ad. 9 mm, 1 ♀ 14 mm, 4 ♀ 13 mm, 1 ♀ 6 mm. — **St. 190.** 19-8-1910. 25 m.w., 8^{15} pm., 15 min. 13 spec.: 1 ♂ ad. 9 mm, 4 ♂ jun. 6—8 mm, 1 ♀ 17 mm, 2 ♀ 13 mm, 1 ♀ 11 mm, 4 ♀ 8 mm. — **St. 192.** 20-8-1910. 25 m.w., 9^{40} pm., 15 min. 10 spec.: 1 ♂ ad. 10 mm, 1 ♂ jun. 8 mm, 7 ♀ 15—17 mm, 1 ♀ 10 mm. — **St. 192.** ibid. 300 m.w., 10^{10} pm., 15 min. 1 ♂ jun. 7 mm. — **St. 193.** 21-8-1910. 10 m.w., 0^{50} am., 30 min. 23 spec.: 2 ♂ ad. 10 mm, 2 ♂ ad. 9 mm, 3 ♂ jun. 5—9 mm, 13 ♀ 11—17 mm, 2 ♀ 9 mm, 1 ♀ 5 mm. — **St. 194.** 21-8-1910. 10 m.w., 4^{30} am., 15 min. 4 spec.: 1 ♂ ad. 9 mm, 1 ♂ jun. 8 mm, 2 ♀ 13 mm. — **St. 194.** ibid. 25 m.w., 5^{00} am., 15 min. 29 spec.: 4 ♂ ad. 8 mm, 8 ♂ jun. 6—7 mm, 13 ♀ 11—13 mm, 4 ♀ 7 mm. — **St. 194.** ibid. 1200 m.w., 6^{00} am., 30 min. 2 ♀ 9—13 mm. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 1 ♀ 10 mm. — **St. 196.** 22-8-1910. 25 m.w., 2^{40} am., 30 min. 8 spec.: 1 ♂ jun. 6 mm, 1 ♀ 13 mm, 4 ♀ 10—11 mm, 2 ♀ 6 mm. — **St. 197.** 24-8-1910. 25 m.w., 7^{45} pm., 15 min. 60 spec.: 6 ♂ ad. 9 mm, 4 ♂ jun. 8—9 mm, 7 ♂ jun. 6—7 mm, 27 ♀ 12—14 mm, 4 ♀ 9 mm, 12 ♀ 6—7 mm. — **St. 197.** ibid. 300 m.w., 7^{00} pm., 30 min. 1 ♂ jun. 7 mm. — **St. 199.** 25-8-1910. 25 m.w., 9^{00} pm., 15 min. 23 spec.: 2 ♂ ad. 9 mm, 4 ♂ jun. 5—7 mm, 2 ♀ 16—17 mm, 9 ♀ 10—15 mm, 6 ♀ 6 mm. — **St. 199.** ibid. 1000 m.w., 10^{10} pm., 30 min. 1 ♀ 16 mm, 2 ♀ 8—12 mm. — **St. 200.** 26-8-1910. 25 m.w., 3^{45} am., 30 min. 33 spec.: 5 ♂ ad. 8—9 mm, 8 ♂ jun. 6—8 mm, 1 ♀ 17 mm, 15 ♀ 11—13 mm, 4 ♀ 10 mm. — **St. 202.** 26-8-1910. 300 m.w., 5^{05} pm., 15 min. 2 ♀ 14 mm, 1 ♀ 12 mm. — **St. 204.** 27-8-1910. 25 m.w., 4^{00} am., 15 min. 19 spec.: 1 ♂ jun. 7 mm, 8 ♀ 10—17 mm, 10 ♀ 6—7 mm. — **St. 204.** ibid. 65 m.w., 4^{30} am., 15 min. 23 spec.: 4 ♂ jun. 6—8 mm, 13 ♀ 13—15 mm, 4 ♀ 10—11 mm, 2 ♀ 6 mm. — **St. 204.** ibid. 300 m.w., 5^{00} am., 30 min. 6 spec.: 1 ♂ ad. 9 mm, 5 ♀ 6—15 mm. — **St. 204.** ibid. 1000 m.w., 5^{55} am., 30 min. 1 ♀ 9 mm. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 18 spec.: 2 ♂ ad. 8—9 mm, 1 ♂ jun. 8 mm, 11 ♀ 11—16 mm, 4 ♀ 7—10 mm. — **St. 208.** 29-8-1910. 25 m.w., 1^{40} am., 15 min. 25 spec.: 2 ♂ ad. 8 mm, 2 ♂ jun. 5—7 mm, 21 ♀ 12—16 mm. — **St. 209.** 29-8-1910. 25 m.w., 4^{55} am., 15 min. 30 spec.: 8 ♂ ad. 7—9 mm, 4 ♂ jun. 6—8 mm, 17 ♀ 9—14 mm, 1 ♀ 7 mm. — **St. 209.** ibid. Verticalnet 75—35 m, 4^{10} pm. 1 ♀ 10 mm. — **St. 209.** ibid. 150 m.w., 4^{25} am., 20 min. 6 spec.: 1 ♂ ad. 8 mm, 1 ♂ jun. 8 mm, 3 ♀ 12 mm, 1 ♀ 10 mm. — **St. 209.** ibid. 300 m.w., 5^{25} am., 15 min. 3 ♀ 13 mm. — **St. 209.** ibid. 1000 m.w., 6^{00} am., 45 min. 5 spec.: 2 ♂ ad. 9 mm, 3 ♀ 12 mm. — **St. 210.** 30-8-1910. 25 m.w., 2^{45} am., 30 min. 32 spec.: 4 ♂ ad. 8—10 mm, 7 ♂ jun. 7—8 mm, 20 ♀ 9—16 mm, 1 ♀ 6 mm. — **St. 210.** ibid. 600 m.w., 3^{35} am., 30 min. 1 ♂ jun. 8 mm, 1 ♀ 14 mm. — **St. 275.** 39°5′ N, 14°50′ E. 3-4-1911. 94 m.w. (S. 200), 8^{30} pm., 30 min. 4 spec.: 2 ♂ jun. 7 mm, 2 ♀ 7—14mm. — **St. 276.** 36°36′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200), 11^{20} pm., 35 min. 176 spec.: 2 ♂ ad. 10 mm, 46 ♂ jun. 6—9 mm. 44 ♀ 15—16 mm, 24 ♀ 9—14 mm, 60 ♀ 6—8 mm. — **St. 277.**

33°20′ N, 27°30′ E. 6-4-1910. 132 m.w., 11^{00} pm., 35 min. 29 spec.: 4 ♂ jun. 6—9 mm, 13 ♀ 14—16 mm, 4 ♀ 11—13 mm, 8 ♀ 6—10 mm. — **St. 279.** 38°11.5′ N, 15°36.5′ E. 23-2-1911. 30 (S. 100), 7^{00} pm., 150 min. 7 spec.: 1 ♂ ad. 11 mm, 3 ♂ jun. 3 mm, 1 ♀ 12 mm, 2 ♀ 8—10 mm. — **St. 281.** 38°15′ N, 15°37′ E. m.w. 1-3-1911. 30 m.w. (S. 100), 3^{45} pm., 60 min. 4 spec.: 2 ♂ ad. 11 mm, 1 ♂ jun. 10 mm, 1 ♀ 8 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 6^{10} pm., 60 min. 1 ♂ ad. 12 mm, 1 ♀ 15 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 7^{50} pm., 60 min. 5 spec.: 3 ♂ ad. 11 mm, 2 ♂ jun. 8—9 mm. — **St. 282.** 38°12′ N, 15°37′ E. 9-3-1911. 40 m.w. (S. 100), 2^{00} pm., 90 min. 11 spec.: 3 ♂ ad. 9—11 mm, 3 ♂ jun. 9 mm, 3 ♀ 16—18 mm, 2 ♀ 10—11 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 5^{30} pm., 90 min. 4 spec.: 1 ♂ jun. 10 mm, 1 ♀ 16 mm, 2 ♀ 7 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 7^{15} pm., 90 min. 1 ♂ jun. 9 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 9^{00} pm., 90 min. 11 spec.: 1 ♂ jun. 10 mm, 7 ♀ 15—18 mm, 3 ♀ abt. 13 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 10^{45} pm., 180 min. 7 ♀ 6—17 mm. — **St. 283.** 38°12′ N, 15°37′ E. 12-3-1911. 40 m.w. (S. 100), 6^{30} pm., 180 min. 20 spec.: 6 ♂ ad. 11—12 mm; 1 ♂ jun. 10 mm, 5 ♀ 16—17 mm, 6 ♀ 11—12 mm, 2 ♀ 8—9 mm. — **St. 283.** ibid. 40 m. w. (S. 100), 9^{45} pm., 180 min. 8 spec.: 3 ♂ ad. 11 mm, 2 ♂ jun. 9 mm, 1 ♂ jun. 6 mm, 2 ♀ 8—14 mm. — **St. 296.** 32°10′ N, 29°50′ E. 25-6-1911. 28 m.w. (S. 200), 2^{30} am., 30 min. 3 spec.: 1 ♂ ad. 9 mm, 1 ♂ jun. 9 mm, 1 ♀ 13 mm. — **St. 297.** 33°10′ N, 25°35′ E. 25-6-1911. 28 m.w. (S. 200), 11^{30} pm., 30 min. 1930 spec. (50 ccm): 100 ♂ ad. 9—10 mm, 300 ♂ jun. 8—9 mm, 100 ♂ jun. 6—7 mm, 250 ♀ 14—15 mm, 230 ♀ 10—13 mm, 950 ♀ 5—9 mm. — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 min. 1420 spec. (45 ccm): 200 ♂ ad. 9 mm, 120 ♂ jun. 8—9 mm, 20 ♂ jun. 7 mm, 10 ♂ jun. 6 mm, 20 ♀ 18 mm, 150 ♀ 13—16 mm, 800 ♀ 7—12 mm, 100 ♀ 6 mm. — **St. 384.** 32°50′ N, 27°10′ E. 7-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 1 ♂ jun. 8 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 24 spec.: 1 ♂ ad. 9 mm, 8 ♂ jun. 6—8 mm, 7 ♀ 12—15 mm, 8 ♀ 5—7 mm.

Atlantic.

St. 69. 28-2-1909. 65 m.w., 10^{45} pm., 30 min. 4 spec.: 2 ♀ 15—16 mm, 2 ♀ 11—12 mm. — **St. 69.** ibid. 300 m.w., 3^{05} pm.. 30 min. 1 ♀ 11 mm. — **St. 264.** 38°14′ N, 24°35′ W. 19-3-1911. 25 m.w. (S. 150), 7^{00} pm., 30 min. 1 ♀ 14—17 mm. — **St. 377.** 31°23′ N, 18°08′ W. 23-7-1911. 15 m.w. (S. 200), 30 min. 9 spec.: 3 ♂ ad. 10 mm, 4 ♂ ad. 10 mm, 4 ♂ jun. 6—9 mm. 2 ♀ 6—8 mm. — **St. 382.** 34°21′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 3 ♀ 12—16 mm. — **St. 383.** 37°16′ N, 14°9′ W. 23-10-1911. 30 m.w. (S. 100), 6^{30} pm.. 30 min. 3 spec.: 1 ♂ ad. 10 mm, 2 ♀ 13—15 mm. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. 56 m.w. (S. 150), 12^{40} am.. 30 min. 4 spec.: 1 ♂ ad. 10 mm, 3 ♀ 10—13 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min, 3 spec.: 2 ♂ jun. 8 mm, 1 ♀ 12 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. 56 m.w. (S. 150), 9^{35} pm., 30 min. 7 spec.: 1 ♂ jun. 8 mm, 2 ♀ 15—17 mm, 4 ♀ 5—8 mm.

The "Thor" Exp. has in all 4863 spec. (467 ♂ ad., 813 ♂ juv., 3583 ♀) from 64 stations, 109 hauls; nearly all the specimens are from the Mediterranean. The species seems to belong to the most widely distributed and numerous Hyperiidea.

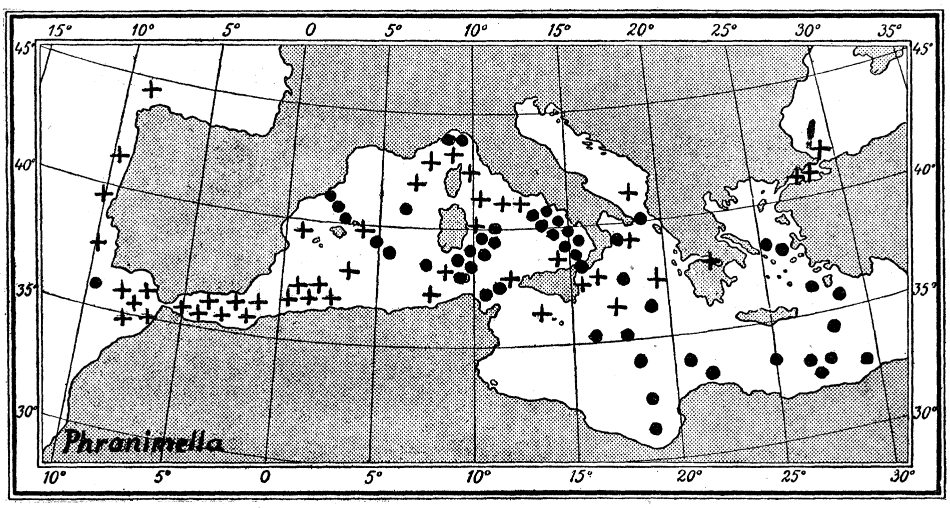

Chart 19. *Phronimella elongata.* ● positive stations, + negative stations (> 500 m, night, 10—300 mw.) Several of the stations lie so close to each other that it was impossible to note them all. Several stations lie outside the Chart the to S.W.

A. Mediterranean.

There are in all 4827 spec. (462 ♂ ad., 806 ♂ jun., 3559 ♀) from 56 stations, 100 hauls.

	No. of st.	No. of hauls	No. of specimens ♂ ad.	♂ jun	♀	total
"Thor" Dec. 1908	2	2	—	1	1	2
Jan. 1909	3	3	1	2	5	8
Feb. —	1	1	—	—	1	1
June 1910	1	1	—	2	4	6
July —	17	36	62	70	315	447
Aug. —	20	38	76	103	517	696
"Thor" total	44	81	139	178	843	1160
other vessels Feb.-April 1911	7	14	21	68	200	289
June —	3	3	301	551	2501	3353
Nov. —	2	2	1	9	15	25
other vessels total	12	19	323	628	2716	3667
"Thor" + other vessels total	56	100	462	806	3559	4827

Depths of the sea and occurrence (Chart). The species is oceanic, as the depth being as a rule > 500 m;

t is, however, also to be found at lower levels (175—195 m, 200 m (3 times), 235 m, 350 m, 360 m and 480 m).

The positive stations lie, 29 in the western, 27 in the eastern basin. In the case of the "Thor" alone, the

Dephts of the stations	No. of stations		
	"Thor"	other vessels	total
0— 500 m	5	4	9
> 500—1000 -	13	—	13
> 1000—2000 -	13	1	14
> 2000—3000 -	8	3	11
> 3000 -	5	4	9
total...	44	12	56

figures are 28 and 16 respectively, but of stations with a depth of > 500 m there are only 25 and 14 respectively (Stations 40, 137, 182, 190 and 192 having slighter depths), in all 39 stations. In the western basin it has been found very nearly everywhere, except between Gibraltar and the Balearic Islands; in the eastern, the distribution is more even, apart from the fact that it was not taken within the Adriatic (though STEUER, records it from here 1913, p. 567, 568) and it is absent in the northern half of the Ægean Sea. It is one of the most numerous and most widely distributed Hyperiidea in the Mediterranean.

Considering as negative all stations where it was not taken by the "Thor" in night hauls 10—300 m. w. and at a depth of > 500 m, there are in the western basin 33 negative stations, in the eastern 13, there is however, a good deal of difference according to the time of the year. During the winter there are in the western basin 16 negative stations and only 3 positive ones (St. 23, 25 and 26 [+ St. 40 with a smaller depth of the sea]) in the eastern 6 negative and 2 positive; during the summer there are in the western basin 22 positive stations (+ St. 137 and 193 with smaller depth) and 17 negative, in the eastern 12 positive (+ St. 182 and 190 with a

M. w.	"Thor" 1908—10, > 500 m.				"Thor" and other vessels, > 500 m, night		
	No. of hauls		No. of specimens, night	Average no. of specimens pr. night haul	No. of hauls	Normal hauls (30 min.)	
	Night	Day				No. of specimens	Average no. pr. haul
10— 40	32	—	827	25.8	35	4475	127.9
65—100		1					
120—250	36	—	193	5.4	41	402	9.8
300—400		4					
> 400		1					
total...	68	6	1020	—	76	—	—

smaller depth) and 7 negative. It may be objected that the figures for the winter are too small to allow of any conclusions; but for the summer, they seem to show, that there are, proportionally a few more positive stations in the eastern than in the western basin.

Vertical occurrence. From the hauls of the "Thor" itself 1908—1910 at stations with a depth > 500 m. 32 or nearly half the night hauls have a length of wire of only 10—35 m. It may be found in large shoals.

The same is shown by collections from other ships or over lower depths of the sea, and this also holds good of STEUER's table from the southern Adriatic (STEUER 1913, p. 567).

Size and propagation. There are about 3 times as many females (3559) as males (1268) (VOSSELER 1901 had 291 ♀, 150 ♂).

The size of ♂ ad. is as a rule 8—10 mm, very rarely 11 mm (13 spec.) or 12 mm (4 spec.). ♂ juv. is at most 10 mm.

♀ is as a rule 16 mm, very rarely 17—19 mm (17 spec. 17 mm; 23 spec. 18 mm; 1 spec. 19 mm). The "Thor" (and VOSSELER 1901) had no females with ova or embryos; but LO BIANCO records (1909, p. 596) from Naples that it has ova in the marsupium in Aug.—Nov. and embryos in Nov.—Jan. The sizes of the specimens have not given any results as to growth and propagation.

B. Atlantic.

There are only 36 spec. from 8 stat., 9 hauls, in the Bay of Cadiz and west or south-west of the latter.

Distribution.

"The subtropical and tropical regions of the Atlantic and of the Pacific; the Mediterranean; the Indian Ocean" (BOVALLIUS 1889).

1. Mediterranean. On the "Thor" etc. see above. — Messina (CLAUS). — At Naples ♂ ad. and ♀ ad. may be found in each haul with 100 m. w., and it is also common deeper down, being the most numerous Phronimid (CHUN, Zoologica 1888, p. 29); but LO BIANCO (1909, p. 596) says that it may be found at Naples during the whole of the year, but not abundant. — VOSSELER (in LO BIANCO 1903—04, p. 278) notes 3 hauls (daytime, 4 spec.) from Naples, 100—2000 m.w.; the hauls with 100 m. w were made with closing-net. — Adriatic: 42°11.3′ N, 17°47′ E, surf., 4 spec. (PESTA 1920, p. 30). — Ragusa (STEUER 1911, p. 673).

2. Atlantic. The northern limit lies at Europe at abt. 36° N, further to the West at abt. 43° N; the southern limit lies at abt. 37° S ("Challenger"). The localities are

the following. "Thor" etc. see above. — Our Zool. Museum has spec. from: 34°20′—34°50′ N, 72°—70°50′ W, ANDREA 1862, 9 ♀; 36° N, 43° W, 23-7-1847, "Galatea", 1 ♀; "34°20′ N, 72° W. — 34°50′ N, 10°50′ W", 1862, ANDREA, 2 ♀; 34°10′ N, 42°10′ W, 25-8-1863, ANDREA, 19 ♀; 32°16′ N, 38°1′ W, WARMING 1866, 1 ♀; 31°30′ N, 21°16′ W, 6-4-1882, HARTMANN, 1 ♂, 21 ♀; 28° N, 23° 40′ W, 11-4-1882, HARTMANN, 4 ♂, 43 ♀; 26°15′ N, 20°56′ W, 7-12-1995, CHR. LEVINSEN, 1 ♀; 26° N, 26° W, IVERSEN 1871, 3 ♀; 25° N, 39° W, HYGOM 1863, 9 ♀; 24°27′ N, 25°03′ W, surf., "Diana" 1893, DAMM, 6 ♀; 23°31′ N, 24°4′ W, STÜBE 1860, 2 ♀; 22° N, 22° W, HYGOM, 1 ♀; 18°17′ N, 54°14′ W, HARTMANN 1882, 1 ♂; 17°46′ N, 51°12′ W, 25 fath., "Diana" 1893, DAMM, 1 ♀; 10°22′ N, 21°16′ W, REINHARDT, 1 ♀; 5°31′ N, 23°15′ W, REINHARDT, 2 ♀; 5° N, 32° W, 1860, HYGOM, 2 ♂, 2 ♀; 1°20′ S, 28°50′ W, ANDREA 1866, 1 ♀; 3° S, 27° W, HYGOM, 2 ♀; 29° S, 27°23′ W, 1866, WARMING, 1 ♀; without locality, WARMING 1863, 4 ♀.

CHEVREUX (1900) enumerates 65 spec. (33 ♂, 32 ♀) from 7 hauls, surf., night: 38°06′ N, 29°18′ W, and (6 stations) $40^1/_2$°—$42^3/_4$° N, 39°—$45^1/_2$° W. — Off Las Palmas (Canaries), 450 m, "an der Oberfläche und in grosser Zahl" (CHUN 1889, p. 531).

The German Plankton-Exped. (VOSSELER 1901) has 441 spec. (24 ♂ ad., 126 ♂ jun., 105 ♀ ad., 186 ♀ jun.) from 68 hauls: Florida Current 4 st. 41.6° N, 56.3° W, to 37.9° N, 59.1° W, 0—200 or 0—400 m. w. Sargasso Sea 15 st.: 37.1° N, 59.9° W; 34.7° N, 62.4° W to 31.5° N, 40.7° W; 29.8° N, 36.8° W to 25.6° N, 34.9° W; 30.8° N, 30.9° W; 0—400 or 0—200 m. w. N. Equatorial Current 12 st. 28.3° N, 34.3° W to 10.2° N, 22.2° W; 12° N, 40.3° W; 0—400 (0—200) m. w. Guinea Current 7 st. 7.9° N, 21.4° W, to 5.3° N, 19.9° W; 9.4° N, 41.9° W; 0—400 or 0—200 m. w. Gulf Stream 1 st.: 37.7° N, 25.2° W, 0—80 m. w. S. Equatorial Current 29 st.: 1.7° N, 17.3° W, to 0° N, 15.2° W; 0.3° S, 15.0° W, to 6.8° S, 14.2° W; 7.8° S, 17.3° W, to 4.4° S, 29.2° W; 3.9° S, 30.1° W, to 0.4° S, 42.4° W; 0—400 (500) or 0—200 (100) m. w.

The "Challenger" Exp. (STEBBING 1888) has the species from the following localities: 25°45′ N, 20°14′ W, surf., 1 ♀; 3°10′ N, 14°51′ W, 200—0 fms., 2 ♀; 1°47′ N, 24°26′ W, 40—0 fms., 21 ♀, 9 ♂; 1°10′ N, 28°23′ W, surf., 11 ♀; 2°42′ S, 14°41′ W, surf., 1 ♀; 36°1′—36°32′ S, 47°35′—42°47′ W, 1 ♀.

3. Indian Ocean. The Copenhagen Zoological Museum has specimens from: S of Madagascar, TRAUSTEDT, 1 ♀; 40°4′ S, 53°20′ E, 1869, ANDREA, 7 ♀; 32°40′ S, 55°20′ E, ANDREA 1861, 2 ♀; 32°15′ S, 58°30′ E, ANDREA 1864, 7 ♀; 27° S, 101°40′ E, 2 ♀. — Bay of Bengal (GILES). — S. of Mindanao, Celebes Sea, 6°20′ N, 123°18′ E, surf., night, 1 ♂, 5 ♀ ("Challenger"). — WALKER (1909, p. 51) mentions "numerous specimens throughout the voyage" ("Sealark"-Exped., between Madagascar and Maldive Archipelago) from the surface to 1000 fms.

4. Pacific. 34°00′ N—30°40′ S, 102°43′—150°00′ W, 1 ♂, 6 ♀ (STREETS 1877, 1882). — China Sea 2 ♂, 5 ♀ (VOSSELER 1901). — Admirality Islands to Japan, 1 ♀; 26°29′ N, 137°57′ E, surf., 1 ♀, 6 ♀; 24°49′ N, 138°34′ E, surf., 1 ♀; 16°35′ N, 117°47′ E, surf., 2 ♀; W. Pacific N of New Guinea, 1 ♂, 2 ♀; 7°35′ N, 149°49′ W, 2 ♂; 7°35′—5°54′ N, 149°49′—147°2′ W, surf., 3 ♀ (STEBBING, "Challenger"). — 27°30′ S, 98°—99° W, ANDREA, 3 ♀ (spec. in our Zool. Museum).

Fam. Anchylomeridæ Bovall.

Anchylomeridæ Bovallius 1889, p. 396 (lit. and syn.). — *Phrosinidæ* Stebbing 1888, p. 1423 (lit. and syn.).

The only three species which can be said to be well-known are all to be found in the "Thor" material, both from the Atlantic and from the Mediterranean.

CHUN (1887, p. 29) mentions an *Anchylomera* n. sp. from Capri: "In dem Schliesnetze fand sich ein Exemplar aus 600 M. und zwei Exemplare aus 1000 M. Tiefe vor Capri. Sie war auch im Januar häufig in dem offenen Netze aus grösseren Tiefen vorhanden." As far as I know, nothing has been elucidated as to which species these specimens belonged to; but it can hardly be any other than *A. Blossevillei.*

1. Genus Anchylomera Milne-Edwards.

Anchylomera Stebbing 1888, p. 1432 (lit.). — *A.* Bovallius 1889, p. 408.

1. ANCHYLOMERA BLOSSEVILLEI Milne-Edwards (Chart 20).

**Anchylomera Blossevillei* Stebbing 1888, p. 1433, Pl. 177 (lit.). — **A. B.* Bovallius 1889, p. 412, Pl. 17 fig. 1—22 (lit.). — *A. B.* Vosseler 1901, p. 88, textfig.

Mediterranean.

St. 10. 15-12-1908. 1200 m.w., 9^{30} am., 120 min. 1 spec. jun. 3 mm. — **St. 24.** 17-1-1909. 65 m.w., 7^{50} am., 30 min. 5 ♀ 5—8 mm (1 with embr. 8 mm). — **St. 25.** 17-1-1909. 65 m.w. 4^{40} pm., 30 min. 2 ♀ 8 mm. — **St. 25.** ibid. 300 m.w., 5^{40} pm., 60 min. 3 ♀ 6—8 mm. — **St. 26.** 19-1-1909. 65 m.w., 0^{15} am., 60 min. 1 ♀ 4 mm. — **St. 26.** ibid. 150 m.w., 0^{50} am., 60 min. 49 spec.: 3 ♂ ad. 8—9 mm, 6 ♂ jun. 6—7 mm, 11 ♀ with ova 6—8 mm, 29 ♀ without ova 5—7 mm. — **St. 28.** 19-1-1909. 65 m.w., 11^{00} pm., 120 min. 2 ♂ ad. 8 mm. — **St. 35.**

29-1-1909. 6^{40} pm., 200 m.w., 60 min. 1 spec. jun. 3 mm. — **St. 35.** 1600 m.w., 11^{25} am., 120 min. 1 ♀ 7 mm. — **St. 38.** 31-1-1909. 25 m.w., 7^{10} pm., 30 min. 1 spec. jun. 3 mm. — **St. 39.** 1-2-1909. 1000 m.w., 0^{30} pm., 120 min. 2 spec. 5 mm: 1 ♂ jun., 1 ♀. — **St. 43.** 3-2-1909. 65 m.w., 6^{15} am., 30 min. 17 spec.: 1 ♂ ad. 9 mm, 7 ♂ jun. 7 mm, 9 ♀ 3—6 mm. — **St. 45.** 6-2-1909. 300 m.w., 11^{25} pm., 30 min. 1 ♀ 8 mm. — **St. 46.** 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 1 ♂ ad. 10 mm. — **St. 47.** 10-2-1909. 65 m.w., 10^{20} pm., 30 min. 3 ♂ ad. 9—10 mm. — **St. 47.** ibid. 300 m.w., 11^{05} pm., 30 min. 1 ♀ 8 mm. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 1 spec. jun. 3 mm. — **St. 134.** 15-7-1910. 25 m.w., 4^{50} am., 30 min. 2 spec. 5 mm: 1 ♂ ad., 1 ♀. — **St. 143.** 23-7-1910. 25 m.w., 1^{20} am., 30 min. 1 ♀ 5 mm. — **St. 144.** 24-7-1910. 25 m.w., 2^{00} am., 30 min. 1 ♂ jun. 4 mm. — **St. 145.** 25-7-1910. 25 m.w., 3^{30} am., 30 min. 2 spec.: 1 ♂ ad. 6 mm, 1 ♀ 7 mm. — **St. 145.** ibid. 300 m.w., 4^{10} am., 30 min. 1 spec. jun. 3 mm. — **St. 147.** 25-7-1910. 25 m.w., 11^{35} pm., 30 min. 4 spec.: 1 ♂ ad. 8 mm, 3 ♀ 6—7 mm. — **St. 152.** 27-7-1910. 25 m.w., 10^{50} pm., 15 min. 2 spec. jun. 3—4 mm. — **St. 152.** ibid. 1000 m.w., 0^{30} am., 60 min. 1 ♀ 5 mm. — **St. 154.** 29-7-1910. Surf., 3^{40} am., 10 min. Abt. 380 spec.: 26 ♂ ad. 5—6 mm, 7 ♂ jun. 5 mm, abt. 50 spec. jun. 2 mm, abt. 300 ♀ 3—5 mm. — **St. 154.** ibid. 25 m.w., 3^{30} am., 30 min. 83 spec.: 8 ♂ ad. 6 mm, 75 ♀ 3—5 mm. — **St. 154.** ibid. 300 m.w., 4^{30} am., 30 min. 8 spec.: 2 ♂ ad. 6 mm, 6 ♀ 4—5 mm. — **St. 156.** 30-7-1910. Surf., 10 min., 2^{25} am. 7 ♀ 1—4 mm. — **St. 156.** ibid. 600 m.w., 3^{00} am., 30 min. 3 ♀ 3—6 mm. — **St. 156.** ibid. 1000 m.w., 0^{40} am., 60 min. 18 spec.: 1 ♂ ad. 7 mm, 1 ♂ jun. 6 mm, 16 ♀ 3—6 mm. — **St. 158.** 31-7-1910. Surf., 10 min., 7^{00} am. 1 ♀ 2 mm. — **St. 158.** ibid. 300 m.w., 7^{30} am., 30 min. 9 spec.: 1 ♂ ad. 7 mm, 8 ♀ 4—6 mm. — **St. 160.** 1-8-1910. 25 m.w., 2^{00} am., 30 min. 8 spec.: 1 ♂ ad. 7 mm, 2 ♂ jun. 3—4 mm, 2 ♀ 5 mm, 3 ♀ 3—4 mm. — **St. 160.** ibid. 300 m.w., 2^{45} am., 30 min. 10 spec.: 2 ♂ ad. 7 mm, 1 ♂ jun. 5 mm, 7 ♀ 4—5 mm. — **St. 160.** ibid. 1000 m.w. 3^{35} am., 60 min. 25 spec.: 2 ♂ ad. 5—7 mm, 2 ♂ jun. 5 mm, 21 ♀ 2—5 mm. — **St. 160.** ibid. 4000 m.w. 3^{30} pm. 1 ♀ 5 mm. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 8 spec.: 3 ♂ jun. 3 mm, 5 ♀ 2—4 mm. — **St. 163.** 3-8-1910. 25 m.w., 1^{05} am., 15 min. 1 ♀ 4 mm. — **St. 163.** ibid. Dredge. 1 ♂ ad. 7 mm. — **St. 179.** 13-8-1910. 65 m.w., 2^{15} am., 30 min. 2 ♀ 4—5 mm. — **St. 181.** 13-8-1910. 65 m.w., 2^{55} pm., 15 min. 4 ♀ 4—5 mm. — **St. 181.** ibid. 300 m.w., 1^{25} pm., 20 min. 1 ♀ 4 mm. — **St. 182.** 13-8-1910. 10 m.w., 11^{00} pm., 15 min. 25 spec.: 6 ♂ ad. 6 mm, 1 ♂ jun. 4 mm, 18 ♀ (6 with ova) 4—5 mm. — **St. 182.** ibid. 65 m.w., 10^{30} am., 15 min. 3 ♀ 3—5 mm. — **St. 182.** ibid. 600 m.w., 11^{40} am., 30 min. 4 spec.: 2 ♂ ad. 6 mm, 1 ♂ jun. 5 mm, 1 ♀ 5 mm. — **St. 183.** 16-8-1910. 65 m.w., 5^{10} pm., 15 min. 1 ♀ 6 mm. — **St. 189.** 19-8-1910. 300 m.w., 8^{55} am., 15 min. 1 ♂ ad. 6 mm. — **St. 193.** 21-8-1910. 10 m.w., 0^{50} am., 30 min. 2 ♀ 4 mm. — **St. 194.** 21-8-1910. Surf., 4^{35} am., 10 min. 2 ♀ 2—4 mm. — **St. 194.** ibid. 10 m.w., 4^{30} am., 15 min. 1 ♀ 3 mm. — **St. 194.** ibid. 25 m.w., 5^{00} am., 15 min. 2 ♀ 3—5 mm. — **St. 194.** ibid. 1200 m.w., 6^{00} am., 30 min. 1 ♀ 5 mm. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 1 ♀ 5 mm. — **St. 196.** 22-8-1910. 25 m.w., 2^{40} am., 30 min. 11 spec.: 2 ♂ ad. 5 mm, 9 ♀ (4 with ova) 4—5 mm. — **St. 199.** 25-8-1910. Surf., 9^{30} pm., 10 min. 1 ♀ 4 mm. — **St. 199.** ibid. 25 m.w., 9^{00} pm., 15 min. 1 ♀ 4 mm. — **St. 200.** 26-8-1910. 25 m.w., 3^{45} am., 30 min. 2 ♀ 5 mm. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 2 ♀ 4 mm. — **St. 208.** 29-8-1910. 25 m.w., 1^{40} am., 15 min. 1 ♂ ad. 5 mm, 1 ♀ 4 mm. — **St. 209.** 29-8-1910. Surf., 5^{00} am., 10 min. 1 ♂ ad. 4 mm. — **St. 209.** ibid. 25 m.w., 4^{55} am., 15 min. 1 ♀ 4 mm. — **St. 209.** ibid. 100 m.w., 3^{45} am., 20 min. 4 ♀ 4 mm. — **St. 209.** ibid. 150 m.w., 4^{25} am. 20 min. 3 ♀ 4 mm. — **St. 216.** 1-9-1910. 25 m.w., 5^{10} am., 30 min. 1 ♀ 3 mm. — **St. 276.** 36°30′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200). 11^{20} pm., 35 min. 1 ♂ ad. 9 mm. — **St. 277.** 33°20′ N, 27°30′ E. 6-4-1911. 132 m.w. (S. 200), 11^{00} pm., 35 min. 1 ♀ 3 mm. — **St. 279.** 23-2-1911. 30 m.w. (S. 100), 7^{30} pm., 150 min. 1 ♀ 3 mm. — **St. 282.** 9-3-1911. 40 m. w. (S. 100), 2^{00} am., 90 min. 1 ♀ 4 mm. — **St. 282.** ibid. 8-3-1911. 40 m.w. (S. 100), 5^{30} pm., 90 min. 1 ♀ 5 mm. — **St. 296.** 32°10′ N, 29°50′ E. 26-6-1911. 28 m.w. (S. 200), 2^{00} am., 300 min. Abt. 150 spec.: 18 ♂ ad. 7—8 mm, 9 ♂ juv. 5—6 mm, abt. 125 ♀ 3—6 mm. — **St. 297.** 33°10′ N, 25°35′ E. 25-6-1911. 28 m.w., 11^{30} pm., 30 min. 15 spec.: 3 ♂ ad. 8—9 mm, 10 ♀ 3—4 mm, 2 ♀ 5—6 mm. — **St. 298.** 34°20′ N, 21°10′ E. 26-6-1911. 38 m.w. (S. 200), 11^{30} pm., 30 min. 27 spec.: 2 ♂ ad. 8—9 mm, 1 ♂ jun. 6 mm, 24 ♀ (3)4—5(6) mm. — **St. 339.** 40°30′ N, 3°10′ E. 20-8-1911. 28 m.w. (S. 200), 3^{00} am., 30 min. 1 ♀ 2 mm. — **St. 340.** 35°50′ N, 21°30′ E. 26-8-1911. 28 m.w. (S. 200), 9^{00} pm., 30 min. 9 spec.: 5 ♂ ad. 5 mm, 4 ♀ 4—5 mm. — **St. 340.** ibid. 108 m.w. (S. 150), 9^{00} pm., 30 min. 1 ♂ ad. 5 mm, 1 ♀ 2 mm. — **St. 341.** 34°00′ N, 26°20′ E. 27-8-1911. 28 m.w. (S. 200), 11^{00} pm., 30 min. 4 ♀ 4 mm. — **St. 384.** 32°50′ N, 27°10′ E. 7-7-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. 7 spec.: 2 ♂ ad. 5 mm, 1 ♂ jun. 4 mm, 3 ♀ 4 mm, 1 ♀ 2 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911. 122 m.w. (S. 150), 8^{30} pm., 30 min. Abt. 100 spec.: 11 ♂ ad. 7 mm, 1 ♂ jun. 5 mm, 5 ♀ with ova 4—5 mm, 27 ♀ without ova 4—5 mm, abt. 50 ♀ abt. 3 mm. — **St. 411.** 40°00′ N, 13°40′ E. 5-1-1912. 112 m.w. (S. 150), 4^{15} am., 30 min.; abt. 80 spec.: 1 ♂ jun. 5 mm, 3 ♀ with ova 5—6 mm, 25 ♀ 4—5 mm, abt. 50 ♀ 2—3 mm. — **St. 412.** 34°33′ N, 24°15′ E. 7-1-1912. 112 m.w. (S. 150), 6^{30} pm., 30 min. Abt. 35 spec.: 5 ♂ ad. 5—7 mm, 1 ♀ with ova 5 mm, abt. 10 ♀ 3 mm, 20 ♀ 4—5 mm. **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5^{00} am. 1 ♀ 7 mm. — **St. 699.** 36°00′ N, 18°58′ E. 7-2-1913. 5^{00} am. 2 ♀ 4 mm, 1 ♀ 6 mm. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 11^{30} am. 2 ♀ 3—4 mm. — **St. 730.** 38°26′ N, 13°37′ E. 16-4-1913. Abt. 170 spec.: 1 ♂ ad. 11 mm, 4 ♂ jun. 6—7 mm, 16 ♀ 6—7 mm, Abt. 150 spec. (2)3—5 mm. — **St. 731.** 37°19′ N, 1°31′ E. 19-4-1913. 2^{30} pm. 2 ♀ 3—5 mm. — **St. 743.** 34°26′ N, 20°08′ E. 23-9-1913. 10 pm. Abt. 660 spec.: abt. 60 ♂ ad. 6—7 mm, abt. 600 ♀ (several with ova 6—7 mm) (3)4—7 mm.

Atlantic.

St. 376. 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min. 12 spec.: 1 ♂ ad. 8 mm, 11 ♀ 2—5 mm. — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 3 ♀ 4 mm. — **St. 377.** 31°23′ N, 18°18′ W. 23-7-1911. 15 m.w. (S. 200). 1 ♀ with ova 5 mm, 30 ♀ 2—3 mm. — **St. 382.** 34°12′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100). 6^{05} pm., 30 min. 11 spec.: 2 ♂ ad. 5 mm, 1 ♂ jun. 4 mm, 5 ♀ with ova 4 mm, 3 ♀ 3 mm. — **St. 383.** 37°16′ N, 14°09′ W. 23-10-1911. 30 m.w. (S. 100), 6^{05} pm., 30 min. 2 spec.: 1 ♂ ad. 6 mm, 1 ♀ 5 mm. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. 12^{40} am., 30 min. Surf. (S. 200). 4 spec.: 1 ♂ ad. 6 mm, 3 ♀ 2—3 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200). 9^{10} pm., 30 min.

1 ♂ ad. 6 mm, 2 ♀ 2 mm. — **St. 399.** ibid. 56 m.w. (S. 150), 9^{10} pm., 30 min. 1 ♀ 4 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 9^{35} pm., 30 min. Abt. 45 spec.: 4 ♂ ad. 5—6 mm, 1 ♂ jun. 5 mm, abt. 40 ♀ 2—3 mm.

The material. There are in all abt. 2200 spec.; the species has been taken both in the Mediterranean and the Atlantic.

Mediterranean.

60 stations, 86 hauls, abt. 2078 spec. (Abt. 234 ♂, abt. 1787 ♀, abt. 57 spec. jun. [♀?]).

and it is distributed over both basins of the Mediterranean; it has, indeed, been found in the southern part of the Adriatic and penetrates nearly to the Dardanelles, whereas curiously enough it has not been found in the western part of the Mediterranean (West of 0°).

Depths in m.	No. of stations	
	Total no. ("Thor" the other vessels)	"Thor" 1908—10
0— 500 ...	13	9
> 500—1000 ...	5	5
> 1000—2000 ...	13	11
> 2000—3000 ...	19	11
> 3000 ...	10	4

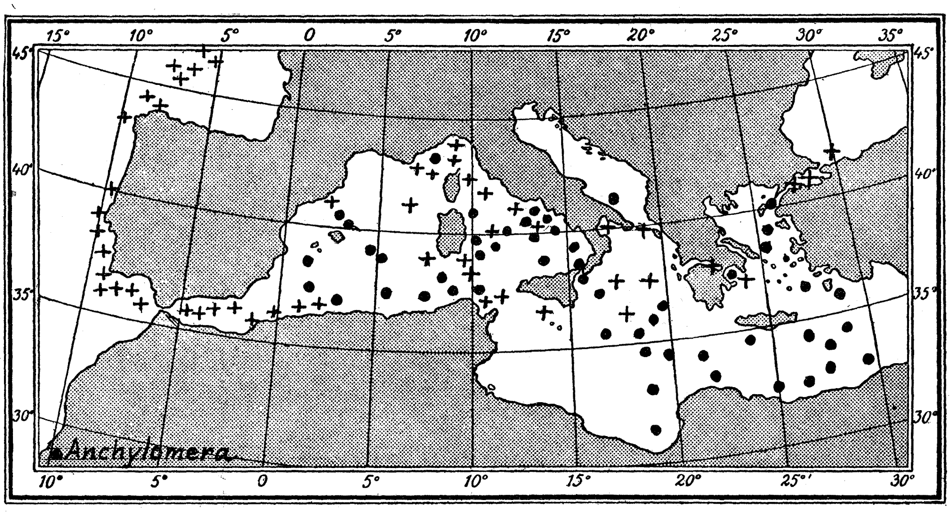

Chart 20. *Anchylomera Blossevillei.* ● positive stations, + negative stations (>100 m, night, 10—250 m.w.). St. 376, 377, 382, 398—400 lie outside the chart to the South West. Several of the stations lie so close to each other that it was impossible to note them all.

Taking stations ("Thor" 1908—10) with a depth > 100 m, there are in the western basin 21 positive stations as against 40 negative stations (night, 0—250 m. w.) i. e. abt. 34 per cent. positive stations. In the eastern basin there are 16 positive as against 12 negative stations i. e. abt. 57 per cent. positive stations. It is thus comparatively more numerous in the eastern than in the western basin. Inside the Dardanelles there are 3 negative stations, no positive ones.

The distribution of stations, hauls og specimens according to months is as follows:

	stations	hauls	spec.
"Thor" Dec. 1908	1	1	1
Jan. 1909	6	9	65
Feb. —	5	6	25
June 1910	1	1	1
July —	9	16	abt. 525
Aug. —	17	30	130
Sept. —	1	1	1
total	40	64	abt. 750
collected by other vessels ...	20	22	abt. 1328
total...	60	86	abt. 2078

In the Mediterranean the species thus belongs to the most widely distributed Hyperiidea.

Depth of the sea and occurrence. As will be seen from the table, the species is to be found at all depths except the lowest (< 75 m),

Vertical occurrence. As the species can be found at comparatively small depths (13 stations have a depth < 500 m) no tables are given to show the abundancy of the hauls in percentage, according to depth.

M. w.	No. of hauls "Thor" 1908—10	
	Night	Day
10— 35	28	1
50—100	6	6
130—250	3	—
300—400	6	4
>400	6	4
total...	49	15

The species is to be found at the same depth in the two basins; at night chiefly at the surface, by day taken especially with 50—100 m. w.

On an average, only a few specimens were taken pr. haul (2—4 pr. normal haul of 30 min.), but shoals have been encountered in the eastern basin both in winter and summer: 660 spec. (St. 743), 380 spec. (10 min.; St. 154, 1910, surf.); 170 spec. (St. 730), 150 spec. (St. 296), 100 spec. (St. 385), 80 spec. (St. 411), 49 spec. (St. 26), 35 spec. (St. 412), 27 spec. (St. 298), 25 spec. (St. 160). If the hauls are referred to normal hauls (30 min.), the western basin (night, 10—35 m. w.) has given 52 spec., the eastern basin 1235 spec.

Size and propagation. In the Mediterranean, the "Thor" herself caught about 750 spec. (101 ♂, about 592 ♀, about 57 juv. [♀?]) and the other vessels about 1328 spec. (about 138 ♂, about 1190 ♀), in all about 2078 spec. (about 239 ♂, about 1782 ♀, about 57 jun.); or in other words about 7 times as many females as males.

The size of ♂ ad. varies between 5 and 11 mm; the greater part are 6—7—8 mm, but quite a number may be 5 or even 10—11 mm. ♂ juv. is 3—7 mm, most frequently 5—6 mm.

♀ without ova are as a rule 5—7 mm; the extreme limits are 4—8 mm, but I believe that all the young of 2—4 mm, which have not been determined as to sex are in reality ♀.

♀ with ova are 4—8 mm, most frequently 5—7 mm, ♀ with ova or embryos have been found in Jan., Aug., Sept. and November; the species thus propagates all the year round.

Atlantic.

There are altogether about 112 spec. (12 ♂, about 100 ♀) from 7 stations, 9 hauls; the most northerly locality is 37°16′ N (St. 383). The depth of the sea varies between > 1100 m and > 4500 m.

Distribution.

1. Mediterranean. Curiously enough, only very few previous writers have recorded this extremely common species from the Mediterranean: Capri, 1 ♀ juv. 1700 m. w., daytime, depth 1100 m (Lo Bianco 1903). — Mediterranean without locality (Bovallius). — Our Zool. Museum has specimens from 37°1′ N, 16°51′ E, and from Messina. — (Is not mentioned by Steuer 1913 from the Adriatic). ?*A*.n. sp.?, Chun 1887, see above p. 134.

2. Atlantic. The most important material mentioned in the literature is that taken by the German Plankton-Expedition (Vosseler 1901); it contains 176 spec. (17 ♂ ad., 38 ♂ jun., 4 ♀ ad., 117 ♀ jun.) from 32 hauls. Only 3 hauls contain more than some few specimens: 17, 40 and 47 spec. The localities are as follows: Florida Current 3 st. 41.6° N, 56.3° W, to 37.9° W, 59.1° W, 0 or 0—200 m. Sargasso Sea 11 st.: 37.1° N, 59.9° W; 34.7° N, 62.2° W to 31.2° N, 56.4° W; 31.4° N, 46.6° W; 31.7° N, 42.7° W to 23.7° N, 36° W; 25.6° N, 34.9° W, and 27.8° N, 33.3° W; 0 or 0—400 (200) m. N. Equatorial Current 4 st. 28.9° N, 35° W to 24.6° N, 31° W, 0—400 m. S. Equatorial Current 14 st.: 1.7° N, 17.3° W, to 7.5° S, 20.3° W, and 5.7° S, 26.5° W, to 5.6° N, 4.4° W, 0 to 0—500 m.

The Copenhagen Zoological Museum possesses specimens from the following localities (specimens from the Indian Ocean, see below), seen by Bovallius: 42°50′ N, 46°10′ W; 36°22′ N, 40°48′ W; 36°6′ N, 39°28′ W; 32°16′ N, 38°1′ W; 31°30′ N, 26°20′ W; 31°30′ N, 19° 20′ W; 30°34′ N, 30°50′ W; 30° N, 17°40′ W; 27°53′ N, 23°3′ W; 25°5′ N, 32° W; 25° N, 28° W; 24° N, 32° W; $23^1/_2$° N, $35^1/_2$° W; 21°30′ N, 28° W; 20° N, 36° W; 5°3′ N, 23°15′ W; 0°30′ N, 29° W; 11°50′ S, 8°11′ W; 15°6′ S, 16° W; 15°19′ S, 24°54′ W; 20°14′ S, 1°4′ W; 25°20′ S, 7° E; 26°20′ S, 20° W; 26°30′ S, 4°36′ E; 26°30′ S, 8°20′ E; 26°30′ S, 34°40′ W; 28°40′ S, 10°35′ E; 29° S, 37°23′ W; 29°30′ S, 12° E; 32°30′ S, 15° E; 37°40′ S, 12° E.—

Southern New England (Holmes, Bull. Bur. Fish., Washington, vol. 24, 1904 (1905), p. 465). — Between Tenerife and St. Thomas, West Indies, 5 spec.; 3°10′ N, 14°51′ W, 0—200 fms., 1 spec.; 0°15′ S, 14°25′ W, surf., 1 spec. (Stebbing, "Challenger"). — 19°13′ S, 39°35′ W (near Bahia) (Stewart 1913). — 4 localities $40^1/_2$°—$42^5/_6$° N, 38°53′—45°25′ W, surf., 9—10^{30} pm. (Chevreux 1900).

From these localities it may be seen that the species is very common in the Atlantic between a line from abt. 40° N at America to abt. 43° N. S to E of New Foundland and from there to abt. 35° N at the European side, — and to the South to abt. 38° S.

3. Indian Ocean. The Copenhagen Zoological Museum possesses specimens from the following localities, at all events partly seen by Bovallius: 11°15′ S, 103° 50′ E; 12° S, 103°50′ E; 13° S, 103°20′ E; 27°30′ S, 98° E; 27°40′ S, 58°30′ E; 27° S, 47°50′ E; 28°40′ S, 51°40′ E; 32°40′ S, 55°20′ E; 32°15′—33° S, 58°—$58^1/_2$° E; 33°50′ S, 56° E; 34° S, 36° E; 35° S, 55° E; 38°29′ S, 29°30′ E; 38°20′ S, 30° E; 38°28′ S, 40° E; 28°54′ S, 41°30′ E.

Off Salomon Atoll (abt. 6° S, 72° E), surf., and N of Saya de Malha Bank (abt. 9° S, 60°—62° E), surf. (Walker 1909),

4. Pacific. The Zoological Museum has specimens from the following localities, taken by the "Galatea"-Exped.: China Sea 14°6′ N, 119°21′ E; Yeddo Bay, and Japan without locality.

The "Challenger"-Exped. has taken the species at the following localities: Off Port Jackson, surf., night; between Sidney and Wellington, surf.; between Api (New Hebrides) and Cape York (N. Australia), surf.; 3 times S of Japan $24^3/_4$°—$26^1/_2$° N, 138°—$138^1/_2$° E, surf.; between Japan and Papua, surf., and twice between Honolulu and Japan, surf.

Symbiosis. "*Phrosina macrophthalma*" is found in *Pyrosoma elegans* (Risso, *teste* Carus, Prodromus p. 423); otherwise nothing is known about symbiosis.

2. Genus Phrosina Risso.

Phrosina Stebbing 1888, p. 1424 (lit.). — *P.* Bovallius 1889, p. 421 (lit.).

1. PHROSINA SEMILUNATA Risso (Chart 21).

**Phrosina semilunata* Stebbing 1888, p. 1425 (lit.), Pl. 176. — *P. s.* Bovallius 1889, p. 426 (lit.), Pl. 18 figs. 3—30. — *P. s.* Vosseler 1901, p. 89, Pl. 8 figs. 18—20.

Mediterranean.

St. 10. 15-12-1908. 25 m.w., 5^{00} am., 60 mi.n 1 ♀ 5 mm. — **St. 10.** ibid. 600 m.w., 3^{45} pm., 60 min. 1 ♀ 5 mm. — **St. 12.** 19-12-1908. 65 m.w. 1^{00} pm., 30 min. 1 ♀ 5 mm. — **St. 13.** 19-12-1908. 65 m.w. 8^{50} pm., 60 min., 2 ♀ 10-13 mm. — **St. 26.** 19-1-1909. 25 m.w., 4^{20} am., 120 min. 8 ♀ 6—9 mm. — **St. 26.** ibid. 65 m.w., 0^{15} am., 60 min. 3 ♀ 8—11 mm. — **St. 26.** ibid. 150 m.w., 0^{50} am., 60 min. 1 ♀ 17 mm. — **St. 26.** ibid. 300 m.w., 6^{40} am., 180 min. 2 ♀ 8—11 mm. — **St. 28.** 19-1-1909. 200 m.w., 9^{00} pm., 30 min. 1 ♀ 15 mm. — **St. 28.** ibid. 400 m.w., 6^{40} pm., 30 min. 1 ♀ 13 mm. — **St. 30.** 21-1-1909. 300 m.w., 7^{10} am., 60 min. 1 ♀ 11 mm. — **St. 35.** 28-1-1909. 300 m.w., 9^{40} pm., 120 min. 2 ♀ 9—12 mm. — **St. 36.** 30-1-1909. 65 m.w., 5^{35} am., 60 min. 2 ♀ 5 mm, 2 ♀ 11—14 mm. — **St. 38.** 31-1-1909. 65 m.w., 6^{30} pm., 30 min. 1 ♂ jun. 5 mm. — **St. 39.** 1-2-1909. 300 m.w., 7^{15} am., 60 min. 1 ♀ 7 mm. — **St. 42.** 2-2-1909. 300 m.w., 9^{40} pm., 30 min. 7 spec.: 1 ♂ ad. 7 mm, 1 ♂ jun. 7 mm, 2 ♀ 5 mm, 2 ♀ 8 mm, 1 ♀ 13 mm. — **St. 43.** 3-2-1909. 65 m.w., 6^{15} am., 30 min. 2 ♀ 10—12 mm. — **St. 45.** 7-2-1909. 65 m.w., 0^{15} am., 30 min. 3 ♀ 8—13 mm. — **St. 45.** ibid. 300 m.w., 11^{25} pm., 30 min. 4 ♀: 9, 17, 19, 22 mm. — **St. 46.** 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 1 ♀ 21 mm. — **St. 46.** ibid. 600 m.w., 6^{25} pm., 30 min. 5 spec.: 1 ♂ ad. 6 mm, 4 ♀ 7, 9, 10, 19 mm. — **St. 47.** 10-2-1909. 65 m.w., 10^{20} pm., 30 min. 24 spec.: 1 ♂ jun. 5 mm, 15 ♀ 3—6 mm, 7 ♀ 8—9 mm, 1 ♀ 13 mm. — **St. 47.** ibid. 300 m.w., 11^{05} pm., 30 min. 6 spec.: 3 ♂ jun. 3—4 mm, 3 ♀ 5—8 mm. — **St. 50.** 17-2-1909. 65 m.w., 2^{00} am., 30 min. 1 ♀ 13 mm. — **St. 51.** 18-2-1909. 300 m.w., 0^{50} am., 30 min. 1 ♀ 8 mm. — **St. 52.** 18-2-1909. 300 m.w., 7^{25} am., 30 min. 7 ♀: 1 ♀ 5 mm, 4 ♀ 7 mm, 2 ♀ 10 mm. — **St. 53.** 18-2-1909. 2600 m.w., 5^{15} pm., 90 min. 1 ♀ 4 mm. — **St. 55.** 19-2-1909. 25 m.w., 6^{40} am., 60 min. 3 ♀ 6—11 mm. — **St. 57.** 20-2-1909. 25 m.w., 5^{45} am., 30 min. 2 ♀ 6—9 mm. — **St. 57.** ibid. 200 m.w., 6^{30} am., 30 min. 11 spec.: 1 ♂ jun. 4 mm, 9 ♀ 4—8 mm, 1 ♀ 15 mm. — **St. 58.** 20-2-1909. 65 m.w., 3^{00} pm., 30 min. 7 ♀: 4 ♀ 4 mm, 2 ♀ 6 mm, 1 ♀ 18 mm. — **St. 59.** 21-2-1909. 1200 m.w., 2^{30} am., 60 min. 1 ♀ 17 mm. — **St. 104.** 26-6-1910. 65 m.w., 6^{20} pm., 30 min. 74 spec.: 17 ♂ jun. (3)4 mm, 16 ♂ ad. 5 mm, 25 ♀ 4—5 mm, 9 ♀ 6—7 mm, 7 ♀ 8—14 mm. — **St. 106.** 25-6-1910. 65 m.w., 2^{30} am., 30 min. 10 ♀ 4—5 mm. — **St. 106.** ibid. 300 m.w., 1^{45} am., 30 min. 10 spec.: 2 ♂ jun. 3—4 mm, 8 ♀ 3—5 mm. — **St. 106.** ibid. 1200 m.w., 0^{20} am., 60 min. 1 ♂ ad. 6 mm, 1 ♀ 5 mm. — **St. 107.** 25-6-1910. 65 m.w., 9^{50} am., 15 min. 31 spec.: 5 ♂ ad. 5 mm, 9 ♂ jun. 4 mm, 8 ♀ 3—6 mm, 3 ♀ 7 mm, 6 ♀ 8—14 mm. — **St. 107.** ibid. 2000 m.w., 7^{30} am., 60 min. 1 ♂ jun. 4 mm, 1 ♀ 13 mm. — **St. 108.** 25-6-1910. 300 m.w., 10^{30} pm., 30 min. 15 spec.: 2 ♂ jun. 4 mm, 10 ♀ 4—6 mm, 3 ♀ 8—11 mm. — **St. 108.** ibid. 2000 m.w., 0^{40} am., 60 min. 1 ♂ jun. 5 mm. — **St. 112.** 27-6-1910. 25 m.w., 1^{30} am., 15 min. Abt. 60 spec.: 5 ♂ jun. 4 mm, abt. 50 ♀ 3—4 mm, 3 ♀ 5 mm. — **St. 112.** ibid. 65 m.w., 1^{05} am., 15 min. 1 ♂ jun. 4 mm, 8 ♀ 4 mm. — **St. 112.** ibid. 300 m.w., 0^{15} am., 30 min. 13 spec.: 2 ♂ ad. 7 mm, 3 ♂ jun. 5 mm, 5 ♀ 4—6 mm, 3 ♀ 7—9 mm, 2 ♀ 14—19 mm. — **St. 113.** 28-6-1910. 300 m.w., 3^{25} am., 30 min. 37 spec.: 6 ♂ ad. 5 mm, 3 ♂ jun. 4—5 mm, 6 ♀ 5—6 mm, 12 ♀ 8—9 mm, 9 ♀ 11—13 mm, 1 ♀ 18 mm. — **St. 115.** 29-6-1910. 25 m.w., 1^{40} am., 15 min. 13 spec.: 1 ♂ jun. 4 mm, 2 ♀ 3 mm, 5 ♀ 5 mm, 5 ♀ 6—9 mm. — **St. 115.** ibid. 65 m.w., 1^{20} am., 15 min. 4 spec.: 1 ♂ jun. 4 mm., 3 ♀ 2—3 mm. — **St. 115.** ibid. 300 m.w., 11^{20} pm., 30 min. 6 spec.: 1 ♀ 11 mm, 5 ♂ ad. 5 mm. — **St. 115.** ibid. 2000 m.w., 0^{30} am., 60 min. 1 ♀ 4 mm. — **St. 116.** 30-6-1910. 25 m.w., 3^{00} am., 15 min. 15 ♀ 3—4 mm. — **St. 116.** ibid. 300 m.w., 4^{05} pm., 30 min. 1 ♂ jun. 4 mm, 1 ♀ 4 mm. — **St. 118.** 1-7-1910. 25 m.w., 0^{20} am., 15 min. Abt. 85 spec.: 12 ♂ jun. 3—4 mm, abt. 75 ♀ 3—5 mm. — **St. 118.** ibid. 65 m.w., 11^{35} pm., 30 min. 22 spec.: 1 ♂ ad. 5 mm, 2 ♀ 4 mm, 1 ♀ 5 mm, 10 ♀ 7—8 mm, 8 ♀ 10—13 mm. — **St. 118.** ibid. 300 m.w., 10^{55} pm., 30 min. 8 spec.: 1 ♂ ad. 5 mm, 5 ♀ 4—5 mm, 1 ♀ 11 mm, 1 ♀ 30 mm. — **St. 120.** 1-7-1910. 300 m.w., 8^{50} pm., 30 min. 5 spec.: 4 ♂ (1 jun., 3 ad.) 5 mm, 1 ♀ 5 mm. — **St. 121.** 2-7-1910. 25 m.w., 3^{35} am., 30 min. 12 spec.: 1 ♂ ad. 5 mm, 3 ♂ jun. 4 mm, 7 ♀ 3—5 mm, 1 ♀ 7 mm. — **St. 122.** 2-7-1910. 600 m.w., 10^{00} am., 60 min. 1 ♂ ad. 5 mm. — **St. 122.** ibid. 1200 m.w., 5^{30} pm., 60 min. 2 spec.: 1 ♂ ad. 5 mm, 1 ♀ 4 mm. — **St. 123.** 3-7-1910. 10 m.w., 2^{30} am., 15 min. 2 ♀ 5—6 mm. — **St. 123.** ibid. 25 m.w., 1^{50} am., 15 min. Abt. 60 spec.: 5 ♂ ad. 5 mm, 9 ♂ jun. 4 mm, abt. 40 ♀ 3—4 mm, 7 ♀ 7—8 mm. — **St. 123.** ibid. 65 m.w., 0^{55} am., 30 min. Abt. 450 spec.: 5 ♂ ad. 6 mm, abt. 30 ♂ jun. 4—5 mm, abt. 400 ♀ 3—7 mm, 20 ♀ 8—10 mm. — **St. 123.** ibid. 300 m.w., 0^{05} am., 30 min. 18 spec.: 9 ♂ ad. 5—6 mm, 8 ♀ 4—5 mm, 1 ♀ abt. 10 mm (defective). — **St. 125.** 9-7-1910. 25 m.w., 10^{30} pm., 30 min. 14 spec.: 5 ♂ ad. 5—6 mm, 2 ♂ jun. 4 mm, 6 ♀ 6—7 mm, 1 ♀ 9 mm. — **St. 125.** ibid. 300 m.w., 9^{45} pm., 30 min. 3 spec.: 1 ♂ ad. 6 mm, 1 ♂ jun. 4 mm, 1 ♀ 5 mm. — **St. 126.** 10-7-1910. 25 m.w., 10^{10} pm., 30 min. 1 ♀ 5 mm. — **St. 126.** ibid. 300 m.w., 9^{30} pm., 30 min. 2 spec.: 1 ♂ ad. 6 mm, 1 ♀ 5 mm. — **St. 129.** 12-7-1910. 25 m.w., 3^{00} am., 30 min. Abt. 100 spec.: abt. 90 ♀ 3—4 mm, abt. 10 ♂ jun. 4 mm. — **St. 129.** ibid. 300 m.w., 3^{40} am., 30 min. 6 spec.: 2 ♂ ad. 6 mm, 4 ♀ 4—6 mm. — **St. 129.** ibid. 600 m.w., 8^{00} pm., 30 min. 7 spec.: 1 ♂ ad. 6 mm, 6 ♀ 3—6 mm. — **St. 129.** ibid. 1000 m.w., 4^{20} am., 60 min. 6 ♀ 3—8 mm. — **St. 129.** ibid. 3500 m.w., 3^{00} pm., 120 min. 3 spec. 5 mm: 1 ♂ ad., 2 ♀. — **St. 130.** 13-7-1910. 0^{50} am., 25 m.w., 30 min. 69 spec. 3—5 mm: 2 ♂ ad. 5 mm, 14 ♂ jun., 53 ♀. — **St. 131.** 13-7-1910. 300 m.w., 10^{35} am., 30 min. 11 spec.: 1 ♂ ad. 5 mm, 1 ♂ jun. 4 mm, 5 ♀ 3 mm, 2 ♀ 4—5 mm, 2 ♀ 6—8 mm. — **St. 131.** ibid. 1000 m.w., 11^{40} am., 60 min. 1 ♂ 5 mm. — **St. 132.** 14-7-1910. 25 m.w., 3^{05} am., 30 min. 10 ♀ 3 mm. — **St. 132.** ibid. 300 m.w., 3^{45} am., 30 min. 6 spec.: 2 ♂ ad. 5 mm, 2 ♂ jun. 4 mm, 2 ♀ 9—10 mm. — **St. 132.** ibid. 600 m.w., 4^{50} am., 30 min. 3 spec.: 2 ♂ jun. 4 mm, 1 ♂ ad. 6 mm. —

St. 133. 14-7-1910. 25 m.w., 11^{00} pm., 30 min. 6 spec.: 1 ♂ jun. 2 mm, 5 ♀ 2—4 mm. — **St. 133.** ibid. 300 m.w., 10^{15} pm., 30 min. 10 spec.: 1 ♂ ad. 6 mm, 2 ♂ jun. 4 mm, 6 ♀ 4—6 mm, 1 ♀ 9 mm. — **St. 133.** ibid. 600 m.w., 9^{20} pm., 30 min. 2 ♀ 6 mm. — **St. 134.** 15-7-1910. 25 m.w., 4^{50} am., 30 min. 10 spec.: 2 ♂ jun. 3—4 mm, 8 ♀ 3—6 mm. — **St. 134.** ibid. 300 m.w., 5^{40} am., 30 min. 7 spec.: 1 ♂ ad. 6 mm, 2 ♂ jun. 3—4 mm, 2 ♀ 3—5 mm, 2 ♀ 10—12 mm. — **St. 135.** 16-7-1910. 25 m.w., 12^{05} am., 30 min. 6 spec.: 1 ♂ jun. 4 mm, 5 ♀ 5—6 mm. — **St. 137.** 19-7-1910. 25 m.w., 8^{15} am., 30 min. 5 ♀ 2—5 mm. — **St. 137.** ibid. 250 m.w., 9^{05} am., 30 min. 7 spec.: 5 ♂ ad. 6 mm, 2 ♀ 3—10 mm. — **St. 138.** 19-7-1910. 25 m.w., 9^{50} pm., 30 min. 1 ♂ jun. 4 mm, 3 ♀ 3—4 mm. — **St. 138.** ibid. 300 m.w., 9^{10} pm., 30 min. 64 spec.: 1 ♂ ad 6 mm, 10 ♂ jun. 4—5 mm. 51 ♀ 3—6 mm, 2 ♀ 9 mm. — **St. 138.** ibid. 1000 m.w., 7^{40} pm., 60 min. 8 spec.: 1 ♂ ad. 5 mm, 1 ♂ jun. 4 mm, 6 ♀ 3—5 mm. — **St. 139.** 20-7-1910. 1^{40} am., 25 m.w., 30 min. 2 ♂ jun. 5 mm. **St. 141.** 20-7-1910. 25 m.w., 10^{35} pm., 15 min. 1 ♀ 5 mm. — **St. 142.** 22-7-1910. 25 m.w., 2^{50} am., 30 min. 1 ♂ jun. 4 mm, 2 ♀ 3 mm. — **St. 142.** ibid. 150 m.w., 3^{40} am., 30 min. 5 spec.: 1 ♂ ad. 15 mm, 3 ♂ jun. 3—4 mm, 1 ♀ 3 mm. — **St. 143.** 23-7-1910. 25 m.w., 1^{20} am., 30 min. 35 spec.: 2 ♂ ad. 5 mm, 3 ♂ jun. 4 mm, 17 ♀ 3—7 mm, 13 ♀ 8—14 mm. — **St. 143.** ibid. 300 m.w., 0^{30} am., 30 min. 2 ♂ ad. 4—5 mm, 1 ♀ 17 mm. — **St. 143.** ibid. 1000 m.w., 2^{00} am., 60 min. 1 ♀ 14 mm. — **St. 144.** 24-7-1910. 25 m.w., 2^{00} am., 30 min. 2 ♀ 3—4 mm. — **St. 145.** 25-7-1910. 300 m.w., 4^{10} am., 30 min. 2 ♀ 4—5 mm. — **St. 147.** 25-7-1910. 25 m.w., 11^{35} pm., 30 min. 35 spec.: 6 ♂ jun. 4 mm, 23 ♀ 3—6 mm, 5 ♀ 7—8 mm, 1 ♀ 10 mm. — **St. 147.** ibid. 1000 m.w., 1^{10} am., 60 min. 3 spec.: 1 ♂ ad. 6 mm, 1 ♂ jun. 4 mm., 1 ♀ 3 mm. — **St. 147.** ibid. 300 m.w., 0^{20} am., 30 min. 8 spec.: 1 ♂ jun. 4 mm, 4 ♀ 4—6 mm, 3 ♀ 8—13 mm. — **St. 152.** 300 m.w., 11^{35} pm., 30 min. 4 spec.: 3 ♂ ad. 6 mm, 1 ♀ 10 mm. — **St. 132.** ibid. 1000 m.w., 0^{30} am., 60 min. 2 ♂ ad. 6 mm. — **St. 156.** 30-7-1910. 25 m.w., 2^{15} am., 30 min. 11 spec.: 5 ♂ jun. 4—5 mm, 6 ♀ 3—6 mm. — **St. 156.** ibid. 300 m.w., 3^{50} am., 30 min. 1 ♀ 3 mm. — **St. 156.** ibid. 600 m.w., 3^{00} am., 30 min. 1 ♀ 27 mm (with embryos). — **St. 156.** ibid. 1000 m.w., 0^{40} am., 60 min. 2 ♂ ad. 5 mm. — **St. 158.** 31-7-1910. 300 m.w., 7^{30} am., 30 min. 6 spec.: 5 ♀ 5—6 mm, 1 ♀ 9 mm. — **St. 160.** 1-8-1910. 25 m.w., 2^{00} am., 30 min. 5 spec.: 1 ♂ 5 mm., 4 ♀ 3—6 mm. — **St. 160.** ibid. 300 m.w., 2^{45} am., 30 min. 8 spec.: 1 ♂ ad. 5 mm, 2 ♂ jun. 4 mm, 2 ♀ 5—6 mm, 1 ♀ with embryos 21 mm, 2 ♀ 16 mm. — **St. 160.** ibid. 1000 m.w., 3^{35} am., 60 min. 6 spec.: 3 ♂ ad. 5 mm, 2 ♂ jun. 4 mm, 1 ♀ 6 mm. — **St. 160.** ibid. 4000 m.w., 3^{30} pm., 60 min. 4 spec.: 1 ♂ ad. 5 mm, 2 ♀ 4 mm, 1 ♀ 9 mm. — **St. 161.** 2-8-1910. 25 m.w., 3^{00} am., 30 min. 19 spec.: 2 ♂ ad. 5 mm, 3 ♂ jun. 4 mm, 13 ♀ 3—5 mm, 1 ♀ 7 mm. — **St. 163.** 3-8-1910. 25 m.w., 1^{35} am., 15 min. 1 ♀ 3 mm. — **St. 163.** ibid. 300 m.w., 1^{05} am., 15 min. 2 ♀ 5—13 mm. — **St. 163.** ibid. 1000 m.w. 0^{05} am., 30 min. 1 ♂ 5 mm. — **St. 179.** 13-8-1910. 65 m.w., 2^{15} am., 30 min. 5 spec.: 1 ♂ ad. 5 mm, 3 ♀ 3—4 mm, 1 ♀ 15 mm. — **St. 181.** 13-8-1910. 65 m.w., 2^{55} pm., 15 min. 2 ♀ 7 mm. — **St. 182.** 13-8-1910. 10 m.w., 10^{00} pm., 15 min. 2 ♀ 4—6 mm. — **St. 182.** ibid. 65 m.w., 10^{30} pm., 15 min. 2 ♂ jun. 4 mm. — **St. 182.** ibid. 600 m.w., 11^{40} pm., 30 min. 5 spec.: 2 ♂ ad. 5 mm, 1 ♂ jun. 3 mm, 2 ♀ 5—7 mm. — **St. 192.** 28-8-1910. 25 m.w., 9^{40} pm., 15 min. 1 ♀ 3 mm. — **St. 192.** ibid. 300 m.w., 10^{10} pm., 15 min. 1 ♂ jun. 4 mm. — **St. 192.** ibid. 600 m.w., 10^{50} pm., 30 min. 4 ♂: 3 ♂ ad. 6 mm, 1 ♂ jun. 4 mm. — **St. 193.** 21-8-1910. 10 m.w., 0^{50} am., 30 min. 9 spec.: 2 ♂ jun. 3—4 mm, 5 ♀ 4—5 mm, 2 ♀ 7 mm. — **St. 194**: 21-8-1910. 25 m.w., 5^{00} am., 15 min. 9 spec.: 4 ♂ jun. 2—3 mm, 4 ♀ 3 mm, 1 ♀ 8 mm. — **St. 194.** ibid. 1200 m.w., 6^{00} am., 30 min. 1 ♂ jun. 3 mm. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 2 ♀ 3—4 mm. — **St. 196.** 22-8-1910. 25 m.w., 2^{40} am., 30 min. 2 ♂ jun. 3—4 mm. — **St. 197.** 24-8-1910. 25 m.w., 7^{45} pm., 15 min. 14 spec.: 8 ♂ jun. 3—4 mm, 6 ♀ 3—4 mm. — **St. 199.** 28-8-1910. 300 m.w., 9^{25} pm., 20 min. 4 spec.: 1 ♂ ad. 5 mm, 3 ♀ 5, 8, 5 mm. — **St. 200.** 26-8-1910. 25 m.w., 3^{45} am., 30 min. 3 ♀ 6 mm. — **St. 202.** 26-8-1910. 300 m.w., 5^{05} pm., 15 min. 1 ♀ 5 mm. — **St. 204.** 27-8-1910. 25 m.w., 4^{00} am., 15 min. 30 spec.: 1 ♂ ad. 5 mm, 4 ♂ jun. 3—4 mm, 13 ♀ 6—10 mm, 12 ♀ 3—5 mm. — **St. 204.** ibid. 65 m.w., 4^{30} am., 15 min. 1 ♂ jun. 4 mm, 2 ♀ 5—9 mm. — **St. 205.** 27-8-1910. 25 m.w., 7^{35} pm., 15 min. 13 spec.: 4 ♂ jun. 4 mm, 7 ♀ 3—4 mm, 2 ♀ 7 mm. — **St. 206.** 28-8-1910. 300 m.w., 1^{05} am., 15 min. 15 spec.: 8 ♂ ad. 5—6 mm, 2 ♂ jun. 4—5 mm, 5 ♀ 4—6 mm. — **St. 206.** ibid. 1000 m.w., 1^{40} am., 45 min. 4 spec.: 1 ♂ ad. 5 mm, 3 ♀ 4—8 mm. — **St. 206.** ibid. 2000 m.w. 3^{05} am., 45 min. 2 spec.: 1 ♂ ad. 5 mm, 1 ♂ jun. 4 mm. — **St. 207.** 28-8-1910. 25 m.w., 8^{40} pm., 15 min. 2 spec.: 1 ♂ jun. 4 mm, 1 ♀ 4 mm. — **St. 207.** ibid. 65 m.w., 9^{20} pm., 15 min. 1 ♀ 3 mm. — **St. 207.** ibid. 1000 m.w., 6^{00} am., 45 min. 3 ♂ ad. 5—6 mm. — **St. 208.** 29-8-1910. Surf. (P. 100), 1^{45} pm., 10 min. 1 ♂ jun. 4 mm. — **St. 208.** ibid. 25 m.w., 1^{40} am., 15 min. 7 spec.: 3 ♂ jun. 3—4 mm, 4 ♀ 3—7 mm. — **St. 209.** 29-8-1910. Surf. (P. 100), 5^{00} am., 10 min. 1 ♀ 4 mm. — **St. 209.** ibid. 25 m.w., 4^{55} am., 15 min. 36 spec.: 11 ♂ jun. 3—5 mm, 18 ♀ 3—4 mm, 7 ♀ 5—7 mm. — **St. 209.** ibid. Vertic. 35—0 m, 5^{35} pm. 1 ♀ 2 mm. — **St. 209.** ibid. Vertic. 75—35 m. 4^{10} pm. 3 ♀ 1—2 mm. — **St. 209.** ibid. 100 m.w., 3^{45} pm., 20 min. 8 spec.: 5 ♂ jun. 3—4 mm, 3 ♀ 2—6 mm. — **St. 209.** ibid. 150 m.w., 4^{25} pm., 20 min. 30 spec.: 10 ♂ jun. 3—4 mm, 18 ♀ 3 mm, 2 ♀ 7 mm. — **St. 209.** ibid. 300 m.w., 5^{25} am., 15 min. 5 spec.: 1 ♂ ad. 6 mm, 3 ♂ jun. 4 mm, 1 ♀ 2 mm. — **St. 209.** ibid. 2000 m.w., 7^{25} am., 45 min. 13 spec.: 5 ♂ ad. 6 mm, 3 ♂ jun. 4 mm, 5 ♀ 2—4 mm. — **St. 210.** 30-8-1910. 25 m.w., 2^{45} am., 30 min. 3 spec.: 1 ♂ jun. 3 mm, 2 ♀ 2—4 mm. — **St. 210.** ibid. 600 m.w., 3^{35} am., 30 min. 12 spec.: 2 ♂ ad. 6 mm, 8 ♀ 3—8 mm, 2 ♀ 9—13(?) mm. — **St. 216.** 1-9-1910. 25 m.w., 5^{10} am., 30 min. 4 spec.: 1 ♂ jun. 4 mm, 1 ♀ 3 mm, 2 ♀ 5 mm. — **St. 217.** 1-9-1910. 300 m.w., 1^{40} pm., 30 min. 9 spec.: 2 ♂ ad. 5—6 mm, 3 ♂ jun. 4 mm, 2 ♀ 3 mm, 2 ♀ 7—14 mm. — **St. 218.** 2-9-1910. 300 m.w., 2^{45} am., 30 min. 1 ♀ 15 mm(?). — **St. 222.** 4-9-1910. 300 m.w., 11^{20} pm., 30 min. 10 spec.: 4 ♂ ad. 6 mm, 5 ♀ 8—12 mm, 1 ♀ with ova 22 mm. — **St. 223.** 5-9-1910. 25 m.w., 4^{35} am., 15 min. 2 spec.: 1 ♂ jun. 4 mm, 1 ♀ 5 mm. — **St. 223.** ibid. 300 m.w., 4^{35} am., 30 min. 2 ♀ 11—25 mm. — **St. 224.** 5-9-1910. 300 m.w., 7^{20} pm., 30 min. 11 spec.: 4 ♂ jun. 4 mm, 4 ♀ 3—5 mm, 1 ♀ 7 mm, 2 ♀ 12—18 mm. — **St. 225.** 6-9-1910. 25 m.w., 3^{30} am., 15 min. 12 ♀ 4—5 mm. — **St. 227.** 6-9-1910. 25 m.w., 5^{55} pm., 30 min. 1 ♀ 5 mm. — **St. 228.** 7-9-1910. 300 m.w., 1^{55} am., 30 min. 1 ♀ 25 mm. — **St. 275.** 39°5′ N, 14°50′ E. 3-4-1911. 94 m.w. (S. 200), 8^{30} pm., 30 min. 3 spec.: 2 ♂ jun. 3—4 mm, 1 ♀ 5(?) mm. — **St. 276.** 36°30′ N, 19°20′ E. 4-4-1911. 132 m.w. (S. 200). 11^{20} pm., 35 min. 14 spec.: 5 ♂ jun. 4 mm, 8 ♀ 3—5 mm, 1 ♀ 8 mm. — **St. 277.** 33°20′ N, 27°30′ E. 6-4-1911. 132 m.w. (S. 200), 11^{00} pm., 35 min. 1 ♀ 8 mm. — **St. 279.** 38°11.5′ N, 15°36.5′ E. 23-2-1911. 30 m.w

(S. 100), 7^{00} pm., 150 min. 2 ♀ 2—6 mm. — **St. 281.** 38°15′ N, 15°37.5′ E. 1-3-1911. 10 m.w. (S. 100), 4^{55} pm., 120 min. 2 ♀ 2—3 mm. — **St. 281.** ibid. 40 m.w. (S. 100), 6^{10} pm., 120 min. 2 ♀ 5 mm. — **St. 281.** ibid. 5 m. 30 m.w. (S. 100), 3^{45} pm. 120 min. 3 spec.: 1 ♂ ad. 6 mm, 2 ♀ 2—3 mm. — **St. 281.** ibid. 200 m. 40 m.w. (S. 100), 7^{50} pm. 120 min. 6 spec.: 1 ♂ ad. 4 mm, 5 ♀ 3—4 mm. — **St. 282.** 38°12′ N, 15°37′ E. 9-3-1911. 40 m.w. (S. 100), 2^{00} am., 60 min. 6 spec.: 1 ♂ jun. 4 mm, 5 ♀ 3—8 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 10^{45} pm., 180 min. 8 spec.: 2 ♂ jun. 2—4 mm, 3 ♀ 2 mm, 2 ♀ 3—4 mm, 1 ♀ 8 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 9^{00} pm., 90 min. 6 spec.: 1 ♂ jun. 2 mm, 3 ♀ 3 mm, 2 ♀ 4—8 mm. — **St. 282.** ibid. 40 m.w. (S. 100), 7^{15} pm., 90 min. 5 spec.: 1 ♂ jun. 2 mm, 3 ♀ 2—4 mm, 1 ♀ 9 mm. — **St. 283.** 38°12′ N, 15°37′ E. 13-3-1911. 40 m.w., 9^{45} pm., 180 min. 7 spec. 4 ♂ jun. 2—4 mm, 3 ♀ 4—6 mm. — **St. 283.** ibid. 40 m.w. (S. 100), 6^{30} pm., 180 min. 14 spec.: 3 ♂ 3—4 mm, 9 ♀ 2—5 mm, 2 ♀ 6—7 mm. — **St. 298.** 33°10′ N, 25°35′ E. 25-6-1911. 28 m.w. (S. 200), 11^{30} pm., 30 min. Abt. 175 spec.: abt. 25 ♂ jun. 3—4 mm, abt. 150 ♀ 2—4 mm, 4 ♀ 6 mm. — **St. 298.** ibid. 38 m.w. (S. 200), 11^{30} pm., 30 min. 63 spec.: 21 ♂ jun. 3—4mm, 42 ♀ 3—5 mm. — **St. 340.** 35°50′ N, 21°30′ E. 26-8-1911. 108 m.w. (S. 150), 9^{00} pm., 30 min. 2 ♀ 3—5 mm. — **St. 384.** 32°50′ N, 27°10′ E. 7-7-1911. 122 m.w. (S 150), 8^{30} pm., 30 min. 1 ♀ 6 mm. — **St. 385.** 35°10′ N, 18°10′ E. 9-11-1911 122 m.w. (S. 150), 8^{30} pm., 30 min. 24 spec.: 8 ♂ jun. 3—4 mm, 12 ♀ 3 mm, 4 ♀ 4 mm. — **St. 410.** 37°12′ N, 1°18′ W. 29-12-1911. 112 m.w. (S 150), 7^{00} pm. 1 ♀ 6 mm. — **St. 412.** 34°33′ N, 24°15′ E. 7-1-1912. 112 m.w. (S. 150). 6^{30} pm., 30 min. 2 spec. 2 mm: 1 ♂ jun., 1 ♀. — **St. 729.** 41°00′ N, 17°44′ E. 14-4-1913. 49 spec.: 4 ♂ ad. 5—6 mm., 10 ♂ jun. 4 mm, 24 ♀ 3—5 mm, 11 ♀ 8—10 mm. — **St. 730.** 38°26′ N, 13°37′ E. 16-4-1913. 7 spec.: 4 ♂ jun. 3 mm, 3 ♀ 3 mm. — **St. 731.** 37°19′ N, 1°31′ E. 19-4-1913. 2^{30} pm. 22 spec.: 6 ♂ jun. 4 mm, 13 ♀ 2—4 mm, 2 ♀ 6—7 mm, 1 ♀ 9 mm. — **St. 698.** 37°20′ N, 9°25′ E. 25-2-1913. 5^{00} am. 1 ♀ 7 mm.

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St. 65. 24-2-1909. 25 m.w., 5^{50} am., 30 min. 3 spec.: 1 ♂ ad. 6 mm, 2 ♀ 8—9 mm. — **St. 65.** ibid. 65 m.w., 6^{30} pm., 60 min. 3 ♀: 9, 12, 18 mm. — **St. 65.** ibid. 300 m.w., 7^{45} am., 120 min. 1 ♀ with ova 18 mm. — **St. 65.** ibid. 600 m.w., 10^{00} am., 120 min. 1 ♀ with embr. 23 mm. — **St. 65.** ibid. 1600 m.w., 0^{30} pm., 120 min. 3 ♀: 2 ♀ 9—14 mm, 1 ♀ with ova 19 mm. — **St. 66.** 25-2-1909. 1200 m.w., 8^{30} am., 120 min. 2 ♀ with ova 18 mm. — **St. 69.** 28-2-1909. 65 m.w., 10^{45} pm., 30 min. 15 spec.: 12 ♀ 4—7 mm, 2 ♀ 8 mm, 1 ♀ 10 mm. — **St. 69.** ibid. 300 m.w., 11^{40} pm., 30 min. 14 spec.: 7 ♀ 16—18 mm, 3 ♀ 19—22 mm, 4 ♀ with ova or embryos 18—22 mm. — **St. 69.** ibid. 600 m.w., 9^{00} pm., 60 min. 12 spec.: 3 ♂ ad. 6 mm, 1 ♂ jun. 4 mm, 8 ♀ 4—7 mm. — **St. 91.** 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 1 ♀ 4 mm. — **St. 263.** 39°22′ N, 22°49′ W. 20-3-1911. 47 m.w. (S. 100), 7^{00} pm., 30 min. 2 ♂ jun. 4 mm. — **St. 264.** 38°14′ N, 24°35′ W. 19-3-1911. 47 m.w. (S. 100), 7^{00} pm., 30 min. 1 ♀ 4 mm. — **St. 266.** 40°47′ N, 21°10′ W. 20-3-1911. 47 m.w. (S. 100), 7^{00} pm., 30 min. 2 spec. 4 mm: 1 ♂ jun., 1 ♀. — **St. 376.** 34°41′ N, 16°14′ W. 22-7-1911. 15 m.w. (S. 200), 8^{15} pm., 30 min. 23 spec.: 8 ♂ jun. 3—4 mm, 15 ♀ 3—4 mm. — **St. 376.** ibid. 30 m.w. (S. 100), 8^{10} pm., 30 min. 11 spec.: 2 ♂ jun. 3 mm, 9 ♀ 3—5 mm. — **St. 377.** 31°23′ N, 18°18′ W. 23-7-1911. 15 m.w. (S. 200). 1 ♀ 4 mm. — **St. 382.** 34°12′ N, 16°24′ W. 23-10-1911. 22 m.w. (S. 100), 6^{05} pm., 30 min. 8 spec.: 3 ♂ jun. 4 mm, 5 ♀ 4 mm. — **St. 383.** 37°16′ N, 14°09′ W. 23-10-1911. 30 m.w. (S. 100). 6^{05} pm., 30 min. 12 spec.: 2 ♂ jun. 3 mm, 10 ♀ 4—6 mm. — **St. 398.** 36°48′ N, 14°22′ W. 26-10-1911. Surf. (S. 200), 12^{40} am., 30 min. 1 ♀ 4 mm. — **St. 399.** 34°23′ N, 15°31′ W. 26-10-1911. Surf. (S. 200), 9^{10} pm., 30 min. 3 spec.: 1 ♂ 3 mm, 2 ♀ 2 mm. — **St. 400.** 32°10′ N, 17°20′ W. 30-10-1911. Surf. (S. 200), 9^{35} pm., 30 min. 6 spec.: 3 ♂ jun. 3 mm, 3 ♀ 2—3 mm.

The material contains in all 2484 spec. (517 ♂, 1967 ♀) from 119 stations, 207 hauls; by far the greater number of specimens were taken in the Mediterranean.

A. Mediterranean.

	No. of stations	No. of hauls	No. of specimens					Average no. of spec. pr. haul
			♂ ad.	♂ jun.	♀ without ova or embryos	♀ with ova	total	
"Thor" Dec. 1908	3	4	—	—	5	—	5	1.3
Jan. 1909	6	10	—	1	23	—	24	2.4
Feb. —	14	18	1	6	79	—	86	4.8
June 1910	8	18	35	47	224	—	306	17.0
July —	26	55	62	125	986	1	1174	21.4
Aug. —	22	46	38	77	192	1	308	6.7
Sept. —	9	10	6	9	27	1	43	4.3
"Thor" total....	88	161	142	265	1536	3	1946	
other vessels	17	25	6	81	327	—	414	
total ...	105	186	148	346	1863	3	2360	

From the table it appears that there are 105 stations, 186 hauls, yielding in all 2360 spec. On an average, the summer hauls yielded much greater numbers than the winter hauls.

No other species was taken by the "Thor" Exp. at such a great number of stations and in so many hauls; *Phronima sedentaria* comes second to it.

Depth of the sea and occurrence.

m.	"Thor" 1908—10.		
	No. of posit. st.	Total no. of st. of the "Thor"	Percentage of posit. st.
0— 500	17	67	22.1 %
> 500—1000	18	31	58.1 —
> 1000—2000	27	41	65.8 —
> 2000—3000	21	35	60.0 —
> 3000	5	10	50.0 —
total ...	88	184	

The species is thus almost only found at depths > 500 m. The 17 stations with depth < 500 m, have the following depths: 64, 75, > 75, 85 (3 st.), 98, 99, > 100, 105, 175—195, 200 (2 st.), 250 (2 st.), 350, 480 m.

As appears from Chart 21, the species is to be found over the whole of the Mediterranean; it even penetrates into the Adriatic, and is encountered as far as the mouth of the Dardanelles, but the stations are not evenly distributed in the two basins.

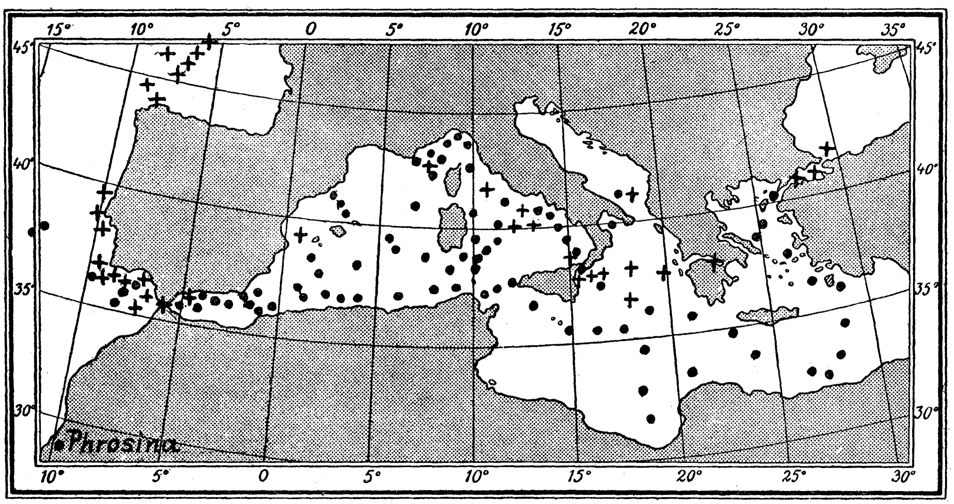

Chart 21. *Phrosina semilunata.* ● positive stations, + negative stations ($>$500 m, night, 10—250 mw). In the Mediterranean several stations lie so close to each other that it was impossible to note them all. In the Atlantic st. 263 264, 266, 376, 377, 382, 399, 400 lie outside the chart to the West.

	Stations with depth $>$ 500 m.		
	Posit. st.	Total no. of st. of the "Thor"	Percentage of posit. st.
Western basin	56	83	67.5 %
Eastern —	15	34	44.1 %

Taking, as the table shows, only stations with a depth > 500 m there are thus $1^1/_2$ times as many per cent. of positive stations in the western as in the eastern basin.

Vertical occurrence. The species was taken in abt. 52 per cent. of all the night hauls ("Thor" 1908—10, depth > 500 m: 106 hauls out of 203), in abt. 38 per cent. of the day hauls (24 out of 64).

During the day, it was not taken nearer to the surface than with 50 m. w., but during the night almost exclusively with 10—35 m. w. (see the table). (According to Steuer (1913, fig. 14 p. 567) it only decreases very little in numbers with increasing depths).

m. w.	"Thor" 1908—10, $>$ 500 m, night.		
	No. of spec. (normal hauls of 30 min.)	No. of posit. hauls	Average no. per normal haul (of 30 min.)
10— 35...........	abt. 1400	35	40
50—100...........	— 75	13	6
130—250...........	— 2	2	1

It may occur in large shoals, up to 450 spec. reckoned as normal hauls (of 30 min.); but as a rule only few specimens are taken at a time.

It is most numerous during the summer; at any rate there are the greatest number of shoals at that time of the year. Of the 32 winter hauls only 2 i. e.: 6.3 per cent. yielded more than 10 spec. (reckoned as normal hauls) *viz.* 11 and 24 spec. whereas 33 of the 129 summer hauls (1910) or 25.5 per cent. yielded 10 or more specimens per haul. True, the largest shoals during the summer are small, 10—50 spec.; the largest figures are the following (normal hauls): 69, 72, 74, 100, 120 (2 times), 170, 450. Curiously enough, there does not seem to be any essential difference between the number of individuals per haul in the two basins.

Size. In the Mediterranean, the "Thor" has taken about 4 times as many females as males: 494 ♂ (148 ad., 346 juv.), 1866 ♀.

♂ ad. The most common size is 5—6 mm, especially 6 mm; some few are 3—4 or 7 mm. Though the "Thor" took over 100 ♀ during the winter, there are only 1 ♂ ad. and 7 ♂ juv.; all the others were taken during the summer (June—Sept.); so it seems evident that ♂ ad. dies out during the autumn.

♂ jun. Most of them are 3—4 mm, a few 5 mm, one single specimen 7 mm.

♀ with ova or embryos. The "Thor" has only taken 3 spec. 21, 22, 27 mm in June—Sept. Lo Bianco (1904, p. 44) records that during the winter and spring, though but rarely, very large specimens may be found at Naples, but he does not say, whether they carry ova or not.

♀ without ova. 1863 specimens found both during winter and summer. The size varies from 2—30 mm, but most of the specimens are 2—10 mm.

Of the quite small specimens (2—4 mm) none have been found in Dec. and Jan.; in Feb. 16 were taken (of 79 ♀ in all) i. e. about 20 per cent., whereas in June—August they make about 50 per cent. of the entire number of females, which points towards their having been spawned at this time of the year; this agrees well with the fact that the only ovigerous females were taken during the summer. Only few females are over 8—10 mm, the numbers decreasing greatly with increasing size, but large specimens have been found, both winter and summer.

The propagation of the species is very difficult to explain from the material available. As ♂ ad. and quite small ♀ have, practically speaking, only been found during the summer, one would think that this was the season of propagation for the species; but in the Mediterranean, only 3 ♀ with ova or embryos were found, though all the larger females were carefully examined in this respect. A proportionally much greater quantity of females with ova or embryos was taken by the "Thor" in the Bay of Cadiz (see below) so that one might imagine that the small individuals were not born in the Mediterranean, but outside in the Atlantic; a further point in favour of this is, that all the ovigerous females in the Atlantic were taken at the end of February, so that in all probability it is the young from these ova which are to be found during summer in the Mediterranean.

B. Atlantic.

	stations	hauls	spec.
"Thor" Febr. 1910...	3	9	51
June — ...	1	1	1
"Thor" total	4	10	52
other vessels	10	11	72
total	14	21	124

The material from the Atlantic thus comprises 124 spec. (1 ♂ ad., 22 ♂ juv., 101 ♀) from 14 stations, 21 hauls.

The results agree quite well with those from the Mediterranean, with the exception that females with ova are proportionally much more numerous; of the 101 ♀, 9 have ova or embryos; the size is 18—23 mm and curiously enough, all were taken with at least 300 m. w. and only at the end of Feb. (in the Mediterranean June—Aug.). The species was only taken south of 40° N; the 18 negative stations (night 0—250 m. w., > 500 m) lie from the Bay of Cadiz to about 47° N.

Distribution.

Bovallius (Monograph) gives the distribution as Atlantic, Mediterranean, Indian Ocean and Pacific, without special localities.

1. Mediterranean. The enormous abundancy and large distribution of the species does not appear from the literature. In existing literature I have not been able to find more than the following localities. Nice (Risso). — Nice, Capri, Messina (Vosseler, in Lo Bianco 1902, 1903). — Lo Bianco (1903—04) regards it as belonging to Panteplankton (cf. Steuer 1913, fig. p. 567), and 1904, p. 44 he enumerates 12 spec. taken at day time (April) in 6 hauls, 500 or 1500 m. w. at Capri. Vosseler (in Lo Bianco 1903—04, p. 278) enumerates 106 spec. from 25 hauls (out of 43 hauls taken by the expedition in all). — Ragusa, 1 spec. 2.6 mm (Steuer 1911). — Adriatic, 0—900 m (Steuer 1913, p. 567). — Pesta (1920, p. 29) mentions 1 ♀ from the Adriatic, 42°11.3′ N, 17°47′ E, surf. — Our Zool. Museum has ancient specimens from Messina.

2. Atlantic. As will be shown by the following list the species is chiefly taken between 40° N and 7° S, but it is found as far as Cape of Good Hope. N. of 40° N only single specimens are found (see below), and off the European coasts it seems only to be found accidentally. — 50 miles W$^3/_4$N of Tearaght, Co. Kerry (Ireland), 350 fms., Febr. 1906, surf., 1 ♀ (Tattersall 1906). — The Copenhagen Zoological Museum has, from ancient time, a very great material at all events partly determined by Bovallius (Monograph), from the following localities in the Atlantic (as to a material from the Indian Ocean, see below): 46° N, 20° W; 43°23′ N, 11°25′ W; 44° N, 43° W; 43° N, 44°16′ W; 42°50′ N, 46°10′ W; 42° N, 46° W; 40°30′ N, 34°30′ W; 39°30′ N, 50° W; 37°50′ N, 51° W; 34°10′ N, 42°10′ W; 36°22′ N, 40°48′ W; 31°30′ N, 21°16′ W; 31° N, 40° W; 30°34′ N, 30°50′ W; 30° N, 17°40′ W; 29° N, 20° W; 33°—28° N, 60°—64° W; 27°53′ N, 25°3′ W; 23°30′ N, 35°30′ W; 22° N, 20° W; 21° N, 36°30′ W; 20° N, 36° W; 19° N, 20°10′ W; 8° N, 24° W; 11°50′ S, 8°10′ W; 29° S, 18° W; 37°40′ S, 12° E; 38°16′ S, 15°10′ E.

Chevreux (1900, p. 147) enumerates 72 spec. (15 ♂, 57 ♀) from 11 st. within about the same area as the "Thor", but also farther to the west; most of the hauls have only given a single specimen each, but two hauls 22 and 24 spec. 8 of the stations lie between the Azores and New Foundland (36°6′ N, 29°18′ W.—42°50$^1/_2$′ N, 45°25′ W); 1 st. lies much farther to the north: 47°15$^3/_4$′ N, 22°48$^3/_4$′ W, 1 st. lies SW of Ireland 44°1$^1/_2$′ N, 15°31′ W, and 1 st. lies W of Ireland 47°17$^1/_4$′ N, 11°58$^5/_6$′ W. Almost all the spec. are taken at the surface at night, but some of them are found in the stomach of *Thynnus alalonga*.

The most important material known from existing literature is that taken by the German Plankton Expedition (Vosseler 1901), comprising 61 hauls, 172 spec. (18 ♂ ad., 54 ♂ jun., 15 ♀ ad., 85 ♀ jun.); only 3 hauls have given more than a single spec., *viz.* 14, 15 and 24 spec. The localities are as follows: The Gulf Stream 1 st. 41.1° N, 21.1° W, 0—350 m; Florida Current 4 st. 37.9° N, 59.1° W—41.6° N, 56.3° W, 0, 0—200 and 0—400 m; Sargasso Sea 16 st., from abt. 23.7° N, 36° W, and 30.8° N, 30.9° W, to 35° N, 62. 1° W, 0, 0—200 or 0—400 m; Northern Equatorial Current 15 st., from abt. 10.2° N, 22.2° W, to 28.3° N, 34.3° W, and besides 12° N, 40.3° W, and 20.4° N, 37.8° W, depths from the surface and to 0—400 m (0—500 m); Guinea Current 7 st., from 2.9° N, 18.4° W, to abt. 9.4° N, 43.5° W, 0—200 or 0—400 m, but 1 st. (2.9° N, 18.4° W) with closing net 1300—1500 m; Southern Equatorial Current 18 st. 1.7° N—6.8° S, 14°—35° W, (0) 0—200 or 0—400 m.

Gulf of Mexico, between Delta of Mississippi and Cedar Keys, 5 spec. (Pearse, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 378).

Stebbing ("Challenger") has the species from the following localities in the Atlantic (1 spec. from each st.): E. of Bermuda 35°18′ N, 51°42′ W, surf.; 18°8′ N, 30°5′ W, surf., night and 2°42′ S, 14°41′ W, surf., night. — Cape of Good Hope (Bate 1862; *Ph. nicetensis*). — Madeira, 3 spec., and near the Cape of Good Hope 35°14$^1/_4$′ S, 15°11$^3/_4$′ E, 2 ♀ (Stewart 1913).

3. Indian Ocean. The Copenhagen Zool. Museum possesses from ancient time a very great material of this species from the Atlantic (see above) and from the following localities in the Indian Ocean: 26°16′ S, 72° E; 35° S, 24° E; 35°30′ S, 29°30′ E; 35° S, 55° E; 36°36′ S, 27°40′ E; 36°50′ S, 50°30′ E; 37° S, 49°20′ E; 38°20′ S, 30° E; 38°29′ S, 29° E; 39°54′ S, 41°30′ E; 40°4′ S, 53°20′ E.

Walker (1909—10) mentions the species from the following localities: 4°16′ S, 71°53′ E, 1200 fms., 1 spec., 3^{30}—6^{30} pm.; ibid. 25 fms., 2^{10}—3^{10} am., 1 spec.; 1—2 miles NW of the passage into Salomon Atoll (S of Maldive), 1—180 fms., 4^{30}—5^{10} pm., 2 spec.; Mauritius, W of Black River, 25 fms., 1^{43}—2^{30} pm., 1 spec.; 8°16′ S, 51°26′ E, 900 fms., 11^{30} am.—1^{30} pm., 1 spec.; NNW of the entrance to Desroches (Amirante), 200 fms., afternoon, 5 spec.; about ibid., 300 fms., 8—9^{30} am., 1 spec. — The "Challenger" Exped. has taken 1 spec. 7°3′ N, 121°48′ E, night (Stebbing). — Buffalo River NW by N distant 21 miles off East London (S. Africa), 490 fms., 1 ♀ with ova (Barnard 1916).

4. Pacific. S of Japan 24°49′ N, 138°34′ E, night, 1 spec.; 26°29′ N, 137°57′ E, night, 1 spec.; 26 27′ S. 90° W, from the stomach of a shark ("*P. longispina*" Sp. Bate) (Stebbing, "Challenger"). — Without locality (Bovallius 1889).

3. Genus Euprimno (Guérin-Méneville) Bovall.

Euprimno Bovallius 1889, p. 397 (lit.). — *Primno* Stebbing 1904, p. 38 (lit.).

1. EUPRIMNO MACROPUS Guérin-Méneville (Chart 22).

**Primno macropa* Stebbing 1888, p. 1441, Pl. 178 (lit.). — *P. m.* Stebbing 1904, p. 38, textfigs. 1—2. — *Euprimno macropus* Bovallius 1889, p. 400, Pl. 17 figs. 23—40, Pl. 18 fig. 1—2. — *E. m.* Vosseler 1901, p. 87, Pl. 8 fig. 91.

Mediterranean.

St. 10. 15-12-1908. 1200 m.w., 9^{30} am., 60 min. 1 ♂ ad. 4.5 mm. — **St. 12.** 19-12-1908. 65 m.w., 1^{00} pm., 30 min. 3 ♀ 4—5 mm. — **St. 15.** 22-12-1908. 1400 m.w. (hour?), 60 min. 6 ♀ (4 with ova 5—6 mm), 4—6 mm. — **St. 34.** 23-1-1909. 25 m.w., 4^{35} am., 30 min. 1 ♀ 4 mm. — **St. 35.** 29-1-1909. 1600 m.w., 11^{25} am., 120 min. 3 ♀ 5 mm. — **St. 38.** 31-1-1909. 150 m.w., 30 min., 8^{20} pm. 1 ♀ 4 mm. — **St. 43.** 3-2-1909. 65 m.w., 30 min., 6^{15} am. 2 ♀ 5—7 mm. — **St. 46.** 7-2-1909. 300 m.w., 7^{30} pm., 30 min. 1 ♀ 5 mm. — **St. 46.** ibid. 600 m.w., 6^{25} pm., 30 min. 1 ♀ 6 mm. — **St. 47.** 10-2-1909. 300 m.w., 11^{05} pm., 30 min. 1 ♂ jun. 4 mm, 2 ♀ 4 mm. — **St. 52.** 18-2-1909. 300 m.w., 7^{25} am., 30 min. 8 spec.: 3 ♂ ad. 4 mm, 1 ♀ 6 mm, 4 ♀ 4 mm. — **St. 53.** 18-2-1909. 2600 m.w., 5^{15} pm., 90 min. 9 ♀ 4—5 mm (2 ♀ with ova 5 mm). — **St. 56.** 19-2-1909. 1900 m.w., 5^{30} am., 60 min. 7 spec.: 1 ♂ ad. 4 mm. 6 ♀ (1 with ova 5 mm) 5—6(7) mm. — **St. 58.** 20-2-1909, 100 m.w., 2^{00} pm., 30 min. 22 spec.: 3 ♂ ad. 4 mm, 2 ♂ jun. 3—4 mm, 17 ♀ (4 ♀ with ova 5—6 mm) 4—6 mm. — **St. 59.** 21-2-1909. 2^{30} am., 1200 m.w., 60 min. 23 ♀ (6 with ova 4—5 mm) 4—5 mm. — **St. 65.** 24-2-1909. 1600 m.w., 0^{30} pm., 120 min. 4 ♀ with ova 5—7 mm, 2 ♀ without ova 7 mm. — **St. 104.** 24-6-1910. 65 m.w., 6^{20} pm., 30 min. 4 ♀ 5 mm. — **St. 106.** 25-6-1910. 300 m.w., 1^{45} am., 30 min. 1 ♂ jun. 4 mm. — **St. 106.** ibid. 1200 m.w., 0^{20} am., 60 min. 38 spec.: 2 ♂ ad. 4—5 mm, 1 ♂ jun. 4 mm, 35 ♀ (9 with ova 5—6 mm) 4—6 mm. — **St. 107.** 25-6-1910. 65 m.w., 9^{50} am., 15 min. 9 spec.: 1 ♂ jun. 4 mm, 8 ♀ jun. 4—5 mm. — **St. 107.** ibid. 2000 m.w., 7^{30} am., 60 min. 42 spec.: 2 ♂ ad. 5—6 mm, 40 ♀ (8 with ova 5—6 mm) (4)5—6 mm. — **St. 108.** 26-6-1910. 2000 m.w., 0^{40} am., 60 min. 40 ♀ (4 with ova 5—6 mm) 4—6 mm. — **St. 112.** 27-6-1910. 300 m.w., 0^{15} am., 30 min. 3 spec.: 1 ♂ jun. 4 mm, 2 ♀ jun. 4—5 mm. — **St. 113.** 28-6-1910. 300 m.w., 3^{25} am., 30 min. 36 spec.: 2 ♂ ad. 4—5 mm, 34 ♀ (1 with ova 6 mm) 4—6 mm. — **St. 115.** 29-6-1910. 65 m.w., 1^{20} am., 15 min. 1 ♂ jun. 4 mm. — **St. 115.** ibid. 300 m.w., 11^{20} pm., 30 min. 1 ♀ 5 mm. — **St. 115.** ibid.

2000 m.w. 0^{30} am., 60 min. 7 spec.: 1 ♂ ad. 5 mm, 6 ♀ (2 ♀ with ova 5 mm) 5—6 mm. — **St. 116.** 29-6-1910. 300 m.w., 4^{05} pm., 30 min. 2 ♀ (1 with ova) 6 mm. — **St. 118.** 30-6-1910. 300 m.w., 5^{55} pm., 30 min. 1 ♀ 5 mm. — **St. 122.** 2-7-1910. 1200 m.w., 5^{30} pm., 60 min. 7 spec.: 3 ♂ ad. 5 mm, 1 ♀ with ova 6 mm, 3 ♀ without ova 4—5 mm. — **St. 126.** 10-7-1910. 300 m.w., 9^{30} pm., 30 min. 1 ♀ 5 mm. — **St. 129.** 12-7-1910. 1000 m.w., 4^{20} am., 60 min. 1 ♀ 5 mm. — **St. 129.** ibid. 3500 m.w., 3^{00} pm., 120 min. 1 ♀ with ova 5 mm. — **St. 131.** 13-7-1910. 300 m.w., 10^{35} am., 30 min. 4 spec.: 2 ♂ jun. 4—5 mm, 2 ♀ 4—5 mm. — **St. 132.** 14-7-1910. 300 m.w., 3^{45} am., 30 min. 5 ♀ 4—5 mm. — **St. 132.** ibid. 600 m.w., 4^{50} am., 30 min. 1 ♀ 6 mm. — **St. 133.** 14-7-1910. 300 m.w., 10^{15} pm., 30 min. 3 ♀ 4 mm. — **St. 133.** ibid. 600 m.w., 9^{20} m.w. 30 min. 13 spec.: 2 ♂ ad. 5 mm, 5 ♂ jun. 4 mm, 6 ♀ 4 mm. — **St. 134.** 15-7-1910. 300 m.w., 5^{40} am., 30 min. 16 spec.: 1 ♂ ad. 5 mm, 1 ♂ jun. 5 mm, 14 ♀ 4—5(6) mm. — **St. 137.** 19-7-1910. 250 m.w., 9^{05} am., 30 min. 6 ♀ (3)4—6 mm. — **St. 138.** 19-7-1910. 1000 m.w., 7^{40} pm., 60 min. 8 spec.: 1 ♂ ad. 5 mm, 1 ♂ jun. 5 mm, 6 ♀ (1 with ova) 5 mm. — **St. 143.** 23-7-1910. 300 m.w., 0^{30} am., 30 min. 1 ♀ 4 mm. — **St. 143.** ibid. 1000 m.w., 2^{00} am., 60 min. 16 spec.: 2 ♂ jun. 4 mm, 14 ♀ 4—5 mm. — **St. 144.** 24-7-1910. 4000 m.w., 6^{20} am., 60 min. 1 ♀ 5 mm. — **St. 147.** 26-7-1910. 1000 m.w., 1^{10} am., 60 min. 1 ♀ 5 mm. — **St. 152.** 28-7-1910. 1000 m.w., 0^{30} am., 60 min. 1 ♀ 4 mm. — **St. 154.** 29-7-1910. 300 m.w. 4^{30} am., 30 min. 1 ♀ 4 mm. — **St. 156.** 30-7-1910. 300 m.w., 3^{50} am., 30 min. 1 ♀ with ova 5 mm. — **St. 156.** ibid. 600 m.w., 3^{00} am., 30 min. 1 ♀ 5 mm. — **St. 156.** ibid. 1000 m.w., 0^{40} am., 60 min. 1 ♀ 4 mm. — **St. 158.** 31-7-1910. 300 m.w., 7^{30} am., 30 min. 95 spec.: 9 ♂ jun. 4 mm, 86 ♀ (14 with ova or embryos 5—6 mm) 5—6 mm. — **St. 160.** 1-8-1910. 300 m.w., 2^{45} am., 30 min. 6 spec.: 2 ♂ jun. 4 mm, 6 ♀ 4—6 mm. — **St. 160.** ibid. 1000 m.w. 3^{35} am., 60 min. 31 spec.: 8 ♂ jun. 4—5 mm, 23 ♀ (1 with ova 6 mm) 4—5(6) mm. — **St. 160.** ibid. 4000 m.w., 3^{30} pm., 60 min. 20 spec.: 3 ♂ ad. 5 mm, 17 ♀ (7 with ova 5—6 mm) 5—6 mm. — **St. 163.** 3-8-1910. 25 m.w., 1^{35} am., 15 min. 1 ♀ 5 mm. — **St. 163.** ibid. 300 m.w., 1^{05} am., 15 min. 6 ♀ 5—6 mm. — **St. 163.** ibid. 1000 m.w., 0^{05} am., 30 min. 21 spec.: 2 ♂ ad. 5 mm, 1 ♂ jun. 4 mm, 18 ♀ (3 ♀ with ova or embr. 5—6 mm) 5—6 mm. — **St. 178.** 12-8-1910. 65 m.w., 0^{20} pm., 15 min. 12 spec.: 2 ♂ jun. 4 mm, 10 ♀ (1 with ova 5 mm) 3—5 mm. — **St. 181.** 13-8-1910. 300 m.w., 1^{25} pm., 20 min. 9 spec.: 1 ♂ ad. 5 mm, 3 ♀ with ova 5 mm, 5 ♀ 6 mm. — **St. 182.** 13-8-1910. 600 m.w., 11^{40} pm., 30 min. 12 ♀ (5 with ova) 5—6 mm. — **St. 183.** 16-8-1910. 300 m.w., 4^{45} pm., 15 min. 11 spec.: 1 ♂ ad. 5 mm, 9 ♀ 4—5 mm, 1 ♀ 7 mm. — **St. 192.** 20-8-1910. 300 m.w. 10^{10} pm., 15 min. 3 spec.: 2 ♀ 6 mm, 1 ♀ 3 mm. — **St. 192.** ibid. 600 m.w., 10^{50} pm., 30 min. 3 spec.: 2 ♂ jun. 3—4 mm, 1 ♀ 5 mm. — **St. 194.** 21-8-1910. 1200 m.w., 6^{00} am., 30 min. 1 ♀ with ova 4 mm. — **St. 195.** 21-8-1910. 65 m.w., 6^{50} pm., 15 min. 1 ♀ 4 mm. — **St. 199.** 25-8-1910. 1000 m.w., 10^{10} pm., 30 min. 2 ♀ 5 mm. — **St. 202.** 26-8-1910. 300 m.w., 5^{05} pm., 15 min. 3 spec.: 1 ♀ with ova 6 mm, 2 ♀ 5 mm. — **St. 206.** 28-8-1910. 1000 m.w., 1^{40} am., 45 min. 2 spec.: 1 ♂ jun. 4 mm, 1 ♀ 4 mm. — **St. 206.** ibid. 2000 m.w., 3^{05} am., 45 min. 5 spec.: 1 ♂ jun. 4 mm, 4 ♀ (2 with ova 4—5 mm) 4—5 mm. — **St. 209.** 29-8-1910. 1000 m.w., 6^{00} am., 45 min. 3 spec.: 1 ♂ jun. 4 mm, 2 ♀ 5 mm. — **St. 209.** ibid. 100 m.w., 3^{45} pm., 20 min. 2 ♀ 4 mm. — **St. 209.** ibid. 150 m.w., 4^{25} pm., 20 min. 1 ♀ 5 mm. — **St. 209.** ibid. 2000 m.w., 7^{25} am., 45 min. 1 ♂ ad. 5 mm. — **St. 210.** 30-8-1910. 600 m.w., 3^{35} am., 30 min. 2 ♀ 4—5 mm. — **St. 217.** 1-9-1910. 300 m.w., 1^{40} pm., 30 min. 5 ♀ (1 with ova 6 mm) 4—6 mm. — **St. 282.** 38°12′ N, 15°37′ E. 9-3-1911. 40 m.w., 2^{00} am., 60 min. 1 ♀ with ova 6 mm, 1 ♀ 3 mm. — **St. 282.** ibid. 40 m.w., 5^{30} pm., 90 min. 1 ♀ 4 mm. — **St 729** 41°00′ N, 17°44′ E. 14-4-1913. 11^{30} am. 66 spec.: 12 ♂ jun. 4 mm, 4 ♀ with ova 5—6 mm, 49 ♀ 4—5 mm, 1 ♀ 6 mm. — **St. 731.** 37°19′ N, 1°31′ E. 19-4-1913. 2^{30} pm. 1 ♀ 6 mm, 2 ♀ 4 mm.

Atlantic.

St. 65. 24-2-1909. 25 m.w., 5^{50} am., 30 min. 1 ♀ 4 mm. — **St. 65.** ibid. 600 m.w., 10^{00} am.(?), 120 min. 3 ♀ 5—7 mm. — **St. 87.** 17-6-1910. 65 m.w., 4^{40} pm., 15 min. 8 ♀ (1 with ova) 6 mm. — **St. 87.** ibid. 300 m.w., 4^{00} pm., 30 min. 2 ♀ 5 mm. — **St. 89.** 18-6-1910. 1000 m.w., 4^{10} am., 30 min. 2 ♀ 5 mm. — **St 91** 18-6-1910. 300 m.w., 6^{55} pm., 45 min. 1 ♂ jun. 4 mm, 1 ♀ 7 mm. — **St. 91.** ibid. 1600 m.w., 5^{25} pm., 60 min. 27 ♀ (4)5—6 mm. — **St. 95.** 23-6-1910. 300 m.w., 5^{10} am., 30 min. 1 ♀ 5 mm.

The material contains 742 spec. (88 ♂, 654 ♀) from 63 stations, 86 hauls, and by far the greatest number of specimens was taken in the Mediterranean.

A. Mediterranean.

	No. of stations	No. of hauls	No. of spec.
"Thor" Dec. 1908....	3	3	10
Jan. 1909....	3	3	5
Febr. —	9	10	82
June 1910 —	9	13	184
July —	16	22	177
Aug. —	14	23	161
Sept. —	1	1	5
"Thor" total	55	75	624
other vessels	3	4	73
total...	58	79	697

The 697 specimens from the Mediterranean were 88 ♂, 609 ♀.

Depths of the sea and occurrence (chart 22).

Depths in m.	No of posit. st. ("Thor" 1908—10)	Total no. of st. of the "Thor" (1908—10)	Percentage of posit st.
0— 500	10	67	15 %
> 500—1000	10	31	32.3 —
> 1000—2000	16	41	39 —
> 2000—3000	15	35	42.9 —
> 3000	4	10	40 —
total...	55	184	

From this it appears that the species has its chief distribution in depths > 1000 m; but it is also very abundant at depths from >500—1000 m; only exceptionally is it to be found at depths < 500 m (the 10 stations with this depth vary between 68 and 480 m).

The species is distributed over both basins of the Mediterranean, and has even been encountered in the southern regions of the Adriatic and at the mouth of the Dardanelles, but it is more frequent in the western than in the eastern basin. The "Thor" 1908—10 has in the western basin 39 positive stations, in the eastern 16 positive stations; considering only stations with a depth > 500 m, the figures are 34 and 11 respectively. In the western basin there are 34 negative stations (night, > 500 m) in the eastern 16 negative stations. In the western basin there are thus 34 positive stations out of 68 in all i. e. 50 per cent.; in the eastern 11 out of 27 i. e. 40.7 per cent.; there are thus $1^1/_4$ times as many positive stations in the western as in the eastern basin.

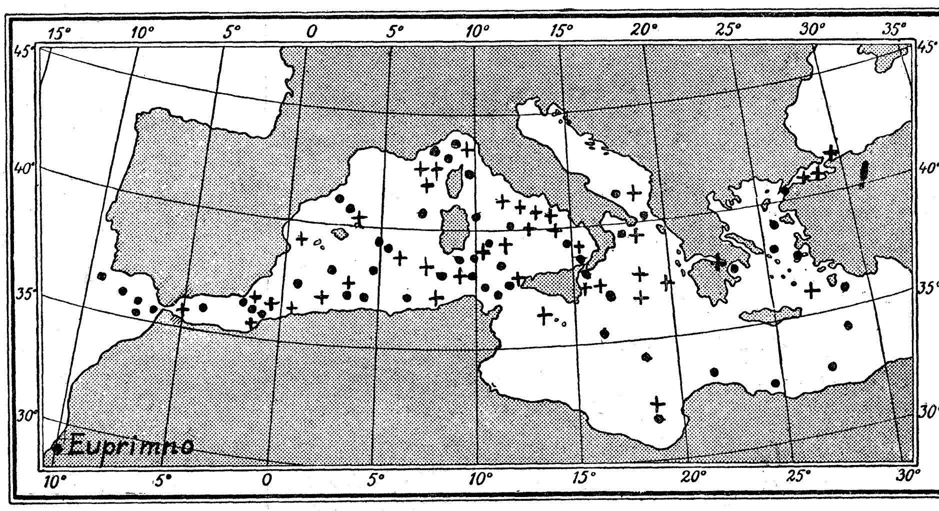

Chart 22. *Euprimno macropus*. ● positive st., + negative st. (night, $>$ 500 m, 0-4000 mw). In the Mediterranean some of the stations lie so close to each other that it was impossible to note them all.

Vertical occurrence.

m. w.	No. of hauls "Thor" 1908—10, > 500 m.					
	Night			Day		
	No. of posit. hauls	total no. of hauls	percentage of posit. hauls	No. of posit. hauls	total no. of hauls	percentage of posit. hauls
10— 35	2	67	3 %	—	5	0
50— 100	2	35	5.7	3	10	30
130— 250	—	6	—	1	3	33.3
300— 400	14	49	28.6	7	22	31.8
500— 800	5	13	38.6	—	5	—
1000—1200	14	22	63.6	2	9	22.2
1400—1800	1	5	20	2	3	66.7
>1800	3	6	50	6	7	85.7
total	41	203		21	64	

From the table it will be seen that the species, curiously enough, lives considerably deeper down than the two other species of this family: at night particularly in the intermediate water-layers (300—1200 m. w.) and only very rarely quite near the surface; during the day, on the other hand, from 50 m. w. down to the very greatest depths. That the number increases with the depth during the night has already been shown by Steuer (1913, p. 567, fig. 14), who points out that it increases in numbers, at any rate as far as 800 m below the surface. This does not appear so clearly from the collections of the "Thor", though these point in the same direction; but this is undoubtedly due to the fact that the species occurs, sometimes in shoals, sometimes more sporadically. The shoals may occur both in winter and summer.

Size and propagation. The ♀ is as a rule a little larger than the ♂, the most ordinary size for the grown ♂ being 4—5 m, for ♀ 5—6 mm. ♀ with ova were taken in Dec., Feb., March, April, June, July, Aug., Sept. ♀ with embryos in July—August, so that the species propagates all the year round. In proportion to the ovigerous ♀ very few have embryos whence it seems that the embryos leave the mother very soon after having been hatched. ♀ with ova and embryos have only once (winter, day time) been taken with 100 m. w. otherwise with 300—4000 m. w. particularly 300 m. w. or at the extreme limit of the fairly frequent occurrence of the species.

B. Atlantic.

There are 45 spec. from 5 stations, 7 hauls. The material is too small to make the basis of biological results.

Distribution.

1. Mediterranean. From Lo Bianco 1902 and 1903 (1904) it is panteplanktonic (50—1200 m) and very common at Naples in spring at the surface. 1904 Lo

BIANCO enumerates (p. 43) 6 hauls during the day at Naples (April): 4 hauls 1500 m. w. have given 9 spec., 2 hauls 500 m. w.: 4 spec. — VOSSELER (in LO BIANCO 1903—04, p. 278) enumerates abt. 135 spec. from 22 day hauls (Febr. 6 to May 10); 18 hauls are from Naples, 2 hauls between Capo Corso and Monaco, 1 at Salina (Eolian Islands) and 1 at Stromboli. The depths of the sea are (600) 1000—2600 m, the lengths of the wire commonly 500—2500 m; but there are 6 hauls with closing net with the following length of wire in metres: 100, 200, 300, 1000, 1200, 1200. — Adria 0—800 m (STEUER 1913).

2. Atlantic. Very common between abt. 40° N and abt. 8° S, but is also found both to the north and to the south of these limits. SW Ireland 2 st., 199—> 1000 fms., 2 spec. (TATTERSALL 1906) — 47°38$^1/_4$′ N, 22° 13$^2/_3$′ W, 1300 m, and 47°42$^2/_3$′ N, 19°30$^1/_4$′ W, 781 m, 3 spec. (CHEVREUX, "Hirondelle" 1900). — Bay of Biscay, 5 hauls 0—100 fms., 5 spec. jun. (STEBBING l. c. 1904). — W. of Bay of Cadiz ("Thor", see above)

The German Plankton-Exped. (VOSSELER 1901) had 295 spec., 91 stations from the following parts of the Atlantic. The Gulf Stream 1 st. 39° N, 23.5 W, 0—37 m. Labrador Current 1 st. 42.4° N, 55.7° W, 0—750 m. Florida Current 8 st. 41.6° N, 56.3° W, to 37.9° N, 59.1° W, surf., 0—200 or 0—400 m, and 1 haul with closing net 400—600 m. Sargasso Sea 30 stations 37.1° N, 59.9° W to 30.8° N, 51.1° W, and 30.9° N, 50° W to 29.8° N, 36.8° W, 0—200 or 0—400 (0—700) m, 1 haul with closing net 800—1000 m (30.3° N, 37.9° W); furthermore 25.6° N, 34.9° W, and 30.8° N, 30.9° W. N. Equatorial Current 13 st. 28.9° N, 35° W to 10.2° N, 26.6° W, and 12° N, 40.3° W; 0—200 or 0—400 (500) m. Guinea Current 8 st. 7.9° N, 21.4° W to 2.9° N, 18.4° W; besides 6.9° N, 43.3° W and 9.4° N, 41.9° W; 0—200 or 0—400 m. S. Equatorial Current 30 stations 17° N, 17.3° W to 5.1° S, 4.1° W, and 6.8° S, 14.2° W to 7.8° S, 17.3° W and to 1.8° S, 38.1° W, 0—(100) 200 m or 0—400 (600) m, but 1 haul with closing net (0.1° N, 15.2° W), 500—700 m. — 30°34′ N, 30°50′ W (specimens in the Copenhagen Zool. Mus.). — Tristan da Cunha 36°27$^1/_2$° S, 8°20′ W, 1 ♀ (STEWART 1913).

3. Indian Ocean. The Copenhagen Zool. Mus. has specimens from 38°30′ S, 30° E, and 32°15′—33° S, 58°—58$^1/_2$° E. — 4°16′ S, 71°53′ E, 2082 fms., 100 fms.; 1—2 miles NW of passage into Salomon Atoll (S of Maldive), 1—180 fms.; Mauritius, W of Black River, 25 and 50 fms.; 3 miles NW of entrance into Desroches Atoll (Amirante), 200, 250 and 300 fms. [WALKER 1909 (1910), totally 10 spec.]

4. Pacific. 36°32′ S, 132°52′ W, surf., 57.8° F, 1 ♀ with embr. (STEBBING, "Challenger").

III. LIST OF LITERATURE UP TO 1918

(including a few papers of later date).

A complete list of literature older than 1887, see Stebbing, Amphip. "Challenger" 1888, p. 1—600, Appendix p. 1617—[illegible]6.
For literature including only one single species, genus or family, see the species etc. in question.
List of all species, genera and synonymies older than 1887, see Stebbing l. c. p. 1685—1726.

Barnard, K. H. 1916: Contribution to the Crustacean Fauna of S. Africa. 5. The Amphipoda. — Ann. S. African Museum, vol. 15, pt. 3, 1916; Hyper. p. 285—94.

Bate, C. Spence 1862: Catalogue of the specimens of Amphip. Crust. in the collections of the British Museum, London 1862.

— 1878: The Willemoësia Group of Crustacea. — Ann. Mag. Nat. Hist. ser. 5, vol. 2, 1878, p. 484.

Bate, C. Spence, & Westwood 1861—69: History of British Sessile-Eyed Crustacea, vol. 2. 1861—69.

Bianco, see Lo Bianco.

Boeck, A. 1870: Crustacea Amphipoda borealia et arctica; Christiania Vid.-Selsk. Forh. 1870, p. 83.

— 1873—76: De Skandinaviske og Arktiske Amphipoder 1873—76.

Bonnier, J.: 1896: Résultats scientifiques de la campagne du "Caudan" dans la Golfe de Gascogne, Edriophthalmes. — Ann. Univ. Lyon, vol. 26, 1896, p. 527.

Bovallius, C. 1885: On some forgotten genera among the Amphipoda Crustacea. — Bihang Kgl. Svenska Vet. Akad. Handl., vol. 10, 1885, No. 14.

— Syst. list 1887: Systemat. list of Amphip. Hyper. — ibid. vol. 11, No. 16, 1887.

— Arctic and Antarctic Hyper. 1887: Arctic and Antarctic Hyperids. — Vega-Exped.s Vet. Iakttag., vol. 4, 1887.

— Monograph 1887: Monograph of the Amphip. Hyper., pt. 1. — Kgl. Svenska Vet. Akad. Handl., vol. 21, No. 5, 1887.

— — 1889: Monograph . . . . , pt. 1: 2; ibid. vol. 22, No. 7, 1889.

— 1890: The Oxycephalids. — Nova Acta Reg. Soc. Sci. Upsal., 1889 (1890), ser. 3.

Brady & Norman 1909: The Crustacea of Northumberland and Durham. — Trans. Nat. Hist. Soc. Northumberland, Durham and Newcastle-upon-Tyne, new ser., vol. 3, pt. 2, 1909.

Carus, J. V. 1885: Prodromus Faunæ Mediterraneæ, vol. 1, Stuttgart 1885; Hyper. p. 421—28.

Chevreux, Ed. 1893: Quatrième campagne de l'Hirondelle, 1888. Sur les Crust. Amphip. recueillis dans l'estomac des germons (Thynnus alalonga). — Bull. Soc. Zool. France, vol. 18, 1893, p. 70.

— 1895: Les Amphip. des premières campagnes de la "Princesse-Alice". — Mem. Soc. Zool. France, Paris 1895.

— "Hirondelle" 1900: Amphip. provenant des campagnes de l'Hirondelle. — Résult. des campagnes scientifiques, Monaco, vol. 16, 1900.

— 1913: Sur quelques interessantes espèces d'Amphip. provenant des parages de Monaco et . . . en Mediterranée. — Bull. Inst. Océanogr. Monaco, No. 262, 1913.

— 1914: Sur quelques Amphipodes pelagiques . . . — ibid. No. 291, 1914.

— 1919: Révision des Scinidæ provenant des campagnes de S. A. S. le Prince de Monaco. — ibid. No. 352, 1919.

— 1920: Révision des Lanceolidæ provenant des campagnes de S. A. S. le Prince de Monaco. — ibid. No. 363, 1920.

Chun, C. 1887 (1888): Die pelagische Thierwelt in grösseren Meerestiefen und ihre Beziehungen zu der Oberflächenfauna. — Bibliotheca Zoologica, Heft 1, 1887 (1888); (Hyper. p. 28—29),

— 1889: Bericht üb. eine nach den canar. Inseln . . . ausgef. Reise, 5, Crust. — Sitzungsber. K. Preuss. Akad. Wiss. Berlin, 1889, p. 527.

— 1895: Atlantis IV. Die secundären Geschlechtscharactere der Männchen von Phronima. — Bibliotheca Zoologica, vol. 7, 1895.

Claus, C. 1871: Untersuchungen üb. Bau u. Verwandschaft der Hyperiden. — Nachr. K. Gesellsch. Wiss. Georg-Augusts Univ., Göttingen, 1871.

— Phronimiden 1879: Organismus d. Phronimiden. — Arbeiten Zool. Inst. Wien, vol. 2, 1879.

— Platysceliden 1879: Gattungen u. Arten d. Platysceliden in systemat. Übersicht. — ibid. vol. 2, 1879, p. 147—98 (1—52).

— 1887: Die Platysceliden. Wien 1887.

Colosi 1918: Crostacei, Parte III, Oxicefalidi. Raccolte planctoniche fatte dalla R. Nave "Liguria" nel viaggio di circonnavigazione del 1903—05 sotto il comando di S. A. R. Luigi di Savoia, Duca degli Abruzzi. Vol. 2, fasc. VIII 1918, pp. 207—225, Pl. XVII, textfigs. Firenze, Public. Inst. St. Sup.

Dana, James 1852: United States Exploring Exped. during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U. S. N., vol. 13, pt. 2, Philadelphia 1852 (1853), with plates.

Fabricius, J. C. 1775: Systema Entomologiæ. Flensburgi et Lipsiæ 1775.

Garbowski, 1896: Zoologische Ergebnisse IX, Hyperienartige Amphip. d. Mittelmeeres. Monograph. bearbeitet auf Grund des während der 5 Exped. S. M. Schiffes "Pola" gesammelten Materiales (1890—94). 1. Theil, Die Sciniden. (Bericht Comm. Tiefsee-Forschung XX). — Denkschr. K. Akad. Wiss., Wien, Math. Naturwiss. Cl., vol. 63, 2. Abt., 1896, p. 89.

Giles, G. M. 1887: On 6 new Amphip. from the Bay of Bengal. — Journ. Asiatic Soc. Bengal, vol. 56, pt. 2, 1887, No. 2, p. 212.

Guérin, F. E. 1836: Description de quelques genres nouveaux de Crust. appartenant de la fam. des Hypérines. — Magasin de Zoologie, vol. 17, 1836.

Hansen, H. J.: Dijmphna 1886: Oversigt over de paa Dijmphna-Togtet indsamlede Krebsdyr. — Dijmphna-Togtets zool.-botan. Udbytte, Kbh. 1886.

— — V. Grönland 1887: Malacostraca marina Groenlandiæ occidentalis. Oversigt over det vestlige Grønlands Fauna af malakostrake Havkrebsdyr. — Vid. Meddel. Naturh. Foren. Kbh. 1887.

Kröyer, H. 1838: Grönlands Amfipoder. — Kgl. Danske Vid. Selsk. Mat. Naturh. Afh., Bd. 7, 1838.

Lo Bianco, S. 1902: Le pesche pelagiche abissali eseguite dal Maia nelle vicinanze di Capri. — Mitth. Zool. Stat. Neapel, Bd. 15, 1902, p. 413—82.

— 1903: Le pesche abissali eseguite da F. A. Krupp col yacht Puritan nelle adiacenze di Capri ed in altre località del Mediterraneo. — ibid. Bd. 16, 1903, p. 109—278, Pl. 7—9 (list of stations p. 119—57, list of species (by Vosseler) p. 278).

— "Maia" 1904: Pelagische Tiefseefischerei der "Maia" in der Umgebung von Capri. Jena 1904. 41 tables (is a translation into German from Lo Bianco l. c. 1902).

— 1909: Notizie biologiche riguardanti specialmente il periodo di maturità sessuale degli animali del golfo di Napoli. — Mitth. Zool. Stat. Neapel, Bd. 19, 1908—09 (1909), p. 513—661 (Crust. p. 591—618).

— 1911: L'influenza dell' ambiente sul periodo riproduttivo degli animali marini. — ibid. Bd. 20, 1910—13 (1911), p. 129—56.

Marion, A. F. 1874: Déscriptions des Crust. Amphip. parasites des Salpes. — Ann. Sci. Nat., Zool.. ser. 5, vo.. 17, 1874.

— 1883: Considérations sur les faunes profondes de la Mediterranée, d'après les dragages opérés au large des côtes méridionales de France. — Ann. Mus. Hist. Nat. Marseille, Zool., vol. 1, 1883.

Miers 1876: Catalogue of Stalk- and Sessile-eyed Crust. of New Zealand. London 1876.

Norman, A. M. 1900: British Amphip. of the tribe Hyperiidea. — Ann. Mag. Nat. Hist., ser. 7, vol. 5, 1900.

Pesta, O. 1920: Ueber einige für die Fauna der Adria neue oder seltene Amphipodenarten. — Zool. Anzeiger, vol. 51, 1920, pp. 25—36.

Prestandrea, N. 1833: Su di alcuni nuovi Crostacei dei mari di Messina.— Effem. scient. e letter. per la Sicilia, vol. 6, No. 16, Palermo 1833.

Risso, A. 1816: Histoire Naturelle des Crust. des environs de Nice. Paris 1816.

— 1822: Mém. sur quelques nouveaux Crust. observés dans la mer de Nice. — Journ. de Physique, de Chimie et d'Hist. Nat., vol. 95. Paris 1822.

Sars, G. O. 1895: Account of the Crust. of Norway, vol. 1, Amphip., 1895.

Say 1818: Account of the Crust. of United States. — Journ. Acad. Nat. Sci., Philadelphia, vol. 1, pt. 2, 1818.

Scott, Th. 1909: On new and rare Crust. from Scottish Waters. — Ann. Mag. Nat. Hist., ser. 8, vol. 4, 1909, p. 31.

Senna, A. 1902: Le esplorazioni abissali nel Mediterraneo del R. Piroscafo Washington nel 1881, 1. Nota sugli Oxicefalidi. — Boll. Soc. Entomol. Ital., Anno 34, 1902.

— 1903: Su alcuni Anfipodi iperini del Museo Zool. di Napoli. — Ann. Mus. Zool. della R. Univ. di Napoli, Nuova Ser., vol. 1, No. 6, 1903, p. 1.

— 1906: Anfipodi Iperini del Plancton di Messina. — Boll. Soc. Entomol. Ital., Anno 38, 1906, p. 153.

Sexton, E. W. 1911: The Amphip. collected by the "Huxley" from the North side of the Bay of Biscay in Aug. 1906. — Journ. Marine Biol. Assoc., Plymouth, vol. 9, No. 2, 1911, p. 199.

Spandl, H., 1924: Amphipoda Hyperiidea aus der Adria. — Zool. Anzeiger vol. 58, 1924, pp. 261—72.

Stebbing, T. R. R. 1888: Report on the Amphip. collected by H. M. S. "Challenger" during the years 1873—76. — Report on the Scientific Results of the voyage of H. M. S. "Challenger", Zool., vol. 29, 1888.

— 1895: Description of 9 new species of Amphip. Crust. from the tropical Atlantic. — Transact. Zool. Soc., London, vol. 13, pt. 10, 1895.

— 1904: Biscayan Plankton, pt. 2, Amphip. and Cladoc. — Transact. Linn. Soc. London, ser. 2, Zool., vol. 10, pt. 2, 1904.

Stephensen, K. 1912: Report on the Malacostraca collected by the "Tjalfe" Expedition, under the direction of cand. mag. Ad. S. Jensen, especially at W. Greenland. — Vid. Medd. Naturhist. Foren. Kbhvn., vol. 64, 1912 (1913).

— 1913: Grønlands Krebsdyr og Pycnogonider. Conspectus Crustaceorum et Pycnogonidorum Groenlandiæ. — Meddel. om Grønland, vol. 22, 1913.

— 1916: Zoogeographical Investigation of certain fjords in Southern Greenland with special reference to Crustacea, Pycnogonida and Echinodermata including a list of Alcyonaria and Pisces. — ibid. vol. 53, 1916.

— 1918: Hyperiidea-Amphipoda (Lanceolidæ, Scinidæ, Vibiliidæ, Thaumatopsidæ). — Report on the Danish Oceanographical Expeditions 1908—1910 to the Mediterranean and adjacent Seas, vol. II D. 2. Edited by Dr. Johs. Schmidt, Leader of the Expedition.

— 1923: Crustacea Malacostraca V. (Amphipoda I). — The Danish Ingolf-Expedition, vol. III, 8, 1923.

Steuer, A. 1911: Adriatische Planktonamphipoden. — Sitzungsber. K. Akad. Wiss., Wien, Math. Naturwiss. Kl., vol. 120, Abt. 1, 1911, p. 671.
— 1913: Einige Ergebnisse d. VII. Terminfahrt S. M. S. Najade im Sommer 1912 in d. Adria. — Internat. Revue d. ges. Hydrobiol. u. Hydrographie, 1913 (Amphip. p. 567 seq.).
Stewart, Dorothy A. 1913: A Report on the Extra-Antarctic Amphip. Hyper. collected by the "Discovery". — Ann. Mag. Nat. Hist., ser. 8, vol. 12, 1913, p. 245.
Streets, Th. H. 1877 (1878): Contributions to the Natural History of the Hawaiian and Fanning Islands and Lower California. — Bull. U. S. Nat. Mus., No. 7, 1877, p. 124 — Smithsonian Miscellaneous Collections, vol. 13, 1878.
— 1882: A Study of the Phronimidæ of the N. Pacific Surveying Exped. — Proc. U. S. Nat. Mus., vol. 5, 1882, p. 3.
Tattersall, W. M. 1906: Pelagic Amphip. of the Irish Atlantic Slope. — Fisheries Ireland, Sci. Invest., 1905, pt. 4 (1906).
— 1913: Clare Island Survey, pt. 42, Amphip. — Proc. R. Irish Acad., vol. 31, 1913.
Tesch, J. J. 1911: Amphipoda. Bull. trimestr. résultats ... Conseil permanent internat. pour l'exploration de la mer 1902—08. Résumé planktonique, pt. 2, 1911, p. 176—93.
— 1915: De Amphipoden der Zuidelijke Noordzee, verzameld met de "Wodan". — Rapporten en Verhandl. uitgegeven door het Rijks-inst. voor Visscherijonderzoek, Deel 1, Afl. 3, 1915.
Thomson, G., and Chilton, C. 1885: Critical list of the Crust. Malac. of New Zealand. — Transact. New Zealand Inst., vol. 18, 1885 (1886), p. 141.
Vosseler, J. 1901: Amphip. d. Plankton-Exped., 1. Teil, Hyperiidea 1. — Ergebnisse d. Plankton-Exped. d. Humboldt-Stiftung, vol. 2, G, e, 1901.
— 1903, see Lo Bianco 1903.
Walker, A. O. 1903: Report on the Amphip. of the "Oceana". — Ann. Mag. Nat. Hist., ser. 7, vol. 12, 1903.
— 1904: On the Amphipoda. — Report Ceylon Pearl Oyster Fisheries, Suppl. Rep. XVII, pt. 2, 1904.
— 1907: Crust. (Amphip.) "Discovery" Antarctic-Exped., Natural Hist. vol. 3, 1907, p. 1—39.
— 1906: Preliminary Descript. of new Species of Amphipoda from the »Discovery« Antarctic Exped., 1902—1904. — Ann. Mag. Nat. Hist., ser. 7, vol. 17, 1906, p. 452—458.
— 1909: Amphip. Hyper. of the "Sealark" Exped. to the Indian Ocean. — Transact. Linn. Soc., London, ser. 2, Zool., vol. 13, pt. 1, 1909.
Woltereck, R. 1909: Hyperiidea gammaroidea. — Bull. Mus. Comp. Zool. Harvard College, vol. 52, 1909, p. 143.