TIJDSCHRIFT

DER

NEDERLANDSCHE

DIERKUNDIGE VEREENIGING

ONDER REDACTIE VAN

Prof. C. PH. SLUITER,

als Voorzitter der Vereeniging,

Dr. J. C. C. LOMAN, Prof. J. F. VAN BEMMELEN EN
Dr. J. E. W. IHLE.

2de SERIE

DEEL XIV

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
LEIDEN — 1915—1916.

ON SOME EUROPEAN SPECIES OF THE GENUS LEANDER DESM., ALSO A CONTRIBUTION TO THE FAUNA OF DUTCH WATERS.

BY

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(With pl. X—XII).

I. *Introduction.*

In the course of last year, in February and in June, even already in the autumn of 1913, numerous specimens of a species of *Leander* Desm. were brought to me by a fisherman of Ierseke: these shrimps, that I had never seen before, had been captured in the salt water of the „Oosterschelde" (Eastern Sheldt), near the eastern extremity of the isle of North Beveland. By means of Mr. STANLEY KEMP's valuable paper „The Decapoda Natantia of the Coasts of Ireland", published in 1910, in which this author also mentions Dr. CALMAN's interesting observation of the mandibular palp being two-jointed in *L. Squilla* and three-jointed in the other forms, I soon succeeded in determining this species, which proved to be the true *Leander Squilla* (Linné).

Other results of my investigations were not only the fact that this species had never before been observed on the coasts of Holland, but also that it is quite different from another species which is very common in the „Hollandsch Diep", the estuary of the river Meuse, and which, in 1887, has been referred to *L. Squilla* by the late Dr. P. P. C. HOEK, our much lamented, learned

Carcinologist and Ichthyologist, in his paper entitled „Crustacea Neerlandica", in this Journal, New Series, Vol. I, p. 100.

I furthermore considered that our knowledge of these two species and of some other ones is still rather incomplete and that there is still some confusion as regards their synonymy. So, e. g., *L. adspersus* (Rathke), *L. Fabricii* (Rathke), *L. rectirostris* (Zaddach) and *L. Leachii* (Bell) have been united, in 1890, by Dr. ORTMANN (Decapoden des Strassburger Museums) to one species, *L. adspersus* (Rathke), but in the Reverend STEBBING's valuable work „A History of Crustacea" and in the interesting paper of the danish Naturalist TH. MORTENSEN on the development of *L. Fabricii*, published respectively in the years 1893 and 1897, the name of *L. Fabricii* has been maintained and not that of *L. adspersus*.

I therefore took the resolution to submit all these questions to a new examination. Thanks to the courteous assistance of several Naturalists, I succeeded in collecting numerous specimens of some species of this genus from the Black Sea, the Adriatic, the Mediterranean and from some localities on the West Coast of Europe. Nearly all these specimens were in my possession at the end of July 1914 and I received still a few shrimps in August, but the terrible war has caused that no specimens could be obtained from the coast of Britanny (Concarneau), from that of Dorsetshire (Poole Harbour) and from the Irish Sea (Liverpool), to which localities I also had written.

My thanks therefore are due to Dr. E. J. ALLEN Esq. (Plymouth), Cand. Mag. H. Blegvad (Copenhagen), Dr. A. BRINKMANN (Bergen, Norway), Dr. R. GAST (Naples), Prof. G. GILSON (Brussels), Prof. P. HALLEZ (Lille), Dr. TH. KRUMBACH (Rovigno), Dr. O. NORDGAARD (Trondhjem), Dr. H. C. REDEKE (Helder), harbourmaster N. A. SIZOO (Numansdorp, Holland), Dr. K. STEPHENSEN (Copenhagen), Mr. A. O. WALKER (Ulcombe, Kent) and Mr. S. A. ZERNÓV (Sebastopol).

I have, finally, to thank Prof. M. BRAUN (Königsberg) and Prof. O. BÜTSCHLI (Heidelberg), who have enabled me to study

some cotypes of *P. rectirostris* Zaddach and its variety *octodentatus* R. Neumann.

The following species are here described:

Leander Squilla (Linné). Typical form.
„ „ var. *intermedia* n.
„ „ var. *elegans* (Rathke).
„ *adspersus* (Rathke). Typical form.
„ „ var. *Fabricii* (Rathke).
„ *longirostris* (H. M.-Edw.).
„ *serratus* (Penn.).
„ „ var. *Treilliana* (Risso).
„ *xiphias* (Risso).

II. *European species of the genus Leander Desm., not described in this paper.*

1° *Leander tenuicornis* (Say) = *L. natator* (H. M.-Edw.), the well-known species from the Sargassum-Sea.

2°. *Palaemon brevirostris* Andrz. from the Black Sea. (A. Andrzeiowski, Catalogue des objets qui se conservent dans le Cabinet Zoologique de l'Université Impériale de St. Vladimir à Kief. Ière Partie: Mammifères, Oiseaux, Reptiles, Poissons et Crustacés. 1838, in: Bull. Soc. Imp. Naturalistes de Moscou. Moscou 1839). This species does probably not occur in Czerniavsky's work „Crustacea Decapoda Pontica Littoralia" of 1884, but it has been mentioned by Dr. J. Thallwitz in his List of the Species of Palaemonidae (Decapoden-Studien, 1891, p. 7). The diagnosis of *P. brevirostris*, given by Andrzeiowski (l. c.), is the following: „rostro tetragono-ancipiti, maxillis breviore dentibus adpressis supra 6—7, subtus 1—2 minimis donato, digitis manui aequalibus".

3° *Leander imbellis* (Fischer) from the Bay of Arcachon. (P. Fischer, Crustacés Podophthalmaires etc. Paris, 1872, p. 20). This species is closely allied to *L. adspersus* (Rathke), but differs by the shorter rostrum, the lower margin of which is

smooth, presenting only a rudimentary denticulation near the apex. This species is not mentioned in the List of Dr. THALLWITZ.

4° *Leander Brandti* Czern. from the Bay of Sebastopol. (V. CZERNIAVSKY, l. c., p. 43, Tab. III, fig. 8). In this species the rostrum is lanceolate, does not reach beyond the antennal scales and is $\frac{5}{3}$ dentate; the 2d tooth is situated over the orbital margin and the apex is entire. Merus of 2d legs very long, carpus reaching beyond the antennal scales, palm hardly longer than fingers.

III. *Key to the described Species and Varieties.*

a' Mandibular palp two-jointed. Fingers of 2d legs little more than half as long as the palm, proportion 9 : 16. Three teeth on the carapace, the 4th tooth either immediately before or just above the orbital margin, rarely only two teeth are on the carapace with the 3d just over that margin. Second tooth of the upper margin just midway between the 1st and the 3d. Shorter ramus of outer antennular flagellum, the coalesced portion included, just as long as antennular peduncle. Carpus of 2d legs measuring more than two-thirds the length of the chela, often slightly longer than it.

b' Carpus of 2d legs longer than merus, usually distinctly longer than chela and rather slender, 8—9-times as long as thick distally.

Coalesced portion of shorter ramus of outer antennular flagellum either a little longer or a little shorter than the free portion, rarely of equal length.

Squilla (Linné) Typical form.

b'' Carpus of 2d legs usually a little shorter than chela and usually a little less slender than in the typical form.

c' Coalesced portion of shorter ramus of outer antennular flagellum usually distinctly shorter than the free portion.

Squilla (Linné), var. *intermedia* n.

c'' Coalesced portion of shorter ramus of outer antennular flagellum usually distinctly longer than the free portion.

Squilla (Linné), var. *elegans* (Rathke).

a'' Mandibular palp three-jointed. Fingers of 2d legs measuring more than two-thirds the length of the palm, sometimes even longer than it.

b' Carpus of 2d legs little shorter than chela, measuring more than two-thirds of it. [1])

c' Shorter ramus of outer antennular flagellum measuring more than two-thirds the length of antennular peduncle. [2]) Second tooth of the upper margin of the rostrum situated either immediately before the orbital margin or over it or just behind it, teeth of the upper margin not prominent.

d' Upper margin of rostrum usually armed with 5 teeth, lower margin with 4. [3]) The rostrum reaches, especially in young and middle-sized specimens, sometimes also in adult individuals, more or less far beyond the middle of shorter ramus of outer antennular flagellum (the coalesced portion included).

adspersus (Rathke) Typical form. [4])

d'' Upper margin of rostrum usually armed with 6, lower with 3 teeth. [3]) Shorter ramus of outer antennular flagellum usually reaching by more than half its length, the coalesced portion included, beyond apex of rostrum.

adspersus (Rathke), var. *Fabricii* (Rathke).

c'' Shorter ramus of outer antennular flagellum measuring

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1) Except sometimes in young male specimens of *Leander longirostris* (H. M.-Edw.). Vide p. 163.

2) In the Mediterranean form of *L. longirostris* (H. M.-Edw.) the shorter ramus seems to be longer than two-thirds the peduncle (Confer p. 164).

3) Not counting the apical tooth near apex of rostrum.

4) These characters of the typical form are taken from a rather small number (22) of specimens: the examination of a larger number from the Black Sea appears therefore desirable, in order to ascertain whether these characters are indeed constant.

invariably just two-thirds the length of the peduncle. Two teeth on the carapace behind the orbital margin, 3d tooth immediately before that margin, 2d tooth always one and a half as far distant from the 1st as from the 3d, teeth spiniform, prominent.

longirostris (H. M.-Edw.).

b'' Carpus of 2d legs considerably shorter than chela, measuring less than two-thirds its length. Rostrum distally more or less turned upwards, with a more or less long, distal portion of the upper margin unarmed.

c' Branchiostegal spine situated at the margin of the carapace. Fingers of 2d legs as long as or slightly shorter than carpus, only slightly longer or as long as palm.

d' Shorter ramus of outer antennular flagellum reaching about to apex of rostrum, though extending never more than 2,5 mm. beyond it. Second joint of mandibular palp in adult specimens 2,5 to 2,7-times as long as thick. *serratus* Penn.

d'' Shorter ramus of outer antennular flagellum reaching 4,5 to 6,5 mm. beyond apex of rostrum. Second joint of mandibular palp in adult specimens 1,7-times as long as thick.

serratus (Penn.), var. *Treilliana* (Risso).

c'' Branchiostegal spine a little remote from the margin of the carapace. Fingers of 2d legs a little longer than carpus, considerably longer than palm. Antennal flagella with dark and light rings. *xiphias* (Risso).

Leander Squilla (Linné) Typical form.

Pl. X, Fig. 1—1*n*.

Cancer Squilla, C. Linnaei Syst. Naturae, Ed. 10, 1758, p. 632.

Palaemon Squilla, J. C. Fabricii Suppl. Entom. System. 1798, p. 403.

Palaemon Squilla, H. Rathke, Beiträge z. Fauna Norwegens, 1843, p. 6, in: Verhandl. kais. Leop. Carol. Akad. Naturf. Bd. XII.

Palaemon Squilla, Fr. Meinert, Crustacea Isopoda, Amphipoda et Decapoda Daniae, 1877, p. 200.

Leander Squilla, A. Appellöf, Die Dekapoden Crustaceen, in: Meeresfauna von Bergen, Heft 2 u. 3, 1906, p. 126.

2 adult females, one of which is ova-bearing, collected June 1902 at Bergen, Norway, at the coast near the Biological Station and received from Dr. O. Nordgaard at Trondhjem.

46 specimens, viz. 14 adult ova-bearing females, 3 younger females without eggs and 29 males, that are of a somewhat smaller size than the females and probably not yet adult, collected June 1914 in the Svendborg Sund at a depth of one meter and received from the Danske Biologiske Station at Copenhagen.

3 females with eggs, one without eggs and 2 young males from Denmark, presented by Dr. K. Stephensen.

The examination of the large collection of 250 specimens of *Leander Squilla* from different parts of Europe, now in my possession, has proved and brought to light, not only that the form from the Black Sea ought to be regarded as a distinct variety, but even that the specimens from the Coast of Holland, from the Channel and from Great-Britain also differ by some distinct characters from the species that inhabits the seas of Scandinavia, so that the former must be distinguished as a second variety. The Scandinavian species, however, is regarded by me as the true *Leander Squilla* of Linnaeus, for he says (l. c.): „Habitat in M. Balthico, Oceano Europaeo".

The adult ova-bearing female attains a length of 60 mm., but females, only 36 mm. long, are already provided with eggs; the eggs are 0,6—0,7 mm. long. The male specimens are of a *smaller* size, the largest measuring 45 mm., and the male of *L. Squilla* certainly does not attain the length of the female. The convexity

of the upper border of the carapace is somewhat variable and this is also the case with the shape and the toothing of the rostrum. The rostrum of the Scandinavian specimens (Fig. 1—1*c*) usually extends *just as far forwards* as the antennal scales, very rarely (in 5 of the 54 specimens) it was a little shorter, reaching as far as the terminal spine of the scaphocerites, in 2 males the rostrum did extend to the distal extremity of the antennular peduncle and only in 3 specimens it reached 0,5 to 0,75 mm. *beyond* the antennal scales. The proximal half of the free part of the rostrum is generally slightly directed downward, the distal half more or less upwards, so that the apex of the rostrum in some specimens, especially in those in which the carapace is much arched longitudinally, is situated below the level of the upper border of the carapace, in other ones just as high as this border or reaching above it. Sometimes the rostrum appears practically straight and in this case either slightly directed downwards, like in a male long 42 mm., or slightly trending upwards, like in a male long 38 mm.

The rostral formulae of 54 specimens were the following:

$\frac{\overset{3}{9} + 1}{4}$ one specimen, an adult ova-bearing female.

$\frac{\overset{3}{9} + 1}{3}$ four specimens, $\frac{\overset{3}{8} + 2}{3}$ four specimens.

$\frac{\overset{2}{9} + 1}{3}$ one specimen, $\frac{\overset{3}{8} + 1}{3}$ eighteen specimens.

$\frac{\overset{3}{9} + 0}{3}$ two specimens, $\frac{\overset{2}{8} + 1}{3}$ three specimens.

$\frac{\overset{2}{9} + 0}{3}$ one specimen, $\frac{\overset{3}{7} + 2}{3}$ one specimen.

$\frac{\overset{3}{9}}{2}$ one specimen (♂), $\frac{7 + 1}{3}$ thirteen specimens.

$\frac{\overset{2}{7} + 1}{3}$ two specimens, $\frac{\overset{3}{6} + 1}{3}$ one specimen (ova-bearing).

$\frac{^{2}7+1}{2}$ one specimen, $\frac{^{2}5+1}{2}$ one specimen (female without eggs).

We conclude from this list that $\frac{^{3}8+1}{3}$ and $\frac{^{3}7+1}{3}$ are the most common formulae and that the upper margin is usually armed with *eight* teeth, not counting the apical tooth, for this number occurs in 25 specimens, i. e. in 46 per cent. In 17 specimens, i. e. in 31 per cent., *seven* teeth were observed, *nine* teeth were rather rare, viz. in 18 per cent., while rostra with *six* or *five* teeth are a quite rare exception. Almost as a rule *three* teeth are observed on the lower margin, viz. in 92 per cent. of all the specimens, only one adult female presented four teeth and two teeth were only seen in 3 young specimens. In 45 of the 54 specimens, i. e. in 83 per cent., the rostrum presented one single apical tooth, only in 5 specimens, i. e. in 9 per cent., two apical teeth did occur, in 3 there was no apical tooth at all and in one young male the nine teeth were situated regularly to the tip. *Almost generally three* teeth are situated on the carapace *behind* the orbital margin, namely in 43 specimens, i. e. in 80 per cent.; the 4th tooth is then situated either immediately before or just above that margin; rarely, viz. in 10 specimens, i. e. in 18 per cent., only *two* teeth were situated on the carapace and the 3d *just above* the orbital margin. The rostral teeth much resemble those of *L. longirostris* (H. M.-Edw.), but, while in this species the 2d tooth is *invariably* one and a half as far distant from the 1st as the 2d from the 3d, in *L. Squilla* the 2d tooth is almost constantly situated *just midway* between the 1st and the 3d, rarely, as in two egg-bearing females from the Svendborg Sund, the 2d tooth is a little farther distant from the 3d as from the 1st and only in one single young male from the same locality the 2d tooth proved to be one and a half as far distant from the 1st as from the 3d, like in *L. longirostris*. The following teeth of the upper margin are placed usually a little closer together, often the foremost one excepted, and the

distance between the foremost tooth and the apical tooth varies rather much, so that sometimes the foremost tooth is situated just midway between the apex of the rostrum and the orbital margin, in other specimens, however, beyond the middle. The 1st tooth of the upper margin is situated a little before the middle of the carapace, its distance from the posterior margin being twice or a little more than twice as long as its distance from the orbital margin. Near the slightly falcate first tooth of the lower margin that part of the rostrum which is situated beneath the lateral crest, appears about one and a half as broad or high as that part which is situated above it.

Nearly as in *L. longirostris* the rostrum, like also other parts of the body and of the legs, as e. g. the posterior margin of the segments of the abdomen, the caudal fan etc., is sprinkled with small reddish dots (chromatophores?), though in most specimens they are disappeared.

Antennal and branchiostegal spines small, especially the latter, that has *a smaller size* than in *L. longirostris*. Telson (Fig. 1*d* and 1*e*) a little longer than 6th segment of abdomen, in the same proportion as in *L. longirostris*, but *both this segment and the telson, like also the uropods, present a somewhat stouter form, being slightly broader in proportion to their length than in L. longirostris* (Plate XII, Fig. 3*d*).

In the male (Fig. 1*f*) the antennular peduncle reaches to midway between the distal extremity of the antennal scale and that of the spine in which terminates the lateral margin of the scaphocerite; sometimes it is slightly shorter, not yet reaching that spine, but in this case the peduncle measures, however, always at least 6/7 the distance between the orbital margin and the tip of the scale. In the female (Fig. 1 *g*) the antennular peduncle is *much shorter* and measures only *three-quarters* that distance. The shorter ramus of the outer flagellum, the coalesced part included, appears *just as long* as the antennular peduncle, measured from the orbital margin. The coalesced portion appears *either a little longer* (Fig. 1*h*) *or a little shorter* (Fig. 1*g*) *than*

the free portion, more rarely both are of equal length: of the 54 specimens that are lying before me, in *twenty five* the fused portion was distinctly *longer* than the free, in *eighteen* the free portion was clearly *longer* than the coalesced part and in *eleven* specimens both portions seemed to be nearly of equal length. The coalesced portion consists, in adult individuals, of 15 to 18 articles, in younger individuals their number is smaller, 14 to 11. As the rostrum appears, in the typical form, in general just as long as the antennal scales, the antennular peduncle little shorter than the scaphocerite and just as long as the shorter ramus, the coalesced portion included, it is obvious that by far the greatest part of the shorter ramus invariably extends beyond the apex of rostrum.

Antennal peduncle as long as 1st joint of peduncle of antennula. The scale that measures about one-fifth the length of the body, shows its greatest width near the base, the length of the scale being in proportion to the greatest width as 25 : 7; outer margin nearly straight, inner margin slightly concave, antero-internal angle obtuse. Mandibular palp two-jointed; in an adult, ova-bearing female from the Svendborg Sund the terminal joint (Fig. 1*i*) is 0,56 mm. long and 0,125 mm. broad at base, while the basal joint is 0,35 mm. long. The mandibular palp was examined by me in one male and three ova-bearing females from Svendborg Sund, in one ova-bearing female from Denmark and in one adult female from Bergen, Norway: in all these specimens it proved to be two-jointed, but in one ova-bearing female from Svendborg Sund (Fig. 1*j*) the palp was distinctly *three*-jointed. The terminal joint was 0,57 mm. long and its form was the same as in the other specimens; the 2d joint, a little shorter than the basal joint, was 0,24 mm. long and 0,18 mm. thick. This appearance of a three-jointed palp is, indeed, a remarkable observation.

The external maxillipeds extend as far forwards as the antennal peduncle or reach with one-third or one-quarter the terminal joint beyond it.

In the male the legs of the 1st pair are as long as the antennal scales, in the adult female they usually reach with the fingers beyond them; in the adult female the carpus is a little more than twice as long as the chela, the fingers slightly shorter than the palm.

The 2d legs (Fig. 1*k*—1*n*), stronger and longer than the legs of the 1st pair, extend in the adult, ova-bearing female with the chela and with one-fourth or one-fifth of the carpus beyond the antennal scales, in the younger females, as e. g. in an ova-bearing specimen, long 39 mm., the carpus of the 2d legs extends only as far as the terminal spine of the scaphocerite, so that only the fingers and two-thirds of the palm reach beyond the tip of the scales; in the male specimens, that are of a smaller size, only the chela projects beyond the scale or even only a part of it. *Almost as a rule in the typical form the carpus appears distinctly longer than the chela.* In 41 of the 45 Scandinavian specimens, in which the legs of the 2d pair were still present, i. e. in 91 per cent., this fact was observed: only in *two* ova-bearing females from Denmark and in one young male from Svendborg Sund the carpus proved to be just as long as the chela and only in *one* almost adult female without eggs from Denmark the chela was slightly longer than the carpus: in this female, long 50 mm., the coalesced portion of the shorter ramus of the outer flagellum was about one and a half as long as the free portion, also in other respects this female proved to be quite typical. The carpus, which is longer than the merus, appears of a *rather slender* form, 8- to 9-times as long as thick at its distal extremity. *Fingers litlle more than half as long as the palm*, the proportion being as 9 : 16 (Fig. 1*l*), palm slightly more than 4- to almost 5-times as long as wide. The fingers (Fig. 1*m*) are armed with a small tooth at the proximal end of their cutting-edge as usual, while the dactylus bears, moreover, a tooth near the articulation.

The three ambulatory legs are rather stout. In the adult female those of the 3d pair reach to the distal extremity of the antennal scales, while those of the 5th are hardly shorter, reaching as

far forwards as the terminal spine of the scaphocerites; often, however, these legs are shorter, those of the 3d pair reaching in the adult female only to the end of the antennular peduncle, while the fifth are almost as long; such shorter legs are also observed in the male and in younger female individuals.

General distribution: Sweden (Goës); The Baltic (Linnaeus); Kattegat, Samsøbelt, Svendborg Sund (Meinert); near Molde and Christian Sund, Norway (Rathke); West Coast of Norway, south of Stat (Appellöf).

Leander Squilla (Linné), var. *intermedia* n. [1])

Plate X, Fig. 1*o*—1*v*.

Palaemon squilla, H. Milne Edwards, Hist. Nat. Crustacés, II, 1837, p. 390.

Palaemon squilla, H. Milne Edwards, in: Le Règne Animal par G. Cuvier, 3e Édit. p. 146. [2])

Palaemon Squilla, Th. Bell, A History of the British Stalk-eyed Crustacea, London 1853, p. 305. [3])

Palaemon squilla, P. Fischer, Crustacés Podophthalmaires et Cirrhipèdes du Département de la Gironde et des côtes du sud-ouest de la France, Paris 1872, p. 19 (Actes de la Société Linnéenne de Bordeaux, t. XXVIII, 5e liv.)

Palaemon squilla, A. M. Norman and G. S. Brady, The Crustacea of Northumberland and Durham, in: Trans. Nat. Hist. Soc. of Northumberland, Durham and Newcastle-upon-Tyne, New Series, Vol. III, Part 2, 1909, p. 21.

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1) The species which has been figured in 1765 by Job Baster (Natuurkundige Uitspanningen, Deel II, Tab. III, Fig. V, VI), is no doubt the well-known *Palaemonetes varians* (Leach), which is very common in the brackish waters of the Province of Zeeland; his description, however, at p. 33, seems to deal with a species of *Leander*, for the upper margin of the rostrum is described as presenting 6 or 8 incisions.

2) The words „Les doigts des serres sont un peu plus longs que la main" in this description are, of course, a clerical error, which, however, could give rise to confusion.

3) Bell's species is referred to *L. Squilla* and not to *L. longirostris*, because in his figure the 2d tooth of the upper margin of the rostrum is distinctly situated *just midway* between the 1st and the 3d, a character that never occurs in *L. longirostris* (H. M.-Edw.).

Palaemon Squilla, A. M. Norman and Th. Scott, The Crustacea of Devon and Cornwall, London, 1906, p. 20.

Leander squilla, Stanley Kemp, The Decapoda Natantia of the Coasts of Ireland, Dublin, 1910, in: Fisheries, Ireland, Sci. Invest., 1908, I (1910), p. 129 and 132, Pl. XX, figs. 3, *a*—*e*.

Leander squilla, G. P. Farran, Decapoda, Clare Island Survey, Part 40, Dublin, 1912, p. 40, in: Proc. Royal Irish Acad. Vol. XXXI.

Nec: *Palaemon squilla*, P. P. C. Hoek, in: Tijdschrift Ned. Dierk. Vereen. (2) Deel I, 1887, p. 100.

Nec: *Leander squilla*, J. J. Tesch, Decapode Crustaceen, ten deele verzameld met de „Wodan", in: Bijdragen tot de Fauna der Zuidelijke Noordzee, IV, 1908, p. 7.

Nec: *Palaemon squilla*, J. J. Tesch, in: Tijdschrift Ned. Dierk. Vereen. (2) Deel XII, 1913, p. LXXXVIII—LXXXIX.

36 specimens, viz. 15 males and 21 females, 7 of which are young, captured February 1914 in the Oosterschelde near Ierseke.

26 specimens, viz. 14 males and 12 females, 9 of which are ova-bearing, collected in the port of the „Goesche Sas" (Sluice of Goes), Oosterschelde, June 1914.

8 females without eggs, but nearly adult, collected September 1913, in the Oosterschelde, off Kats, near low-water mark.

1 almost adult female without eggs, collected October 1913 in the Oosterschelde.

6 specimens, viz. 3 males and 3 females without eggs, from Plymouth, received from the Marine Biological Laboratory: these specimens are of medium size or young.

22 specimens of medium size, viz. 14 males and 8 females, 6 of which are ova-bearing, from Brixham, Tor Bay, received from Mr. F. W. Millett.

3 adult females without eggs, collected at Le Portel, Straits of Calais, and presented by Prof. Hallez of Lille.

8 specimens, viz. 2 young males and 6 adult females without eggs from the Straits of Calais and presented by Prof. Hallez.

This new variety, which hitherto has been regarded by the authors as the true *L. Squilla* (Linné), may easily be distinguished from the typical form of Scandinavia by the characters of the shorter ramus of the outer antennular flagellum and of the 2d legs. Unnecessary to add that it was just the large number of specimens at my disposal which has enabled me to establish the constancy of the characters on which these varieties are founded.

Like in the typical form, the male has a *somewhat smaller* size than the adult, ova-bearing female: the largest female with eggs from the Goesche Sas is 62 mm. long, the male does not surpass the length of 45 mm. The smallest female with eggs from the Oosterschelde is 51 mm. long, but the ova-bearing females from Tor Bay are much smaller, measuring only 35 to 40 mm., a difference of length that we also have observed in the typical form.

As regards the length of the rostrum (Fig. 1*o*—1*q*) in proportion to the antennal scales, the variety *intermedia* agrees with the typical form, though the rostrum sometimes already slightly reaches beyond the scales, a character which in the variety *elegans* is usually observed: in 60 of 98 specimens of the variety *intermedia*, i. e. in 61 per cent., the rostrum appears just as long as the scales, in 25 specimens, i. e. in 25,5 per cent., it reaches only as far as the terminal spine of the scales, but in 13 specimens, i. e. almost in 14 per cent., the rostrum extends already 0,5 to 1,25 mm. *beyond* their distal extremity. The rostral formulae of 106 specimens were the following:

$\frac{12^{3}}{2}$ one specimen, $\frac{8^{3}+1}{3}$ fifty three specimens.

$\frac{9^{4}+1}{3}$ one specimen, $\frac{8^{2}+1}{3}$ five specimens.

$\frac{9+1^{3}}{3}$ fourteen specimens, $\frac{8+1^{3}}{2}$ one specimen.

$\frac{9^{2}+1}{3}$ one specimen, $\frac{8^{3}+0}{3}$ five specimens.

$\frac{^{3}9+0}{3}$ three specimens, $\frac{^{3}7+2}{3}$ two specimens.

$\frac{^{3}9}{3}$ two specimens, $\frac{^{2}7+2}{3}$ one specimen.

$\frac{^{3}8+1}{4}$ two specimens, $\frac{^{3}7+1}{3}$ nine specimens.

$\frac{^{3}8+2}{3}$ four specimens, $\frac{^{3}7+0}{3}$ two specimens.

The formulae present the same diversity as in the typical form, here also the formula $\frac{^{3}8+1}{3}$ most times occurs, while $\frac{^{3}9+1}{3}$ and $\frac{^{2}7+1}{3}$ are also not rather rare. In one young male from Brixham, 39 mm. long, the rostrum (Fig. 1*r*) that reaches as far as the terminal spine of the scales and that is straightly and obliquely directed upwards from the orbital margin to the tip, is armed above with 12 teeth, beneath with 2 and presents therefore certainly a rare exception: the first nine teeth are typical, 3 on the carapace, the 4th just before the orbital margin, but, in stead of 1 or 2 apical teeth, one observes three small teeth between the 9th tooth and the apex of rostrum, the 10th tooth situated as close to the 9th as to the following, so that these teeth cannot be considered as „apical" teeth.

We conclude furthermore from these formulae, that, like in the typical form, the upper margin is usually armed with *eight* teeth (in 66 per cent. of the specimens), more rarely with *nine* (20 per cent.) or with *seven* (13 per cent.), — that the rostrum usually bears one apical tooth (81 per cent. of the specimens), rarely two apical teeth (6,6 per cent.) or no apical tooth at all (9,4 per cent.) and that only in 3 specimens the teeth are placed regularly to the tip. In 92 per cent. of the specimens invariably *three* teeth are placed on the carapace, the 4th just before or just above the orbital margin; in 7 specimens *two* teeth proved

to be situated on the carapace, i. e. in 6,6 per cent. The 1st tooth of the upper margin is one and a half to two-times as far distant from the posterior margin of the carapace as from the anterior. Only in 2 specimens from Brixham the lower margin was armed with four teeth and in the already described specimen from the same locality with the formula $\frac{12^{3}}{2}$, like also in a male from the Oosterschelde, the lower margin presented two teeth, so that *three* teeth prove to occur generally. As regards the form of the rostrum, this variety resembles the typical species, though the upper margin appears often quite straight with the apex trending not at all upwards (Fig. 1*o*, 1*p*).

In the middle-sized specimens from Brixham the straight-lined rostrum is often obliquely directed upwards from the orbital margin to the tip (Fig. 1*q*).

The small red dots with which the rostrum and other parts of the body of the Scandinavian specimens proved to be sometimes marked, seem to want in the variety *intermedia* (STANLEY KEMP, l. c. p. 129), though it is possible that these dots disappear by the influence of the spirits in which the specimens are preserved; this different influence on the specimens is proved by the fact that all the specimens from the Oosterschelde are straw- or cream-coloured, those from the English Channel yellow-whitish, those from Brixham like also the specimens from Svendborg Sund gold-yellow.

As regards the antennal and branchiostegal spines and the abdomen with the caudal fan the variety *intermedia* fully agrees with the typical form.

Like in the latter the antennular peduncle appears, with regard to the antennal scale, somewhat *longer* in the male than in the female and the shorter ramus, the coalesced portion included, appears *just as long* as the peduncle.

While in the typical form the coalesced portion appears as often a little longer as a little shorter than the free portion, in the variety *intermedia* the coalesced portion is generally *distinctly*

shorter than the free part (S. KEMP, l. c. Fig. 3*d*), more rarely both are nearly of the same length and it is only a very rare exception when the free portion of the ramus is shorter than the rest. So in 38 of 63 specimens from the Oosterschelde (i. e. in 60 per cent.) the fused portion proved to be distinctly shorter than the free, in 21 (i. e. in 33 per cent.) both portions were about of equal length, but only in 4 specimens (i. e. in 6,3 per cent.) the coalesced portion was distinctly longer than the rest. As regards the other localities, in 21 of 33 specimens (i. e. in 64 per cent.) the fused part was clearly shorter than the free, in 7 (i. e. in 21 per cent.) both portions were nearly of equal length and in 3 ova-bearing females from Brixham and in an adult female (Fig. 1*s*) without eggs from the Straits of Calais (i. e. in 12 per cent.) the free portion was distinctly shorter than the rest, in one specimen from Brixham, finally, the shorter ramus was fused to the outer flagellum almost for its whole length.

The antennal scale has the same form as in the typical species. Mandibular palp two-jointed (S. KEMP, l. c. Fig. 3*b*).

The external maxillipeds and the legs agree with those of the typical form, except the legs of the 2^{d} pair.

These legs reach as far forwards as in the Scandinavian specimens; a rare exception, no doubt, is presented by an adult female, long 62 mm., from Le Portel, for in this specimen the left carpus extends only with one-fourth, the right only with one-fifth its length beyond the antennal peduncles, so that the left chela projects only with the fingers, the right only with one-third of the fingers beyond the scales. Otherwise as in the typical species, in the variety *intermedia the carpus of 2^{d} legs appears almost generally a little shorter than the chela* (Fig. 1*t*), rarely just as long, but it is quite a little wonder to observe a specimen in which the carpus is longer than the chela. In 56 of the 66 specimens from the Oosterschelde, i. e. in 85 per cent., the carpus proved to be slightly shorter than the chela and only in 9 specimens, i. e. in 14 per cent., it was about as long as the chela, though not longer; as regards the specimens from the other

localities, in 31 of the 33 specimens, i. e. in 94 per cent., the carpus was slightly shorter than the chela, in 2 nearly of equal length. Only in one single young male from the Oosterschelde the carpus proved to be slightly longer than the chela. In this variety the carpus of 2d legs usually appears *a little less slender* (Fig. 1*v*) than in the typical species, only 6 to 7-times as long as thick at the distal extremity: with regard to this character I must, however, remark, that the carpus varies rather much and in some individuals it shows the same slender form (Fig. 1*u*) as in the typical *L. Squilla* from Scandinavia. The shape of the chela and the relative length of the fingers are the same as in the typical species.

General distribution: The variety *intermedia* is at present with certainty known from the coast of the dutch province of Zeeland, from the English Channel (Le Portel, Straits of Calais, South-coast of England) and occurs also all round the Irish Coast, according to the observations of Leach, H. Milne Edwards, Couch, Th. Bell, Canon Norman, Stanley Kemp and myself. According to Stanley Kemp it occurs also in Scotch waters, but it appears now desirable to examine whether the Scotch form belongs to the variety *intermedia* or to the typical species of Norway.

The variety *intermedia* occurs, no doubt, also on the whole west coast of France and perhaps should the specimens from Portugal, recorded by B. Osorio, in: Jornal Sciencias Math., Phys. e Nat. 2a Serie N0 I, Lisboa, 1889, p. 64, also be referred to it.

Leander Squilla (Linné), var. *elegans* Rathke.

Pl. XI, Fig. 1*w*—1*z*4.

Palaemon elegans, H. Rathke, Zur Fauna der Krym, Ein Beitrag, in: Mémoires présentés à l'Acad. Imp. Sciences de Saint-Pétersbourg par divers savans et lus dans ses assemblées. T. III, St. Pétersbourg 1837, p. 370, Tab. IV, fig. 5.

Palaemon squilla, J. Dana, Unit. States Explor. Exped. Crustacea, 1852, p. 586, pl. 38, fig. 9.

Palaemon squilla, C. HELLER, Die Crustaceen des südlichen Europa, Wien 1863, p. 267.

Leander squilla, V. CZERNIAVSKY, Crust. Decap. Pontica littoralia, Charkow 1884, p. 48.

Palaemon squilla, J. V. CARUS, Prodromus Faunae Medit. Stuttgart 1885, p. 474.

Leander squilla, A. ORTMANN, in: Zool. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 522, Taf. XXXVII, fig. 15 (partim) and in: Ergebn. Plankton-Exped. der Humboldt-Stiftung, Kiel und Leipzig, 1893, p. 47.

Leander squilla, A. SENNA, in: Bull. Soc. Entomol. Italiana, Vol. XXXIV, Firenze, 1903, p. 327.

Leander squilla, TH. R. R. STEBBING, in: Annals South African Museum, Vol. VI, London, 1910, p. 386 and in: Trans. Royal Soc. Edinburgh, vol. L, Part. II (N° 9), Edinburgh 1914, p. 286.

65 specimens, all of medium size or still younger, except one female with eggs, from the Bay of Sebastopol, Black Sea, presented to me by mr. S. A. ZERNÓV of the Biological Station in that town.

19 specimens, all young or of medium size, except one ova-bearing female, from Rovigno, Adriatic, collected by and received May 1914 from Dr. TH. KRUMBACH of the Zoological Station in that town.

I am much indebted to Messr. KRUMBACH and ZERNÓV for having kindly sent me, upon my request, a sufficiently large number of specimens of *L. Squilla*, respectively from the Adriatic and from the Bay of Sebastopol, but it is a great pity that all these numerous specimens are young, except one single ova-bearing female from either locality. Nevertheless it is certain that the species which inhabits the Black Sea, must be considered as a proper variety, which must bear the name of *elegans*, because it is identical with RATHKE's *P. elegans* of 1837. To this variety probably also belongs the species that occurs in the Adriatic and

in the Mediterranean, near Madeira, the Canaries and near St. Vincent in the Cape Verde Islands, but the few specimens from Naples do not enable me to substantiate this supposition.

The only egg-bearing female from the Bay of Sebastopol is 46 mm. long, the same length is indicated by RATHKE for his *P. elegans*. This variety differs in the first place from the typical species and from the variety *intermedia by the rostrum* (Fig. 1*w*—1*y*) *extending almost generally more or less beyond the antennal scales*: in 45 of 60 specimens from the Bay of Sebastopol, i. e. in 75 per cent., the rostrum projects 0,5 to 1,25 mm. *beyond* the tip of the antennal scales, only in 14 specimens, i. e. in 23 per cent., it is just as long as the latter and only in one very young individual the rostrum did not yet reach to their distal extremity. In the ova-bearing female from Rovigno, which, like the ova-bearing specimens from Brixham, is of a small size, only 35 mm. long, in the ova-bearing females from Naples that measure 45—52 mm. and nearly in all the young individuals from Rovigno, the rostrum appears, however, as long as the scales, but in the specimen from Madeira that Dana has figured, it distinctly projects beyond them.

The formulae of 57 specimens from the Bay of Sebastopol are the following:

$\frac{3}{9+1}$ one specimen, $\frac{2 \text{ or } 3}{8+1}$ twenty six specimens.

$\frac{2}{9+1}$ one specimen, $\frac{2}{8+0}$ one young specimen.

$\frac{2 \text{ or } 3}{8+2}$ four specimens, $\frac{2 \text{ or } 3}{7+2}$ six specimens.

$\frac{2 \text{ or } 3}{8+1}$ eight specimens, $\frac{2 \text{ or } 3}{7+1}$ ten specimens.

The diversity of these formulae is not so great as in the variety *intermedia*; the formula $\frac{8+1}{3}$ here also mostly occurs, more rarely the formulae $\frac{7+1}{3}$ and $\frac{8+1}{4}$, so that in *L. Squilla*

and its two varieties the rostrum is most times $\frac{8+1}{3}$ toothed; the formula $\frac{9+1}{3}$, not rare in the variety *intermedia*, is, among the Black Sea specimens, only presented by one single specimen, but, on the contrary, the formula $\frac{8+1}{4}$ is observed in 14 per cent. of the specimens. Also, like in the typical form and in the variety *intermedia*, the upper margin is usually armed with *eight* teeth, viz. in 69 per cent. of the specimens, more rarely with *seven*, namely in 28 per cent., but only in 2 specimens, i. e. in $3^1/_2$ per cent., with *nine*: in the variety *intermedia*, however, in 20 per cent. of the specimens the rostrum was armed with nine teeth. In 80 per cent. of the specimens only one apical tooth occurs, as in the typical species and as in the variety *intermedia*, but in 18 per cent. the rostrum presented two apical teeth, in a larger percentage, therefore, than in the specimens from the west coast of Europe; only in one young individual there was no apical tooth at all. In 77 per cent. of the specimens the lower margin is armed with *three*, but in 23 per cent. with *four* teeth: while a rostrum with 4 teeth on the lower margin appears, in the typical species and in the variety *intermedia*, as a great exception, in the variety *elegans no less than 23 per cent. of the specimens are armed with four teeth on the lower margin*, a fact which therefore appears to be characteristic of this variety. Specimens with only two teeth on the lower margin do no more occur. In the larger specimens from the Bay of Sebastopol *three* teeth are situated on the carapace, the 4th tooth just before the orbital margin, but in the youngest individuals, measuring 20 mm. or less, only *two* teeth are placed on the carapace and the 3d tooth either just above or just before the orbital margin. The 1st tooth of the upper margin is $1^1/_4$—$1^1/_2$-times as far distant from the posterior margin of the carapace as from the orbital margin. The shape of the rostrum is also characteristic, because, in the Black Sea specimens, *the distal half is invariably and rather strongly trending upwards*.

In the specimens from Rovigno the rostrum has the same form as in those from the Black Sea and the toothing-formulae of 16 individuals are the following:

$\frac{\overset{3}{9}+1}{3}$ three specimens, $\frac{\overset{3}{7}+2}{3}$ one specimen.

$\frac{\overset{3}{8}+2}{3}$ two specimens, $\frac{\overset{3}{7}+1}{3}$ two specimens.

$\frac{\overset{3}{8}+1}{3}$ seven specimens, $\frac{\overset{3}{7}+1}{2}$ one specimen.

The formula $\frac{\overset{3}{8}+1}{3}$ here again most times occurs. In more than half the number of the specimens, in 56 per cent., the upper margin is armed with *eight* teeth, in 25 per cent. with *seven*, and *nine* teeth are only observed in 3 specimens. In one young individual the lower margin presents *two* teeth, in all the others *three*; in 81 per cent. of the specimens there is one apical tooth, in 19 per cent. two apical teeth occur. In the small egg-bearing specimen from Rovigno not only three teeth are situated on the carapace, but even the 4th arises still from it, its apex, however, distinctly reaches beyond the orbital margin; in the larger specimens the 4th tooth is just placed over the orbital margin, in the younger individuals just before it. In the ova-bearing specimen the 1st tooth is one-fourth farther distant from the posterior than from the anterior margin of the carapace, this is also the case in the other specimens or at the utmost the distance from the posterior margin appears one and a half as long as the distance from the anterior or little more.

In the 5 specimens from Naples, finally, the rostrum is $\frac{\overset{3}{8}+1}{3}$ dentate, in one specimen the 4th tooth arises still from the carapace, but the apex projects beyond the orbital margin, in 3 specimens the 4th tooth is situated just over the orbital margin and in the last specimen immediately before it; in these 5 specimens the distal half of the rostrum is rather strongly trending upwards.

The 1st tooth is situated $1^1/_4$ to $1^1/_2$-times as far from the posterior as from the anterior margin.

Carapace and abdomen resemble those of the specimens from the west coast of Europe.

The variety *elegans* of the Black Sea is furthermore characterized by the shorter ramus of the outer antennular flagellum, *the coalesced portion* (Fig. 1*z*) *of which appears invariably distinctly longer than the free portion*: in all the specimens from the Bay of Sebastopol this character is observed, except only in the ova-bearing specimen, where both portions seem to be of equal length. Twelve of 14 specimens from Rovigno show the same proportion of the coalesced part to the free, in 2 specimens both portions seem to be of equal length. As regards, finally, the 5 specimens from the Gulf of Naples, the fused portion appears in two distinctly longer, in one distinctly shorter than the free part, while in two females both portions are of equal length. That specimen from Naples, in which only *three sevenths* (Fig. 1_{z^1}) of the shorter ramus are coalesced, is a female with eggs, long 48 mm.: such specimens are in the Mediterranean probably still rare, while the relative number of specimens in which the free portion appears as long or longer than the coalesced, will prove to increase, as I suppose, in the western parts of the Mediteranean and on the coast of Portugal, this variety passing then gradually northward into the variety *intermedia*.

Mandibular palp two-jointed, agreeing with Kemp's figure 3*b* (l. c.); in a young specimen, long 37 mm., from the Bay of Sebastopol the terminal joint, as long as the basal one, is 0,4 mm. long and 5-times as long as thick at its base.

As regards the external maxillipeds and the legs this variety does not differ from the variety *intermedia*. In 64 specimens from the Bay of Sebastopol the carpus of 2d legs appears *slightly shorter* than the chela (Fig. 1_{z^2}), except in 2 quite young specimens in which both are of equal length; the shape is also the same, so e. g. the carpus of the ova-bearing female is 6-times as long as thick at the distal extremity. As regards the 11 spe-

cimens from Rovigno, the carpus appears in the small ova-bearing female and in four other young specimens shorter than the chela, in five just as long as the chela and in one young individual, measuring 34 mm., the carpus (Fig. 1_{z^4}), which is 6,5-times as long as thick at the distal extremity, appears even slightly longer than it, a great exception, no doubt. In three of the 5 specimens from Naples the carpus is slightly shorter than the chela, in two both are of equal length. Fingers a little more than half as long as the palm.

At p. 126 an adult female, without eggs, from Denmark is described; the 2d legs of this female fully resemble those of the ova-bearing female from the Bay of Sebastopol, the carpus being slightly shorter than the chela; in this female the coalesced portion of the shorter ramus of the outer flagellum is longer than the free part, so that this female agrees in both these characters with the variety *elegans*. The rostrum, however, $\frac{\overset{3}{8}+2}{3}$ dentate, is *just as long* as the antennal scales and the 1st tooth is *twice* as far distant from the posterior as from the anterior margin of the carapace.

It appears desirable to examine whether the type species and the two varieties perhaps also differ by the colour of living specimens.

General distribution: Black Sea, near Sudagh and Cape Porthenion (Rathke), Odessa (Andrzeiowski); Mediterranean: Greece (Guérin), Cyprus (Heller), Algiers (Lucas), Taranto (Costa), Naples (Carus), Adriatic (Heller), South coast of Sardinia (Senna), Spezzia and Viareggio (Targioni Tozzetti), Nizza, Livorno, Messina (Ortmann).

Azores (Barrois); Madeira (Dana); Canaries (Brullé); St. Vincent, Cape Verde Islands (Ortmann, Stebbing).

Whether the specimen, recorded by the Rev. Stebbing, (l. c.), from a salt lake or „Vlei" in False Bay, South Africa, should also be referred to *L. Squilla*, appears somewhat doubtful, because two teeth of the rostrum are placed behind the eyes and because the telson bears three latero-dorsal pairs of minute spines.

Leander adspersus (Rathke).

Pl. XI, Fig. 2—2*f*.

Palaemon adspersus, H. Rathke, Zur Fauna der Krym. Ein Beitrag, in: Mémoires prés. à l'Acad. Imp. des Sciences de Saint-Pétersbourg par divers savans et lus dans ses assemblées. T. III. St. Pétersb. 1837, p. 368, Tab. IV, fig. 4.

Leander rectirostris, V. Czerniavsky, Crust. Decapoda Pontica littoralia. Charkow 1884, p. 40.

23 specimens, 8 of which are adult ova-bearing females, collected April 1914 in the Bay of Sebastopol, Black Sea, presented by Mr. S. Zernóv of the Biological Station of Sebastopol.

The largest specimens, ova-bearing females, are 75 mm. long and fully agree with Rathke's description. Their rostral formulae are the following:

$\frac{7+1}{4}$ one specimen, $\frac{5+2}{5}$ one specimen.

$\frac{6+1}{5}$ one specimen, $\frac{5+1}{4}$ seven specimens.

$\frac{6+1}{4}$ seven specimens, $\frac{5+1}{3}$ two specimens.

$\frac{6+1}{3}$ two specimens, $\frac{4+1}{4}$ one specimen.

We conclude from these formulae that in the typical species which inhabits the Black Sea, the lower margin of the rostrum (Fig. 2—2*b*) is usually armed with *four* teeth, rarely with *three*, as already stated by Rathke, while five teeth are a great exception. In 10 specimens the upper margin is armed with six teeth, in 10 with five: according to Rathke's description, however, the usual number should be *five*. The 2^{d} tooth of the upper margin is situated slightly before the orbital margin or immediately over it, but even in the latter case the apex of the tooth is invariably situated before the orbital margin. One observes

constantly a small apical tooth, that forms the upper part of the bifid apex, quite exceptionally two apical teeth occur. In all the specimens the rostrum slightly reaches beyond the antennal scales by 0,5 to 2,5 mm. The proximal part of the rostrum is generally a little directed downwards and the distal part more or less upwards, so that the apex of the rostrum is situated in the same horizontal line as the upper margin of the cephalothorax, sometimes below, often, however, above that margin.

In most specimens, especially those of medium size and young, the shorter ramus (Fig. 2*e*) of the outer antennular flagellum reaches only *by one-third to one-half* its length, the fused portion included, beyond the apex of rostrum; in 4 adult female and in 2 young specimens, however, about two-thirds of the shorter ramus reach beyond it, so that in these specimens nearly the whole free portion of the ramus is situated before the apex of rostrum.

The mandibular palp (Fig. 2*f*) differs from STANLEY KEMP's figure 2*b* in his paper „The Decapoda natantia of the Coasts of Ireland" of 1910, by the 2^{d} joint being slightly longer in proportion to the 3^{d} or terminal one; the relative width or thickness of the latter is somewhat variable.

A female without eggs, long 65 mm., is infested by a *Bopyrus*. General distribution: Black Sea (Bays of Sebastopol, Feodossia, Novorossiisk, Suchum and Kertsch) according to RATHKE and CZERNIAVSKY.

Leander adspersus (RATHKE) var. *Fabricii* (RATHKE).

Pl. XI, Fig. 2*y*—2*l* and Pl. XII, Fig. 2*m*—2*p*.

Palaemon Fabricii, H. RATHKE, Beiträge zur Fauna Norwegens, in: Verhandl. der kais. Leop.-Carol. Akad. der Naturforscher, Bd. XII, 1843, p. 6.

Palaemon rectirostris, E. G. ZADDACH, Synopseos Crustaceorum Prussicorum Prodromus, Regiomonti 1844, p. 1.

Palaemon Leachii, TH. BELL, A History of the British Stalk-eyed Crustacea, London 1853, p. 307.

Palaemon rectirostris, C. Heller, Die Crustaceen des südlichen Europa, Wien 1863, p. 269, Taf. IX, Fig. 13.

Palaemon rectirostris, P. Fischer, Crust. Podophthalmaires et Cirrhipèdes du Département de la Gironde, Paris 1872, p. 19 (Extrait des Actes de la Soc. Linn. de Bordeaux, t. XXVIII).

Palaemon Fabricii, Fr. Meinert, Crustacea Isopoda, Amphipoda et Decapoda Daniae, 1877, p. 201.

Palaemon rectirostris, var. *octodentatus*, R. Neumann, System. Uebersicht der Gattungen der Oxyrhynchen. Catalog der Podophthalmen Crustaceen des Heidelberger Museums. Beschreibung einiger neuer Arten. Inaug.-Dissert. Leipzig 1878, p. 37.

Palaemon rectirostris, J. V. Carus, Prodromus Faunae Mediterraneae, Pars II, Stuttgart 1885, p. 474.

Leander adspersus, A. Ortmann, Die Dekapoden-Krebse des Strassburger Museums, in: Zool. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 524.

Leander adspersus, A. Senna, Le Esplorazioni abissali nel Mediterraneo del R. Piroscafo Washington nel 1881, in: Bull. della Soc. Entom. Ital. Vol. XXXIV, Firenze 1903, p. 328.

Leander adspersus, Stanley Kemp, The Decapoda Natantia of the Coasts of Ireland, in: Fisheries, Ireland, Sci. Invest. 1908, I (1910), p. 131, Pl. XX, figs. 2, *a-e*.

Confer: Th. Mortensen, Undersøgelser over vor almindelige Rejes (*Palaemon Fabricii* Rtk.) Biologi og Udviklingshistorie etc. København 1897 (Development).

7 specimens (2 adult females, one of which with eggs, one male and 4 young specimens) from Bergen, Norway, presented by Dr. A. Brinkmann of Bergen and Dr. O. Nordgaard of Trondhjem.

11 specimens (2 young males, 3 adult egg-bearing and 6 younger females) from Denmark, presented by Dr. K. Stephensen.

16 specimens (12 males, 4 females, 3 of which are egg-bearing, the rest of medium size or young), captured June 1914 in the Isefjord, Denmark, 1 M. deep, received from the Danske Biologiske Station at Copenhagen.

13 specimens (5 males and 8 females, all young except one female of medium size with eggs), captured May 1914 at a depth of 0,5 to 2 M. in the Nyborg Fjord, Denmark, between *Zostera* and received from the Danske Biologiske Station.

9 female specimens, 4 of which are egg-bearing, from the Gulf of Naples, received from the Zoological Station.

The rostral formulae of 40 specimens from Denmark and from Bergen, Norway, are the following:

$\frac{7+0}{3}$ one specimen from Nyborg Fjord, in which the apex of the rostrum is broken off.

$\frac{6+1}{5}$ one specimen, $\frac{6+0}{3}$ one specimen.

$\frac{6+2}{4}$ one specimen, $\frac{6+0}{2}$ one specimen.

$\frac{6+1}{4}$ five specimens, $\frac{5+1}{4}$ two specimens.

$\frac{6+2}{3}$ one specimen, $\frac{5+1}{3}$ six specimens.

$\frac{6+1}{3}$ twenty specimens, $\frac{5+0}{3}$ one specimen.

These formulae teach us that in the variety *Fabricii* RATHKE the upper margin (Fig. 2*g*—2*i*) is usually armed with *six* teeth and the lower with *three*, in harmony with RATHKE's description of *P. Fabricii*: according to this author in the typical *L. adspersus* from the Black Sea the upper margin should be usually armed with *five* and the lower with *four* teeth. As a great exception the rostrum presents two apical teeth in stead of one and very rarely also the upper teeth are situated along the whole length of the rostrum, in which case no „apical" tooth exists.

In one specimen from Nyborg Fjord seven teeth were placed on the upper margin. Like in the typical species from Sebastopol the rostrum usually projects a little beyond the scaphocerites, but often it is just as long as the scales; also as regards its direction

the rostrum resembles the specimens from the Black Sea, in some specimens it runs straightly or almost straightly forwards, but very often the rostrum is distally more or less trending upwards. According to RATHKE's description of *P. Fabricii* the distal half of the upper margin should be unarmed, entire, as in *L. serratus*; this case, however, does rarely occur among the specimens lying before me, such a form of the rostrum is represented in one of my figures, but I will add that an adult, egg-bearing female from Sebastopol presents quite the same form.

The males are all of a *smaller* size than the females, but, of course, this may be fortuitous: the largest male specimens from the Isefjord are hardly 50 mm. long, while the length of the egg-bearing females from this locality varies between 50 and 60 mm., but the adult egg-bearing females from Denmark are 75 mm. long. Now I would first call attention to the fact that the antennular peduncle appears, just as in *L. Squilla*, with regard to the length of the antennal scales, distinctly *longer* in the male (Fig. 2*j*) than in the female (Fig. 2*k*), or, with other words, that the antennular peduncle reaches farther forwards in the male than in the female. So e. g. in a male, long 48 mm., from the Isefjord the antennular peduncle is 9 mm. long and reaches as far forwards as the terminal spine of the scale, which is $10^1/_4$ mm. long; in an egg-bearing female, nearly of the same size, namely 53 mm. long, from the same locality, however, the peduncle is only 8 mm. and the scale $11^1/_4$ mm. long, so that the peduncle appears but slightly longer than two-thirds the length of the scale, its distal extremity not by far reaching the terminal spine. Even in the adult, egg-bearing females, long 75 mm., from Denmark, in which the antennular peduncle measures four-fifths the length of the scale, the terminal spine is situated just midway between the distal extremity of the peduncle and that of the scale.

In the Black Sea species the shorter ramus of the outer antennular flagellum extends, as has already been described, especially in young and middle-sized specimens, rarely also in

adult individuals, only by $^1/_3$ to $^1/_2$ of its length, the fused portion included, beyond apex of rostrum; in the Scandinavian specimens, on the contrary, the shorter ramus generally projects *by more than half its length*, the fused portion included, beyond apex of rostrum, namely by two-thirds to eight-ninths that length and it happens but very rarely that the rostrum extends to the middle — though never beyond the middle — of the shorter ramus, the fused portion included, as e. g. in an adult female from Bergen and in two other ones from the Isefjord. *The different toothing of the rostrum, combined with the different bearing of the shorter ramus of the outer antennular flagellum, now induces me to regard the Scandinavian form as a variety of L. adspersus* RATHKE, *which, of course, must bear the name of Fabricii.* According to S. KEMP (l. c. p. 128) the free portion of the shorter ramus should reach beyond the apex of the rostrum by more than three-quarters its length; in the Scandinavian specimens this is also often the case, but often also not only the whole free part of the shorter ramus but even a part of the coalesced portion projects beyond the rostrum.

The mandibular palp of the Scandinavian specimens (Fig. 2*l*) agrees with that of the specimens from the Black Sea, the terminal joint is a little more slender, but its form is somewhat variable, as has already been described above; the 2d joint, however, appears in the Scandinavian specimens also somewhat longer with regard to the terminal joint than in S. KEMP's figure 2*b* (l. c.).

The rostral formulae of the 9 specimens from the Gulf of Naples are the following:

$\frac{6+1}{4}$ three specimens; $\frac{6+1}{3}$ two specimens; $\frac{5+1}{3}$ four specimens.

The number of specimens from this locality is too small for drawing any conclusion whether the rostrum is armed, in the Mediterranean species, usually with 5 or with 6 teeth on the upper and with 3 or with 4 on the lower margin: probably, however, the Mediterranean form will prove to agree with that of Scandinavia, for HELLER (l. c.) remarks that the lower margin

of the rostrum is usually tridentate, more rarely armed with 4 teeth. In the largest specimen, a female with eggs, the rostrum that is $\frac{5+1}{3}$ dentate, is very slightly (0,5 mm.) shorter than the scaphocerites, quite horizontal, not turned upwards at the tip.

The shorter ramus of the outer flagellum extends by two-thirds or three-quarters its length, the fused portion included, beyond the rostrum, sometimes almost by its whole length, in 2 specimens, however, only by three-fifths of it.

The smallest specimen with eggs is 47 mm. long.

The mediterranean form, like probably also that which is found in the Adriatic, should therefore be referred, in my opinion, to the variety *Fabricii* RATHKE.

Palaemon Leachii BELL certainly also belongs to the variety *Fabricii* RATHKE.

Upon my request Prof. M. BRAUN of Königsberg has been so kind to send me two type specimens of *Palaemon rectirostris* ZADDACH from the Bay of Danzig, preserved in the Zoological Museum of that University. The examination of these types brought at once to light that *P. rectirostris* ZADDACH is *identical* with the variety *Fabricii* of *L. adspersus* (RATHKE).

Unfortunately both specimens are much mutilated, in both types, indeed, the caudal fan and the 6th segment of the abdomen are wanting, like also the legs of the 2d pair: measured from the apex of the rostrum to the end of the 5th segment of the abdomen they proved to be 52 mm. long. The rostrum of one of the two specimens (Fig. 2*m*), a little, viz. 1,5 mm., longer than the scales, extends straightly forwards, hardly trending upwards at apex; the rostral formula is $\frac{6+1}{4}$, the 2d tooth arises just behind the orbital margin, but the apex of this tooth is distinctly situated before it, as is generally the case in *L. adspersus*. The distance between the 2d and the 3d tooth is as large as that between the 3d and the 4th; this distance is shorter than

the distances between the other teeth. Measured at their apices the interspaces between the teeth, from the 1st to the extremity of the rostrum, prove to be 2,46 mm., 1,94 mm., 1,86 mm., 2,64 mm., 2,9 mm., 2,2 mm. and 0,8 mm. long and these numbers also show that the apical tooth, which is closely situated to the tip, is a little less distant from the 6th tooth as the latter from the 5th.

In this specimen the coalesced portion of the shorter ramus of the outer antennular flagellum is 2 mm. long (Fig. 2*n*), the free portion 6,2 mm., so that *one-fourth* appears to be coalesced. The free portion consists of 17 joints that are more or less longer than broad, while the terminal joint is a little more than twice as long as broad. Like in the Scandinavian specimens the shorter ramus extends by four-fifths (in the other type by two-thirds) its length, the fused portion included, beyond the apex of rostrum.

The rostral formula of the other type is $\frac{5+1}{3}$, the 2d tooth is situated as in the first and the distances between the apices of the teeth, are, from the 1st tooth to the apex of the rostrum, 2,34 mm., 1,75 mm., 2,8 mm., 2,85 mm., 2,5 mm. and 0,6 mm. long.

Like in the first type, one-fourth of the shorter ramus is fused to the outer flagellum.

Measurements of the legs in millimeters.

	First type				Second type			
	1st leg	3d leg	4th leg	5th leg	1st leg	3d leg	4th leg	5th leg
Length of merus	5,1				4,55			
» of carpus	6,1				5,75			
Width of carpus at the distal end	0,66				0,66			
Length of chela	3,1				3,2			
» of palm	1,5				1,5			
» of fingers	1,6				1,7			
Width of the palm	0,68				0,76			
Length of carpus		2,8	3,2	3,5		2,6	2,9	3,2
» of propodus		5,2	6,6	7,3		5	6,2	6,7
» of dactylus		2	2,32	2,5		1,9	2	2,2

The legs of the 1st and of the 5th pair of the first type have been figured (Fig. 2*o* and 2*p*).

Prof. Bütschli of Heidelberg kindly sent me 3 cotypes (2 ova-bearing females and one younger female without eggs) of *P. rectirostris* Zaddach, var. *octodentatus* R. Neumann from Palma de Mallorka. The examination of these specimens proved at once their identity with the variety *Fabricii*. The largest specimen, a female with eggs, is 58 mm. long and its rostrum, just as long as the scales and hardly trending upwards at apex, is $\frac{7+1}{4}$ dentate; 2d tooth immediately behind the orbital margin. Antennular peduncle $9^1/_4$ mm., shorter ramus (the coalesced portion included) 8 mm. long and reaching by two-thirds its length beyond apex of rostrum.

The other egg-bearing specimen is 50 mm. long, the rostrum, hardly longer than the scales and hardly upturned distally, is $\frac{6+1}{3}$ dentate; the last specimen, finally, is also 50 mm. long and its rostrum, that slightly reaches beyond the scales and that is distinctly turned upwards at apex, is $\frac{7+1}{3}$ dentate, the teeth placed as in the first female. According to S. Kemp (l. c., page 128) the upper margin, however, is armed dorsally with five to seven teeth and in the specimen from Nyborg Fjord, described above, the rostrum bears also 7 teeth.

General distribution: Sweden (Goës); The Baltic, Gulf of Danzig (Zaddach); Denmark (Meinert); Gulf of Kiel (Wedemeyer); Christianiafjord (Wollebaek); South West coast of Norway (Rathke, Sars, Appellöf, etc.); West coast of Ireland (S. Kemp); Thames estuary (S. Kemp); Weymouth (W. Thompson); Poole Harbour (Bell); West coast of France (Bay of Arcachon [Fischer], Gironde, Charente, le Croisic, Concarneau, Boulonnais [Bonnier]); Adriatic and Mediterranean (Heller, R. Neumann, Gourret, Senna, Thiele, etc.).

Leander longirostris (H. M.-Edw.).

Pl. XII, Fig. 3—3*n*.

Palaemon longirostris, H. Milne Edwards, Hist. Nat. Crust. II, 1837, p. 392.

Palaemon Edwardsii, C. Heller, Die Crustaceen des südlichen Europa, Wien 1863, p. 265 [1]).

Palaemon Edwardsii, P. Fischer, Crust. Podophth. et Cirrhip. du Départ. de la Gironde et des Côtes du Sud-Ouest de la France, Paris 1872, p. 19.

Palaemon Edwardsii, J. V. Carus, Prodromus Faunae Medit., Pars II, Arthropoda, Stuttgart 1885, p. 473.

Palaemon squilla, P. P. C. Hoek, Crustacea Neerlandica, in: Tijdschrift Ned. Dierk. Vereen. N. R. Dl. I, 1887, p. 100.

Leander edwardsii, A. Ortmann, in: Zool. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 515.

Palaemon edwardsii, M. J. Rathbun, in: Proc. Unit. Stat. Nat. Mus. Wash. Vol. XXII, 1900, p. 314.

Leander squilla, J. J. Tesch, Bijdragen tot de Fauna der Zuidelijke Noordzee. IV. Decapode Crustaceen ten deele verzameld met de „Wodan", 1908, p. 7 and in: Tijdschr. Ned. Dierk. Vereen. (2) Dl. XII, 1913, p. LXXXVIII—LXXXIX.

4 specimens, viz. 2 males and 2 ova-bearing females, from the „Hollandsch Diep" (Dutch Sea), received from Dr. H. C. Redeke, February 1914, sub nomine *Pal. Squilla* [2]).

130 specimens, among which 100 ova-bearing females, captured May 1914, in the Hollandsch Diep near Numansdorp, received from the harbour-master N. A. Sizoo.

206 specimens, viz. 112 males and 94 females, all without eggs, captured January 1915 in the Hollandsch Diep off Willemstad, received from Mr. N. A. Sizoo.

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1) Miss Rathbun has as usual clearly explained wherefore the name *longirostris* should be used for the species so designated by H. Milne Edwards at p. 392 (l. c.) in stead of the name *Edwardsii* Heller, in: Japanese Stalk-eyed Crust. Proc. Unit. Stat. Nat. Mus. Vol. XXVI, 1902, p. 50, 51.

2) The „Hollandsch Diep" belongs to the estuary of the river Meuse.

4 adult egg-bearing females obtained July 1899 in the Hollandsch Diep and presented bij the late Dr. P. P. C. Hoek.

53 specimens (26 ♂, 27 ♀, among which 12 are ova-bearing) collected in 1886 in the Hollandsch Diep and presented to me in 1902 by Dr. P. P. C. Hoek sub nomine *Pal. Squilla*.

20 specimens of medium size or young, without eggs, collected August 1906 in the river Schelde (Sheldt) near Antwerp, received from the Royal Zoological Museum at Brussels.

4 specimens of medium size from the river Schelde (Sheldt) near Santvliet, received from the Museum at Brussels.

2 specimens, one of which is nearly adult, from the river Schelde (Sheldt), received from the same Museum.

3 specimens (2 ♂, 1 ♀ without eggs) from the river Schelde (Sheldt), presented by Prof. G. Gilson of Brussels.

12 young specimens from the river Schelde (Sheldt) near Antwerp, presented by Prof. G. Gilson in 1906.

1 young female, without eggs, collected by myself, December 1900, off the West Coast of the Isle of Walcheren, at a depth of 11 fathoms.

1 female of medium size, without eggs, from Biarritz, France, collected May 1903 and presented to me by Mr. A. O. Walker, sub nomine *L. squilla* (Linn.).

As far as I am aware, *Leander longirostris* (H. M.-Edw.) has not yet been recorded from north of the isle of Noirmoutier on the West Coast of France. This species, however, has already been captured in 1886 by Dr. P. P. C. Hoek in the Haringvliet and the Hollandsch Diep, and in the quoted paper of 1887 he writes that this shrimp ascends the river New Merwede as far as the Ottersluis, near Werkendam; this species, however, was referred by Hoek, though with some hesitation, to *L. Squilla* (Linné), and afterwards also by Dr. Tesch in his paper on the Decapods collected by the „Wodan". The catch, last year, of some specimens of the true *Leander Squilla* (Linné) in the Oosterschelde (Eastern Sheldt) near Ierseke first called my attention to this question and so became the origin of this paper.

The adult ova-bearing females from the Hollandsch Diep are 70—75 mm. long, specimens of a somewhat smaller size are, however, already also provided with eggs and the Collection contains even two egg-bearing females that are only 44 or 45 mm. long. Like is the case with *L. adspersus* (RATHKE), the male seems to be of a *smaller* size than the female, the largest male specimens of the Hollandsch Diep being 65 mm., rarely 70 mm. long. *The whole body* of *L. longirostris* is *sprinkled with small chromatophores*, innumerable small reddish dots of unequal size; they are well developed and quite conspicuous on the upper and on the lower half of the rostrum, on the antennular and antennal peduncles, near the distal extremity of the scaphocerites, on the abdominal segments and on the caudal fan, but they exist also on the carapace, on the legs and on the pleopods.

In the adult male the rostrum usually reaches 1—2 mm., in the adult female (Fig. 3—3$_c$) 1—3 mm. *beyond* the distal extremity of the antennal scales; in the male it often, however, projects only 0,5 mm. beyond the scaphocerites, but rarely in this species the rostrum appears just as long as the scales; among 160 adult or almost adult specimens, for the greater part ova-bearing females, the rostrum proved to be about 20-times just as long as the scales, while in 140 specimens it distinctly projected beyond them. In 2 adult male specimens from the Hollandsch Diep the rostrum was just as long or almost just as long as the antennular peduncle, but this is a very rare exception. In young individuals, 40 mm. long or less, the rostrum also often appears just as long as the scales or it reaches only 0,5 mm. beyond them, and one young male and 2 or 3 still younger specimens were observed, in which the rostrum reached to midway between the distal extremity of the antennular peduncle and that of the scaphocerites. The rostrum is usually slightly directed upward, obliquely, in a straight or almost straight line from the base to the apex, but often a more or less long proximal part of the rostrum reaches horizontally forward, while the distal part appears more or less distinctly trending upwards. Only

in about 10 adult specimens the rostrum was quite straight along its whole length, running horizontally forwards, but in very young individuals this is more often the case.

Of 378 specimens the rostral formulae were the following:

$\frac{12}{6}$ two specimens, $\frac{9+1}{4}$ six specimens, $\frac{8+1}{3}$ twenty nine specim.,
$\frac{12}{5}$ one specimen, $\frac{9+2}{4}$ one specimen, $\frac{8}{4}$ two specimens,
$\frac{11+1}{7}$ one specimen, $\frac{9}{4}$ nine specimens, $\frac{8}{3}$ four specimens,
$\frac{11+1}{5}$ one specim., $\frac{9}{3}$ seven specimens, $\frac{7+2}{4}$ eighty six specim.,
$\frac{11}{3}$ two specimens, $\frac{8+3}{5}$ two specimens, $\frac{7+2}{3}$ thirty seven specim.,
$\frac{10}{6}$ one specimen, $\frac{8+2}{5}$ two specimens, $\frac{7+1}{4}$ forty eight specim.,
$\frac{10}{4}$ one specimen, $\frac{8+2}{4}$ twenty five specim., $\frac{7+1}{3}$ twenty six specim.,
$\frac{10}{3}$ one specimen, $\frac{8+1}{5}$ one specimen, $\frac{7+0}{4}$ one specimen,
$\frac{9+1}{6}$ one specimen, $\frac{8+2}{3}$ three specimens, $\frac{6+2}{4}$ three specimens,
$\frac{9+1}{5}$ one specim., $\frac{8+1}{4}$ seventy two specim., $\frac{6+2}{3}$ two specimens.

These numbers demonstrate in the first place *the great diversity* of the toothing formulae and furthermore that the formulae $\frac{7+2}{4}$ in 86 specimens, $\frac{8+1}{4}$ in 72, $\frac{7+1}{4}$ in 48, $\frac{7+2}{3}$ in 37, $\frac{8+1}{3}$ in 29 and $\frac{7+1}{3}$ in 26 specimens are those which in most cases are observed. In 198 of the 378 specimens *seven* teeth [1]) were placed on the upper margin of the rostrum, i. e. in about 52 per cent., in 140 *eight*, i. e. in 37 per cent. of the total number of specimens; in 25 specimens, i. e. in 6,6 per cent., *nine* teeth

1) Not counting the apical tooth or teeth.

were observed, but in 16 of these 25 specimens there was no apical tooth, the nine teeth extending here until to the apex. Only in 5 specimens the upper margin presented six teeth and in the 3 with ten the teeth reached to the tip; in 4 specimens the rostrum was armed with eleven teeth, but in 2 of them there was no apical tooth, the teeth reaching again to the apex. This was also the case in the 3 specimens, the rostrum of which carried twelve teeth.

In 254 of the 378 specimens, i. e. in 67 per cent., the lower margin proved to be armed with *four* teeth, in 111, i. e. in 29 per cent. with *three*; only in 8 specimens *five* teeth were observed and only in 4 *six*. One of these 4 specimens, with the formula $\frac{10}{6}$, is a young female, long 38 mm., in which the rostrum shows abnormal features; the rostrum, indeed, hardly reaches the distal end of the antennular peduncle, the upper margin appears in the middle rather strongly convex, so that the rostrum is much broader or higher than usual and the teeth reach to near the tip. In one specimen that was captured off Willemstad on the Hollandsch Diep, the lower margin was armed with *seven* teeth, the 3^{d} of which, however, was in a rudimentary condition.

We furthermore establish the fact that in 159 of the 378 specimens, i. e. in 42 per cent., *two* apical teeth exist and in 186, i. e. in 49,2 per cent., only *one*; in 2 adult females from the Hollandsch Diep, the rostrum of which is $\frac{8+3}{5}$ toothed, *three* apical teeth were observed, a very rare exception indeed, and in the specimen with the formula $\frac{7+0}{4}$ there was no apical tooth at all and the foremost (7th) tooth of the upper margin was rather far distant from the apex. In 30 of the 378 specimens, i. e. in about 8 per cent., the teeth of the upper margin are placed until to the tip, but almost half of them are young individuals.

We may therefore conclude from these observations that the upper margin is usually armed with *seven* teeth besides the apical tooth or teeth, less often with *eight*, that the lower margin is

usually armed with *four* teeth, less often with *three* and that in general one or two apical teeth occur, almost as often two as one, while in adult specimens the teeth are rather rarely placed along the whole length of the rostrum, more often, however, in young individuals. The rostral teeth much resemble those of *L. Squilla* (LINNÉ), those of the upper margin are *large*, *spiniform* and *directed obliquely forwards*; in *L. adspersus* (RATHKE) and its variety *Fabricii* the teeth of the upper margin are *less prominent* and have *a quite different form*. In RATHKE's species the anterior margin of the teeth is namely *much shorter* in proportion to the distance between the tip of the tooth and that of the preceding one, so that the teeth are much less prominent.

In *L. longirostris* (H. M.-EDW.) the *two* first teeth of the upper margin are *invariably* situated on the carapace behind the orbital margin, while the 3d tooth is always placed just in front of this margin; the distance between the apices of the two first teeth is constantly *one and a half as long* as the distance between the 2d and the 3d. Among the numerous specimens of the Hollandsch Diep there was only one, in which the *three* first teeth were placed on the carapace, the 3d tooth being immediately situated *behind* the orbital margin; the rostrum of this specimen was $\frac{8+2}{4}$ toothed. The 4th tooth is as far distant from the 3d as the 3d from the 2d, often, however, its distance from the 3d is a little shorter than the distance between the 2d and the 3d; the distances between the three or four following teeth ordinarily gradually increase in length, though sometimes the foremost tooth appears again a little shorter. The apical tooth or teeth are much smaller than the preceding and placed near the tip. The 1st tooth of the upper margin is a little more than twice as far distant from the posterior margin of the carapace than from the anterior and does not arise with a crest.

The lower margin of the rostrum is deeply emarginate at the base, the teeth are less prominent than those of the upper margin

and that part of the rostrum which is situated below the lateral crest, is much higher than that above it.

Among the 206 specimens, collected in January 1915 off Willemstad, 4 males and 4 females occur, the rostrum of which presents more or less abnormal peculiarities. In the first male, long 64 mm., the rostrum attains only the middle of the 3d joint of the antennular peduncle and extends almost straight forward, though a line uniting the apices of the teeth of the upper margin is slightly ascending; the extremity of the rostrum is rounded, but armed with 2 teeth, of which the lower is slightly longer than the upper, and the lower margin is armed with 3 teeth. There are 6 teeth on the upper margin, of which 2 are on the carapace as usual, while the 2d is but little farther distant from the 1st as from the 3d; the distances between the following teeth slightly increase in length and the 6th tooth is as far distant from the 5th as from the lower tooth at the rounded extremity of the rostrum.

In the second male, which measures 60 mm., the rostrum, slightly ascending and reaching only 1 mm. beyond the antennal scales, is armed above with 9 teeth that extend to near the tip, so that there is no apical tooth; 2 teeth are on the carapace and the 2d is not yet one and a half as far distant from the 1st as from the 3d, but this specimen is conspicuous by *a smooth unarmed interspace* between the 5th tooth which is situated on the middle of the free part of the rostrum and the 4th tooth; this unarmed interspace is but little shorter than the distance between the 1st and the 4th tooth; lower margin 4-dentate.

In the third male, 56 mm. long, the rostrum, slightly ascending and hardly reaching beyond the scales, is $\frac{6+2}{4}$ dentate. The two apical teeth, which are situated close together, are *of an extraordinarily small size* and one observes furthermore a smooth interspace between the 3d and the 4th tooth of the upper margin, so that the 3d tooth appears as far distant from the 1st as from the 4th.

The fourth male, finally, of the same size as the 3d, is $\frac{6+1}{3}$ dentate, and presents quite normal characters, except that there is but *one* tooth on the carapace; this tooth is apparently the second, for the place of the 1st is indicated by a minute prominence, which, however, is coloured by a small red spot, similar to those with which the body is marked.

A similar abnormality as in the fourth male, just described, exists in a female without eggs, long 69 mm., in which the rostrum is $\frac{5+2}{4}$ dentate. In this specimen, however, not only the 1st but even the 4th tooth are only indicated by a minute prominence, so that there is again only *one tooth* on the carapace; both prominences are marked with the usual red spots, so that the teeth are not broken off.

In the second female, long 69 mm., the rostrum is $\frac{5+2}{3}$ dentate and is of normal appearance, except that the foremost or 5th tooth of the upper margin, situated just behind the middle of the free part of the rostrum, is separated by a long interspace from the 1st apical tooth and this interspace is nearly as long as the distance between the 2d and the 5th tooth.

The third female, which is 65 mm. long, is $\frac{9+1}{6}$ dentate. The rostrum presents normal characters, but the 6th tooth of the upper margin is almost twice as large as the preceding and more prominent, while the three following teeth are situated much closer together than usually; the 2d tooth of the lower margin, finally, is rudimentary.

The last female is 75 mm. long and $\frac{8+1}{4}$ dentate; it appears only peculiar *by the extraordinarily small size* of the apical tooth.

Looked at from the lateral side, the carapace of this species appears slightly concave above between the gastric and the somewhat convex, smaller, cardiac region.

Branchiostegal spine as large as the antennal one and situated at the margin of the carapace; both spines project beyond it.

Anterolateral angle of the carapace rounded.

Abdomen and caudal fan much resemble those of *L. adspersus* and its variety *Fabricii*, but the 6th segment appears *a little less broad*, viewed from above, than in RATHKE's species.

The antennular peduncle (Fig. 3*e*) extends as far forward as the terminal spine of the scaphocerite and measures $^1/_6$ the length of the body or a little less. The shorter ramus (Fig. 3*f*) of the outer flagellum is fused to the longer for about *one-third* its length and measures constantly *two-thirds* the length of the peduncle, when the coalesced portion is included; the coalesced joints, 9 or 10 in number, are about 3-times as broad as long and the free portion consists of $2^1/_2$- to 3-times as many joints, i. e. 24 to 27. The shorter ramus reaches beyond apex of rostrum by one-half to two-thirds its length, the fused portion included. The longer outer flagellum measures about $^5/_7$, the inner flagellum half the length of the body.

The antennal peduncle reaches about as far forwards as the 1st joint of the antennular peduncle and the flagellum is about one-fourth longer than the body. The scaphocerite (Fig. 3*g*) which measures one-sixth the length of the body, appears broadest at the posterior third and the greatest width is just one-third the length; the outer margin, straight or a little concave anteriorly, appears slightly convex on its posterior half, the inner margin is also slightly concave and the antero-internal angle is obtuse.

Mandibular palp *three-jointed* (Fig. 3*h*), the 2d joint, about twice as long as broad, is just as long as the basal joint and half as long as the third or terminal one, that gradually narrows distally; the palp is rather much setose, especially the terminal joint. External maxillipeds projecting by one-quarter their terminal joint beyond the antennal peduncle.

In the adult male the legs of the 1st pair are as long as the scales, rarely a trifle shorter, in the adult female also as long as the antennal scales or they project with the fingers beyond them. The carpus is in the male $^1/_5$, in the female $^1/_5$ to $^1/_4$ longer than the merus, rarely in the male the difference in length is a

little smaller; the carpus appears in the adult male almost twice, in the adult female twice or nearly twice as long as the chela. In younger individuals the carpus appears with regard to the chela a little shorter: so in a specimen, long 35 mm., the carpus is hardly more than one and a half as long as the chela and in a very young specimen, that measures 27 mm., the carpus is not yet one and a half as long as the chela, the chela being 1,6 mm. long, the carpus 2,2 mm. In the adult male the fingers are scarcely shorter than the palm or just as long, but in the adult female the palm appears $^1/_5$ to $^1/_3$ longer than the fingers.

In the male the legs of the 2^d pair usually reach with the chela beyond the antennal scales, sometimes, in the adult, with the chela and a small portion of the carpus, $^1/_8$ to $^1/_6$, more rarely only with four-fifths of the chela. In the adult, egg-bearing female these legs do also not invariably extend equally far forwards, in some specimens they reach by the chela and two-fifths of the carpus beyond the antennal scales, in others only by one-fourth of the carpus or by the chela alone, in other adult individuals the carpus attains even not yet the end of the scales and in these specimens the 2^d legs project only by four-fifths of the chela beyond the scaphocerites. At a younger age the 2^d legs reach not so far: in a specimen, long 45 mm., little more than the fingers extends beyond the scales and in individuals, 26 mm. long, even the fingers reach only for a part beyond them. The legs of the 2^d pair (Fig. 3*i*—3*k*) are longer and stronger than those of the 1st and usually of equal length, rarely one leg appears a little longer than the other; they *closely resemble* those of *L. adspersus* (RATHKE). In the Table at page 160 the 2^d legs of 24 specimens from the Hollandsch Diep have been accurately measured under the microscope, namely of 13 males and 11 females: these measurements lead to the following conclusions.

In the male the carpus seems to be constantly *a trifle shorter* than the merus, though not more than 0,4 mm., in the adult female, however, the merus appears often a trifle shorter than the carpus. The carpus appears in the male 6—7-times as long

as thick at the distal extremity, in the adult female 7—8-times, rarely it presents here also a little less slender form, so in N^0 14 and N^0 17 of the Table. Like in *L. adspersus the chela is constantly a little longer than the carpus*, but the difference in length varies rather much. In the 13 male specimens the carpus proved to be $^1/_{3,2}$—$^1/_6$ shorter than the chela, the difference in length being in the male *rather large* (Fig. 3*k*); in the adult female (Fig. 3*i*), however, the difference in length between carpus and chela is *usually much smaller* ($^1/_{10}$—$^1/_{16}$), though in 2 adult females the carpus proved to be $^1/_7$, respectively $^1/_5$ shorter than the chela. Therefore to the naked eye carpus and chela appear, in the female, to be in general of equal length. While in the adult female the palm appears about 4-times as long as wide, it presents a somewhat less slender form in the male, the proportion between length and width varying in the male between 3,1 and 3,6, though sometimes (N^0 5) the palm here also proved to be just 4-times as long as wide; in young specimens the palm appears also a little broader. Almost in all the male specimens, more than 140 in number, from the Hollandsch Diep, the fingers proved to be *a little shorter than the palm, measuring at least three-fourths of the latter*: only 8 males were observed, (5 of which have been measured, N^0 1, 3, 6, 9, 10 and 12 of the Table), in which the fingers were *slightly longer* than the palm, the proportion varying between 1,01 and 1,18. In the adult female the fingers are constantly shorter than the palm, measuring *two-thirds to four-fifths* of the latter, but at a younger age they appear slightly longer. At one-quarter of its length from the articulation the dactylus bears a small obtuse tooth and midway between this tooth and the articulation another which is somewhat smaller; opposite to the latter the immobile finger presents a similar small tooth and between this tooth respectively the larger tooth of the dactylus and the extremities of the fingers a sharp cutting-edge occurs as usual. In young specimens these teeth are less distinct or even wanting at all.

Table of measurements of the second legs of specimens from the Hollandsch Diep in millimeters.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Length of the body . . .	68	67	67	66	66	64	62	61	58	58	56	56	52	75	75	75	75	70	70	70	60	44	30	25
» » » merus. . .	7,3	7,5	6,8	7,3	7,2	7,2	6,7	6,1	5,8	6,1	5,7	5,75	5,2	9,1	8,6	8,8	8	8,75	8,5	8,5	6,5	4,2	2,75	2,25
» » » carpus . .	6,9	7,1	6,5	7	6,8	6,8	6,4	5,7	5,2	5,9	5,3	5,7	4,8	9,4	8,5	8,5	7,5	9	9	8,75	6,75	4,2	2,85	2,25
Width of the carpus at its distal extremity . .	0,97	1,1	0,96	1,1	0,98	1,04	0,92	0,9	0,85	0,9	0,8	0,9	0,71	1,4	1,2	1,2	1,2	1,15	1,2	1,1	0,92	0,64	0,43	0,38
Length of the chela . . .	8,9	9,7	8,6	9	8,55	9,8	7,76	7,3	7,55	8,25	7,26	6,85	6,1	10,5	10	9,4	9,5	9,7	9,75	9,4	7,2	4,83	3,34	2,81
» » » palm . . .	4,4	5	4,15	4,8	4,8	4,5	4,2	4	3,55	3,9	3,7	3,4	3,2	6,2	5,6	5,7	5,25	5,6	5,75	5,4	4,2	2,65	1,84	1,55
Width » » » . . .	1,3	1,5	1,3	1,32	1,2	1,35	1,24	1,1	1,1	1,18	1,08	1,08	0,92	1,6	1,45	1,4		1,44				0,75	0,52	0,46
Length of the fingers . .	4,5	4,7	4,45	4,2	3,75	5,3	3,56	3,3	4	4,35	3,56	3,45	2,9	4,3	4,4	3,7	4,25	4,1	4	4	3	2,18	1,5	1,26
Carpus shorter than chela	$^1/_{4,45}$	$^1/_{3,7}$	$^1/_{4,1}$	$^1/_{4,5}$	$^1/_5$	$^1/_{3,27}$	$^1/_{5,7}$	$^1/_{4,5}$	$^1/_{3,2}$	$^1/_{3,5}$	$^1/_{3,65}$	$^1/_6$	$^1/_{4,7}$	$^1/_{10}$	$^1/_7$	$^1/_{10}$	$^1/_5$	$^1/_{12}$	$^1/_{13}$	$^1/_{14}$	$^1/_{16}$	$^1/_8$	$^1/_{6,7}$	$^1/_5$
Length of the fingers in proportion to the palm	1,02	$\frac{47}{50}$	1,07	$^7/_8$	$\frac{25}{32}$	1,18	$\frac{89}{105}$	$\frac{33}{40}$	1,12	1,12	$\frac{178}{185}$	1,01	$\frac{29}{32}$	$\frac{43}{62}$	$\frac{11}{14}$	$\frac{37}{57}$	$\frac{17}{21}$	$\frac{41}{56}$	$\frac{16}{23}$	$\frac{20}{27}$	$\frac{5}{7}$	$\frac{218}{265}$	$\frac{75}{92}$	$\frac{126}{155}$

N° 1—13 male specimens, in N° 1, 3, 6, 9, 10 and 12 the fingers are longer than the palm; N° 14—20 ova-bearing females, N° 21—24 young females.

The three posterior legs are *longer* and *slenderer* than those of *L. adspersus* and *L. Squilla:* those of the 3d pair reach in the male to the anterior extremity of the antennal scales, but project in the female with a part of their dactyli or sometimes even by the whole dactylus beyond them, the legs of the 5th pair, finally, project in the male by the dactylus, sometimes only by half this joint, beyond the antennal scales, while in the female the dactylus or even a small portion of the propodus reaches beyond the scaphocerites.

Of an adult, ova-bearing female, long 72 mm., the merus proved to be 9,2 mm. long and 0,8 mm. broad, 11-times as long as broad, the carpus, measured from articulation to articulation, long 5,5 mm. and 0,84 mm. thick distally, the propodus 10,2 mm. long and 0,56 mm. broad in the middle, 18-times as long as broad; the dactylus, finally, 3,6 mm. long, measured *one-third* of the propodus.

Eggs very numerous, 0,8—0,9 mm. long and 0,65—0,7 mm. broad. As is proved by the collections from the Hollandsch Diep, the female is provided with eggs in the month of May; in the second half of January both the male and the female have already attained their full size, but ova-bearing specimens are still wanting at that time of the year.

The collections from the river Sheldt near Antwerp which I had the honour to receive from Prof. Gilson of Brussels, are indeed interesting: these specimens are partly of medium size, partly quite young, males and females, the latter, however without eggs. The toothing formulae of 40 specimens are the following:

$\frac{9}{4}$ one specimen,

$\frac{8+2}{5}$ one specimen,

$\frac{8+2}{4}$ two specimens,

$\frac{8+1}{4}$ eleven specimens,

$\frac{7+2}{4}$ ten specimens,

$\frac{7+1}{4}$ ten specimens,

$\frac{7+2}{3}$ two specimens,

$\frac{7+1}{3}$ one specimen,

$\frac{8}{4}$ one specimen, $\frac{6+2}{4}$ one specimen.

We conclude from these formulae, that, like in the specimens from the estuary of the Meuse, the formulae $\frac{8+1}{4}$, $\frac{7+2}{4}$ and $\frac{7+1}{4}$ are those that most times occur. Also in other respects these formulae agree with those of the shrimps from the Hollandsch Diep, except the lower margin which is generally armed with *four* teeth, in 3 specimens only with *three*, but this may be a fortuity.

The general form, the length and the direction of the rostrum with regard to the antennal scales is also the same: in specimens of medium size the rostrum appears slightly longer than the scales, in quite young ones, however, it reaches only their extremity or rarely appears even a little shorter.

In the females the fingers of the 2^{d} legs are a little shorter than the palm or just as long as it, rarely the palm appears a trifle shorter than the fingers; in the male specimens, however, *the fingers* (Fig. 3*m*) *are*, *most times*, *much longer than the palm* and the carpus (Fig. 3*l*) shows a *somewhat stouter* shape than in the male specimens from the Hollandsch Diep. As results from the following Table, in which the measurements of the 2^{d} legs of four males from the Flemish Pier near Antwerp are indicated, the fingers are in N°. 1 *almost one and a half as long* as the palm, but the other specimens form, as regards the length of the fingers, a gradual transition to the specimens from the Hollandsch Diep and the same transition-proportions are presented by these specimens with regard to the stouter shape of the carpus. The occurrence of so many male specimens with the fingers of the 2^{d} legs longer than the palm in the collection from near Antwerp may, of course, be a fortuity, but these longer fingers are probably often observed in young or medium-sized specimens, so that the rarity of such individuals in the collections from the Hollandsch Diep may probably be explained by the specimens from that locality being almost all adult or nearly so.

	1	2	3	4
Length of the body	52	51	50	50
Length of the merus	5,1	4,8	4,9	4,9
Length of the carpus.	4,3	4,4	4,6	4,3
Width of the carpus at its distal extremity .	0,8	0,78	0,7	0,78
Length of the chela	7,3	7,3	6,94	7,36
Length of the palm	3	3,2	3,3	3,3
Width of the palm	1,1	1,1	1,04	1,06
Length of the fingers.	4,3	4,1	3,64	4,06
Carpus shorter than chela	$\frac{1}{2,43}$	$\frac{1}{2,5}$	$\frac{1}{3}$	$\frac{1}{2,4}$
Length of the fingers in proportion to the palm.	1,43	1,3	1,1	1,23

These numbers furthermore demonstrate that the carpus appears, in proportion to the chela, even shorter than in the males from the Hollandsch Diep. The 2d legs of these specimens much resemble those of the mediterranean *Leander xiphias* (Risso).

The female from the west coast of Walcheren agrees with the specimens from the Hollandsch Diep.

The specimen from Biarritz, finally, was, of course, of great importance, because this locality is situated not far from the mouth of the river Gironde, from where *L. longirostris* has first been recorded. It is a young female without eggs, 54 mm. long. The rostrum with the formula $\frac{7+1}{4}$, reaches 1,5 mm. beyond the antennal scales and runs straight forward, though the distal third is slightly upturned. The shorter ramus of the outer antennular flagellum is typical and projects by two-fifths its length beyond apex of rostrum. The legs of the 1st pair are as long as the antennal scales, while those of the 2d project by the chela and one-third of the carpus beyond them; the carpus is 6,8 mm. long, the chela 8 mm. (palm 4,4 mm., fingers 3,6 mm.).

The legs of the 3rd pair project by the dactyli beyond the antennal scales, those of the 5th by the dactyli and $^1/_8$ of the propodi.

Upon my request Prof. DÖDERLEIN of Strassburg has been so kind to send me for examination two of the 7 specimens from Oran, which Dr. ORTMANN (l. c.) has described under the name of *L. Edwardsii* (HELLER). These two specimens, middle-sized females without eggs, 58 mm. and 61 mm. long, are unfortunately much mutilated though, as Prof. DÖDERLEIN wrote, they are the best preserved of the seven: no wonder, for these specimens have been collected 80 years ago. In the smaller specimen the 2d legs are wanting and of most ambulatory legs the propodi and dactyli also and only in one specimen the shorter ramus of the outer antennular flagellum is still preserved.

The rostrum of the larger female that is distinctly trending upwards and extending 2 mm. beyond the antennal scales, is $\frac{6+2}{4}$ dentate, a formula which was also observed in a dutch specimen; the 2d tooth of the upper margin is one and a half as far distant from the 1st as from the 3d. While in the typical species the shorter ramus of outer antennular flagellum measures invariably two-thirds the length of the peduncle, it appears in this specimen *distinctly longer*, the peduncle measuring 9,5 mm., the shorter ramus 7,5 mm.; the coalesced portion is 2 mm. long. The shorter ramus reaches by the whole free portion beyond the tip of the antennal scales and it extends 3,5 mm. beyond apex of rostrum, i. e. almost by half its length. The 2d legs that are equal, project already by the chela and one-quarter of the carpus beyond the antennal scales. Merus 7,25 mm. long, carpus 8 mm. long, 0.9 mm. thick at the distal and 0,54 mm. at the proximal extremity, chela 8,25 mm. long (palm 4,75 mm., fingers 3,5 mm.); these numbers demonstrate that the carpus has a *more slender* shape than in the typical species and that it is *hardly shorter* than the chela, the difference being only $^1/_{33}$. The ambulatory legs, especially the propodi, are apparently also of a somewhat more slender form.

The rostrum of the other specimen is $\frac{7+2}{4}$ dentate — a quite

typical formula — distinctly trending upwards at apex and reaching 2 mm. beyond the distal end of the antennal scales.

The preceding observations indicate that these specimens from Oran differ from the typical species by the shorter ramus of the outer antennular flagellum measuring more than two-thirds the length of the peduncle and by the more slender legs, especially by the more slender shape of the carpus of the 2d legs, which is hardly shorter than the chela. When these characters of the mediterranean specimens should prove to be constant, it would seem necessary to distinguish them as a proper variety *mediterranea*.

General distribution: Estuary of the Meuse, Hollandsch Diep (Hoek, Tesch); Zuiderzee, IJ, in the Rhine near Katwijk, near Warffum, Holland (Maitland, Tesch); Noirmoutier, Vendée (Fischer); Mouth of the Gironde, as far as Bordeaux, where this shrimp is fished (H. Milne Edwards, Fischer); Corsika (Heller); Coast of Liberia (Miss Rathbun).

As far as I am aware, *Leander longirostris* has not yet been observed north of Holland nor in British waters.

Leander serratus (Penn.).

Pl. XII, Fig. 4*a*—4*d*.

Astacus serratus, Th. Pennant, British Zoology, t. IV, 19, Pl. 16, fig. 28.

Palaemon serratus, H. Milne Edwards, Hist. Nat. Crust. II, 1837, p. 389.

Palaemon serratus, Th. Bell, A History of the British Stalk-eyed Crustacea, London 1853, p. 302.

Palaemon serratus, C. Heller, Die Crustaceen des südlichen Europa, Wien 1863, p. 263.

Palaemon serratus, P. P. C. Hoek, in: Tijdschr. Ned. Dierk. Vereen. (2) Deel I, 1887, p. 102.

Leander serratus, A. Ortmann, in: Zool. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 517, Taf. XXXVII, Fig. 12.

Leander serratus, J. J. Tesch, in: Bijdragen tot de Fauna der Zuidelijke Noordzee. IV. Decapode Crustaceen ten deele verzameld met de „Wodan", 1908, p. 7.

Leander serratus, Stanley Kemp, The Decapoda Natantia of the Coasts of Ireland, Dublin, 1910, in: Fisheries, Ireland, Scient. Invest., 1908, I [1910], p. 128, 130.

One adult male from the Brouwershavensche Gat (Passage of Brouwershaven), Holland, collected June 1904.

One adult male, collected September 1913, off Kats, in the Oosterschelde, near low-water mark.

One adult male and one adult female without eggs, collected respectively May and August in the Oostgat (Eastern Passage), West coast of the isle of Walcheren.

One adult male collected, June 1901, in the Deurloo, South west coast of the isle of Walcheren.

One adult female without eggs, collected at a depth of 7 feet, July 1901, off the coast of Belgium between the „Wielingen" and the „Wandelaar".

One adult male collected off the coast of Belgium, near the sand-bank of Middelkerke.

8 adult or nearly adult specimens from Le Portel, Straits of Calais, presented by Prof. Hallez of Lille, 1903.

25 specimens, 14 of which are adult, from the Straits of Calais, received from Prof. Hallez, 1903.

7 young specimens from the Coast of Brixham, Devon, received from Mr. F. W. Millett, 1903.

2 adult ova-bearing females from Rovigno, Adriatic, received from Dr. Krumbach, May 1914.

4 specimens of medium size from Port Said, presented January 1904 by Capt. S. S. Flower of Giza.

The length of the adult specimens varies from 75 to 105 mm., the largest being a female with eggs, long 105 mm., from Rovigno and a female without eggs, long 102 mm., from the Straits of

Calais. Except the two from Rovigno, the females of this collection are not egg-bearing. One female, long 68 mm., from Le Portel is infested by a *Bopyrus* at the right side of the carapace and another, long 46 mm., from Brixham bears two *Bopyri*, at either side one.

The rostral formulae of 48 specimens show a rather great diversity and are the following:

$\frac{8+1}{5}$ one specimen,
$\frac{8+1}{4}$ two specimens,
$\frac{7+1+1}{6}$ one specimen,
$\frac{7+1+1}{4}$ two specimens,
$\frac{6+1+1+1}{8}$ one specimen,
$\frac{7+2}{5}$ one specimen,
$\frac{7+1}{5}$ nineteen specimens,
$\frac{7+2}{4}$ one specimen.
$\frac{7+1}{4}$ ten specimens.
$\frac{6+2}{5}$ two specimens.
$\frac{6+1}{5}$ four specimens.
$\frac{6+1}{4}$ two specimens.
$\frac{6+1}{3}$ one specimen.
$\frac{5+1}{6}$ one specimen.

The most common formula proves to be $\frac{7+1}{5}$, less often $\frac{7+1}{4}$. In 31 of the 48 specimens, i.e. in 65 per cent., the upper margin is armed with *seven* teeth, not counting the apical tooth or teeth; in 7 specimens, i.e. in 15 per cent., with *eight*, in 9, i.e. in 19 per cent., with *six* and in an adult male, long 83 mm., from the Straits of Calais only with *five* teeth. In the larger female from Rovigno with the formula $\frac{7+1+1}{6}$ and in two adult specimens from the Straits of Calais with 8 teeth on the upper margin the foremost tooth is placed on the unarmed part of the upper margin, about midway between the 7th tooth and the apex of the rostrum and in a specimen, long 80 mm., from the same locality, even two teeth are placed on the unarmed part of the upper margin at some distance from one another, the 8th tooth being situated rather close to the apical tooth. In 44 specimens, i.e. in 92 per

cent., there is but *one* apical tooth, quite exceptionally in 3 specimens from the Straits of Calais and in one of the specimens from Port Said *two* apical teeth were observed. In the first of these three specimens the two apical teeth that are much smaller than the preceding, are of equal size and the anterior is situated just midway between the apex of the rostrum and the posterior, in the second the posterior apical tooth is much smaller than the anterior, their position, however, is the same; in the third specimen, finally, which is very young, the posterior apical tooth is well developed, but the anterior is quite rudimentary and only visible by means of a strong magnifying-glass. In the adult female, long 93 mm., from the Straits of Calais, with the formula $\frac{6+1}{3}$, the apical tooth is rudimentary, hardly visible. In 27 specimens, i.e. in 56 per cent., there are *five* teeth on the lower margin, in 17, i.e. in 35 per cent., *four* teeth; in the adult female, long 93 mm., there are only *three* teeth, the 2^{d} situated just before the 6th or foremost tooth of the upper margin. In the larger, ova-bearing female from Rovigno, long 105 mm., the lower margin is armed with *six* well-developed teeth, that reach to near the extremity of the rostrum, the foremost being situated just opposite the apical tooth. In the male, long 80 mm., from the Straits of Calais there are only 5 teeth on the upper margin, but *six* on the lower; these six teeth reach to near the apical tooth, but they are much smaller than usual, less prominent and the 2^{d} is also longer than in the typical species, so that the rostrum presents an abnormal appearance. In the male, finally, from the Straits of Calais with the formula $\frac{6+1+1+1}{8}$, the *eight* teeth of the lower margin reach to near the foremost tooth of the upper, they are also smaller and less prominent than in the typical species, the first tooth, especially, is very small; in this specimen the 4th tooth of the upper margin is abnormally developed. In all the specimens *two* teeth are invariably placed on the carapace behind the orbital margin and the third imme-

diately before it, except only in the smaller female, long 88 mm., from Rovigno and in a specimen from Calais, in which the 3d tooth arises over the orbital margin, though the point projects beyond it. According to S. Kemp (l. c. p. 128) the 2d tooth should sometimes be situated over the orbital margin and then only one tooth on the carapace. The distance between the 1st and the 2d tooth is *about one and a half as large* as that between the 2d and the 3d, rarely twice or a little more than twice and only in one specimen it was not yet one and a half as large.

The rostrum of 3 specimens presents a rather abnormal form and characters. Of the rostrum of a male, long 83 mm., from the Straits of Calais, the upper margin is rather convex and armed with 5 teeth, 2 of which are on the carapace, the 2d one-third farther distant from the 1st as from the 3d; the 4th tooth is almost as far distant from the 3d as the 2d from the 1st and the 5th is one-third farther from the 4th as the 4th from the 3d: these teeth present therefore a quite different appearance than usually. There is no apical tooth and of the 3 teeth of the lower margin the 2d is much longer and much less prominent than in the typical species.

In a young male, long 40 mm., from Brixham the rostrum reaches only as far forward as the terminal spine of the antennal scales and is quite straight, not at all trending upwards; the upper margin is armed with 6 teeth as usual, an apical tooth is wanting and the distal unarmed part is rather short, the lower margin, finally, presents two large teeth.

In another young male, long 53 mm., also from Brixham the distal part of the rostrum is hook-shaped, the hook curved backward and one observes but one tooth on the lower margin: a remarkable monstrosity indeed.

Antennular peduncle *as long* in the male *as* in the female. According to Heller, l. c. p. 262, 264, this species should differ from *L. Treillianus* by the shorter ramus of the outer flagellum not reaching the extremity of the rostrum, while in the latter species it should project beyond it.

Ortmann in his revision of the genus *Leander*, in: Zoolog. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 514 makes also use of this character for distinguishing both species. The study of the numerous specimens at my disposal now proved at once *that this character is not consistent and does not hold good.* In all the specimens, except the two from Rovigno, the shorter ramus appears *distinctly shorter* than the peduncle, measured from the orbital margin; in the larger female from Rovigno the peduncle is but 0,5 mm. longer than the shorter ramus and in the other female from the same locality both are of equal length. In 12 of 28 *adult* specimens examined the shorter ramus proved to be 0,5 to 2,5 mm., usually 1 mm., shorter than the rostrum, in 8 it reached just to the apex and in 8 it reached 1,5 to 2,5 mm. beyond the rostrum; in the *young* individuals, however, from the Straits of Calais the shorter ramus projects invariably 1 to 2 mm. beyond apex of rostrum, in the young specimens from Brixham even 2,5 to 3,5 mm. and in the specimens from Port Said that are 70 mm. long, 2 to 2,5 mm., so that in these young individuals the shorter ramus extends for two-fifths to three-quarters of its length beyond the apex. According to Heller the shorter ramus should be fused to the longer for one-third, according to S. Kemp for about one-quarter its length: in 13 out of 30 *adult* specimens it proved to be coalesced only *for one-fifth*, *in* 8 *for somewhat more than one-fifth*, *and in* 9 *for one-quarter its length*, in the *young* specimens also for one-quarter, rarely for a little more.

The mandibular palp (S. Kemp, l. c. fig. 1*b*) is three-jointed and presents exactly *the same form* in the specimens from the English Channel as in the females from Rovigno and as in the specimens from Port Said. In an adult female from the English Channel (Fig. 4*a*) the 1st or basal joint is 0,7 mm. long, the 2d 0,6 mm. long and 0,22 mm. thick in the middle, 2,7-times as long as thick, the 3d joint 1,1 mm. long and 5-times as long as thick at base. In the smaller ova-bearing female from Rovigno the basal joint (Fig. 4*b*) is 0,8 mm. long, the 2d 0,6 mm. long and 0,24 mm. thick, 2,5-times as long as thick, the 3d joint

1,08 mm. long and 6-times as long as thick at base. In 2 specimens from Port Said the 2d joint proved to be a little less slender, namely only 2,1-times as long as thick: my supposition that this less slender shape was caused by the younger age of these specimens proved to be correct, for the same form and proportions were shown by a specimen from the English Channel the size of which was the same.

Except only the two ova-bearing females from Rovigno (Fig. 4*d*) and a specimen, long 70 mm., from Port Said, in all the specimens the legs of the 2d pair (Fig. 4*c*) project by one half to four-fifths of the fingers beyond the antennal scales, in the two egg-bearing females from the Adriatic and in this Port Said specimen, however, *by the fingers and half the palm*. Carpus always distinctly shorter than merus and as long or slightly longer than the fingers, the latter usually a little longer than the palm, rarely just as long.

The legs of the 5th pair reach to the tip of the antennal scales, in the two egg-bearing females from Rovigno they project even by the dactyli beyond them.

The two egg-bearing females from Rovigno must, in my opinion, be referred to *L. serratus* (Penn.). The rostrum presents the same form and toothing as the typical species, in the larger female, long 105 mm., the shorter ramus reaches hardly 2 mm. beyond apex of rostrum, while in the other it is 1 mm. shorter than the rostrum, just as observed also in the typical *serratus* from the English Channel.

The mandibular palp shows quite the same form and characters. The only difference that I see, is presented by the second legs, which, like in the variety *Treilliana*, project by the fingers *and half the palm* beyond the scales, while in the typical species from the English Channel these legs reach only by one half to four-fifths of the fingers beyond them.

General distribution: Northern part of Øresund, Denmark (Meinert); Berwick (Norman and Brady); Helder, Holland (Hoek, Tesch); coast of Belgium (van Beneden); West coast of France

(Milne Edwards, Fischer, Bonnier); Channel Islands (Norman); South coast of England (Bell, Norman and Scott, etc.); Liverpool Bay (Walker); Clew Bay, west coast of Ireland (Farran); Coast of Portugal (Osorio).

Algiers (Lucas); Nizza (Targioni Tozzetti); Spezia (Neumann); Naples (Carus); Greece (Guérin); Bosporus (Heller).

Leander serratus (Pennant), var. *Treillianus* (Risso).

Pl. XII, Fig. 5.

Melicerta Triliana, A. Risso, Hist. Nat. Crustacés des environs de Nice, Paris 1816, p. 111, Pl. 3, fig. 6 [1]).

Palaemon Treillianus, H. Milne Edwards, Hist. Nat. Crustacés, II, 1837, p. 392.

Palaemon serratus, H. Milne Edwards, in: Le Règne Animal, etc. par G. Cuvier. Crustacés, p. 146, Pl. 54, fig. 1 (teste C. Heller).

Palaemon Treillianus, C. Heller, Die Crustaceen des südlichen Europa, Wien 1863, p. 266, Taf. IX, fig. 1—9.

Palaemon Treillianus, J. V. Carus, Prodromus Faunae Medit. Part. II, Stuttgart 1885, p. 473.

Palaemon serratus, var. *Treillianus*, B. Osorio, in: Jornal Scienc. Math., Physic. e Natur. 2*a* Serie — N°. I, Lisboa, 1889, p. 64.

Leander treillianus, Th. Adensamer, Zoolog. Ergebnisse XI, Decapoden, gesammelt auf S. M. Schiff „Pola" in den Jahren 1890—1894, Wien 1898, p. 26.

? *Leander Latreillianus*, V. Czerniavsky, Crustacea Decapoda Pontica Littoralia. Charkov 1884, p. 44.

Confer: F. Doflein, Lebensgewohnheiten und Anpassungen bei dekapoden Krebsen. Jena 1910.

2 adult females, one of which with eggs, from the Gulf of Naples, purchased from the Zoological Station.

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1) The name „*Triliana*" in Risso's work ought, no doubt, to be regarded as a typographical error, in stead of „*Treilliana*".

It is with much doubt that these two specimens are referred to Risso's *L. Treillianus*, for they only differ from the females that were captured at Rovigno and referred p. 166, 171 to *L. serratus* (Penn.), by unimportant characters presented *by the shorter ramus of the outer antennular flagellum and by the mandibular palp.*

The ova-bearing female is 86 mm. long. The rostrum the unarmed part of which is distinctly trending upward, though the apex is hardly situated higher than the upper border of the carapace, projects rather little (3,5 mm.) beyond the antennal scales and is $\frac{7+1}{5}$ dentate. The 3d tooth is situated over the orbital margin and, as in *L. serratus*, the distance between the 1st and the 2d is one and a half as long as that between the 2d and the 3d; the foremost tooth is placed immediately before the penultimate joint of the antennular peduncle, just midway between the apical tooth and the orbital margin of the carapace; the 3d tooth of the lower margin is placed immediately before the foremost tooth of the upper.

The antennular peduncle, measured from the orbital margin of the carapace, is 12,5 mm. long and reaches to the distal quarter of the scaphocerite; the shorter ramus is *just as long* as the peduncle and fused to the longer *for one-quarter* of its length. *The shorter ramus extends by about one-third its length, viz. 4,5 mm., beyond apex of rostrum.*

The mandibular palp differs from that of the specimens which were referred to the typical *L. serratus,* by the *stouter* form of the 2d joint, which is 1,7-times as long as thick; the 1st or basal joint is 0,8 mm. long, the 2d 0,52 mm. long and 0,31 mm. thick; the 3d 1,26 mm. long, 0,25 mm. thick at base, 5-times as long as thick.

External maxillipeds reaching by two-thirds the distal article beyond the antennal peduncle.

The legs of the 1st and of the 5th pair reach the end of the antennal scales. The legs of the 2d pair project by the fingers and *two-thirds of the palm* beyond the antennal scales: merus

8,5 mm. long, carpus 7 mm., palm 7 mm., fingers 6,5 mm., palm 2,6 mm. broad.

The other female measures 81 mm. The rostrum hardly reaches 2 mm. beyond the scales and is rather little upturned distally, so that the apex is situated in the same horizontal line as the 2d tooth of the upper margin; it is $\frac{7+1}{4}$ dentate, the 3d tooth immediately before the orbital margin and the 2d one and a half as far from the 1st as from the 3d. Distance between the foremost tooth and the apex little more than $^1/_3$ the length of the rostrum. Third tooth of the lower margin situated immediately before the foremost tooth of the upper and just before the penultimate joint of the antennular peduncle.

The antennular peduncle extends here also to the distal quarter of the scaphocerite and is 13 mm. long; the shorter ramus, 11,5 mm. long, appears *a little shorter* than the peduncle, exactly as in the typical *L. serratus* from the coast of Belgium. *The shorter ramus, fused to the longer only for one-fifth its length, extends by four-sevenths, viz. 6,5 mm., beyond apex of rostrum.*

The mandibular palp (Fig. 5) resembles that of the ova-bearing female, the 2d joint being also 1,7-times as long as thick: the 1st or basal joint is namely 0,9 mm. long, the 2d 0,51 mm. long and 0,3 mm. thick, the 3d 1,16 mm. long and 0,24 mm. thick at base, being almost 5-times as long as thick at base.

The external maxillipeds extend by half the terminal joint beyond the antennal peduncle.

The legs of the 1st and of the 5th pair reach as far forward as the terminal spine of the scaphocerite.

The 2d legs reach by hardly more than the fingers beyond the scales: merus 7,5 mm. long, carpus 7 mm., palm 6.25 mm., fingers 6 mm., the palm being 2,4 mm. broad.

As follows from these observations, the two specimens differ from those that have been referred to the typical *L. serratus* 1^0 by the somewhat different form of the mandibular palp, 2^0 by the shorter ramus reaching, in the adult species, *considerably*

farther beyond apex of rostrum. New researches, however, are necessary to decide whether these characters are invariably consistent and occur together. Now I would first call attention to the description of H. MILNE EDWARDS (l. c. 1837), with which these specimens do not agree. The body has the same shape as in the specimens from Rovigno, referred to *L. serratus*, the lower margin of the rostrum also, and the shorter ramus of the outer flagellum is not much longer, but just as long or even slightly shorter than the peduncle. Also, according to HELLER's description, the shorter ramus should be, in *L. Treillianus*, much longer than the peduncle and fused to it for one-third its length.

Leander Latreillianus of CZERNIAVSKY (l. c.) from the Black Sea belongs probably to another species or variety. The toothing of the rostrum differs from that of the typical *serratus* and the variety *Treillianus* by the smaller number of teeth on the upper margin, 4 or 5 or 6 besides one or two apical teeth and by the 2d tooth being situated „above the eyes".

General distribution: Lisbon (OSORIO); Mediterranean and Adriatic (Triest, Lussinpiccolo, Zara, Lessina, Ajaccio, Marseille, Nizza, Sicily, Algiers, Messina, Sporades, according to HELLER, GOURRET, ADENSAMER and others).

Leander xiphias (RISSO).

Plate XII, Fig. 6.

Palemon xiphias, A. RISSO, Hist. Nat. Crustacés des environs de Nice, Paris 1816, p. 102.

Palaemon xiphias, C. HELLER, Die Crustaceen des südlichen Europa, Wien 1863, p. 266, Taf. IX, Fig. 10 (Fig. 9 of the Explanation of the Plate).

Palaemon xiphias, J. V. CARUS, Prodromus Faunae Medit. Stuttgart 1885, p. 473.

Palaemon xiphias, P. GOURRET, Révision des Crust. Podophth. du Golfe de Marseille, Marseille 1888, p. 40.

Leander xiphias, A. ORTMANN, in: Zool. Jahrb., Abth. f. Syst. Bd. V, 1890, p. 518.

Confer: F. Doflein, Lebensgewohnheiten und Anpassungen bei dekapoden Krebsen, Jena 1910.

17 specimens, one of which is egg-bearing and full-grown, while the others are younger and of different size, from the Gulf of Naples, received from the Zoological Station.

The ova-bearing female is 74 mm. long. The rostral formulae of 16 specimens are the following:

$\frac{7+1}{5}$ eight specimens, $\frac{7+2}{4}$ one specimen.

$\frac{7+2}{5}$ one specimen, $\frac{7+1}{4}$ one specimen.

$\frac{6+1+1}{5}$ one specimen, $\frac{6+1}{5}$ two specimens.

$\frac{6+1+1}{4}$ one specimen, $\frac{6+1}{4}$ one specimen.

The most common formula is $\frac{7+1}{5}$, sometimes the foremost tooth is situated more forward. In 13 of 16 specimens the upper margin is armed with *seven*, in 3 only with *six* teeth, not counting the apical tooth; in 2 specimens *two* apical teeth are observed, in the rest only one. Two teeth are invariably placed on the carapace, the 3d immediately before it, the 2d tooth is about one and a half as far distant from the 1st as from the 3d. In 12 of 16 specimens, i. e. in 75 per cent., the lower margin is armed with *five*, in 4 with *four* teeth. In most specimens the rostrum fully agrees with Heller's figure.

The shorter ramus of the outer flagellum, which in most specimens is fused to the longer for *one-fifth* its length, rarely for one-fourth or for one-sixth, as in the adult ova-bearing female, reaches in all the specimens beyond the apex of the rostrum, but the portion that reaches beyond it, varies from 1,5 to 5,5 mm., in one specimen, long 56 mm., the shorter ramus reaches even only 0,6 mm. beyond the rostrum: sometimes just half the shorter ramus reaches beyond the rostrum, in other specimens

somewhat more or less and in the specimen long 56 mm. only $^1/_{14}$ projects beyond the apex. The shorter ramus is usually slightly longer than the antennular peduncle, sometimes just as long and in a specimen of medium size, long 50 mm., the peduncle is 7,4 mm. long, the shorter ramus 7 mm.

Mandibular palp *three-jointed* (Fig. 6), closely resembling that of *L. serratus* (PENN.). In a specimen, long 66 mm., the 1st or basal joint is 0,7 mm. long, the 2d 0,46 mm. long and 0,155 mm. thick, 3-times as long as thick, the tapering 3d joint 0,8 mm. long and 0,12 mm. thick at base.

In the ova-bearing specimen the 2d legs reach by the fingers and one-third the palm beyond the antennal scales, in younger specimens only with the fingers or a part of them. Carpus distinctly shorter than merus and slightly longer than the palm, fingers invariably much longer than the palm, and as much shorter than the merus as they are longer than the carpus.

In one female without eggs, long 68 mm., the rostrum is abnormally developed. It hardly extends 2,5 mm. beyond the antennal scales, there are 12 teeth on the upper margin and these teeth are situated *along the whole length;* two teeth are on the carapace, the 3d immediately before the orbital margin, the 2d tooth is only one-third farther distant from the 1st as from the 3d, the 6th and the 7th tooth are smaller, i. e. shorter, than the 5th or the 8th and the two foremost teeth near the apex are not situated on the upper margin but at either side of it. The shorter ramus of the outer antennular flagellum is distinctly longer than the peduncle, extends by half its length beyond the apex of the rostrum and is fused to the longer not yet for one-sixth its length. For the rest this specimen agrees with the others.

A female without eggs, long 60 mm., bears a *Bopyrus* at the left side of the carapace.

General distribution: Adriatic and Mediterranean Seas (Lussin, Zara, Lesina, Marseille, Nizza, Corsica, Sicily, Messina, Naples, according to RISSO, HELLER, GOURRET and others).

EXPLANATION OF THE PLATES.

Plate X.

FIG. 1—1*n* *Leander Squilla* (LINNÉ). Forma typica. All the figures are taken from specimens that were collected in the Svendborg Sund. — 1, 1a and 1*b* Cephalothorax etc. of ova-bearing females, long 54 and 55 mm., × 3; 1*c* carapace and rostrum of an ova-bearing female, long 36 mm., × 3; 1*d* 5th and 6th segment of the abdomen and caudal fan of an ova-bearing female, long 59 mm., × 3; 1*e* extremity of the telson of this female, × 25; 1*f* antennal region of a male, long 45 mm., × 3, this male being one of the two in which the peduncle is just as long as the rostrum; 1*g* antennal region of an ova-bearing female, long 60 mm., × 3; 1*h* antennular flagella of an ova-bearing female, long 50 mm., × 3; 1*i* mandibular palpus of an adult, ova-bearing female, × 25; 1*j* the three-jointed mandibular palpus of the ova-bearing female, with the rostral formula $\frac{9+1}{4}$, × 25; 1*k* left leg of the 2d pair of an ova-bearing female, long 55 mm., × 3; 1*l* chela of this leg, × 5; 1*m* toothing of the fingers of this chela, × 17; 1*n* carpus of the 2d legs of an ova-bearing female, × 5.

FIG. 1*o*—1*v* *Leander Squilla* (LINNÉ), var. *intermedia* n. — 1*o* and 1*p* cephalothorax, rostrum etc. of adult, ova-bearing females, long respectively 61 and 55 mm., from the Goesche Sas, Oosterschelde, × 3; 1*q* rostrum of a young male, long 43 mm., from Brixham, × 3; 1*r* distal part of the rostrum of the male, long 39 mm., from Brixham, with the formula $\frac{12^{3}}{2}$, × 10; 1*s* antennular flagella of a female without eggs, long 65 mm., from the Straits of Calais, in which the coalesced portion of the shorter ramus is much longer than the rest, × 3; 1*t* right leg of the 2d pair of an adult, ova-bearing female, long 61 mm., from the Goesche Sas, Oosterschelde, with slender carpus, × 3; 1*u* carpus of this leg, × 5; 1*v* the stouter carpus of a female without eggs, long 51 mm., from Kats, Oosterschelde, × 5.

Plate XI.

FIG. 1*w*—1*zzzzz* *Leander Squilla* (LINNÉ), var. *elegans* (RATHKE). — 1*w*, 1*x*, 1*y* cephalothorax, rostrum etc. respectively of an ova-bearing female long 46 mm. and of two young females without eggs, long 38 mm. and 36 mm., all from the Bay of Sebastopol, × 3; 1*z* antennal region of a young female without eggs, long 34 mm., from Sebastopol, × 4; 1*zz* antennular flagella of the adult female with eggs, long 46 mm., from the Gulf of Naples, in which the coalesced portion of the shorter ramus is *shorter* than the rest, × 5; 1*zzz* left leg of the 2d pair of a young female, without eggs, long 42 mm., from the Bay of Sebastopol, × 3; 1*zzzz* carpus of this leg, × 5;

1*zzzzz* left leg of the 2d pair of a young specimen, long 34 mm., from Rovigno, × 5.

FIG. 2—2*f* *Leander adspersus* (RATHKE). All the figures are taken from specimens collected in the Bay of Sebastopol. — 2, 2*b* Cephalothorax, rostrum etc. respectively of ova-bearing females, long 70 and 75 mm., × 3; 2*a* rostrum etc. of a young female without eggs, long 57 mm., × 3; 2*c* caudal fan and 6th segment of the abdomen of an adult female with eggs, × 3; 2*d* extremity of the telson of an adult female with the rostral formula $\frac{4+1}{4}$, × 10; 2*e* antennal region of a female without eggs, long 68 mm., × 3; 2*f* mandibular palp of an adult, ova-bearing female, × 25.

FIG. 2*g*—2*l* *Leander adspersus* (RATHKE), var. *Fabricii* (RATHKE). — 2*g* rostrum etc. of an adult, ova-bearing female, long 74 mm., from Denmark, × 3; 2*h*, 2*i* rostrum etc. of ova-bearing females respectively long 52 and 57 mm. from the Isefjord, × 3; 2*j* antennal region of a male, long 46 mm., from the Isefjord, × 3; 2*k* antennal region of a young female, long 50 mm., from Denmark, × 3; 2*l* mandibular palp of an adult female from Denmark, × 25.

Plate XII.

FIG. 2*m*—2*p*. Type specimen of *P. rectirostris* ZADDACH, collected in the Bay of Danzig, from the Museum of Königsberg. — 2*m* Cephalothorax, rostrum etc., × 3; 2*n* outer antennular flagellum with shorter ramus, × 10; 2*o* leg of the 1st pair, × 5; 2*p* leg of the 5th pair, × 5.

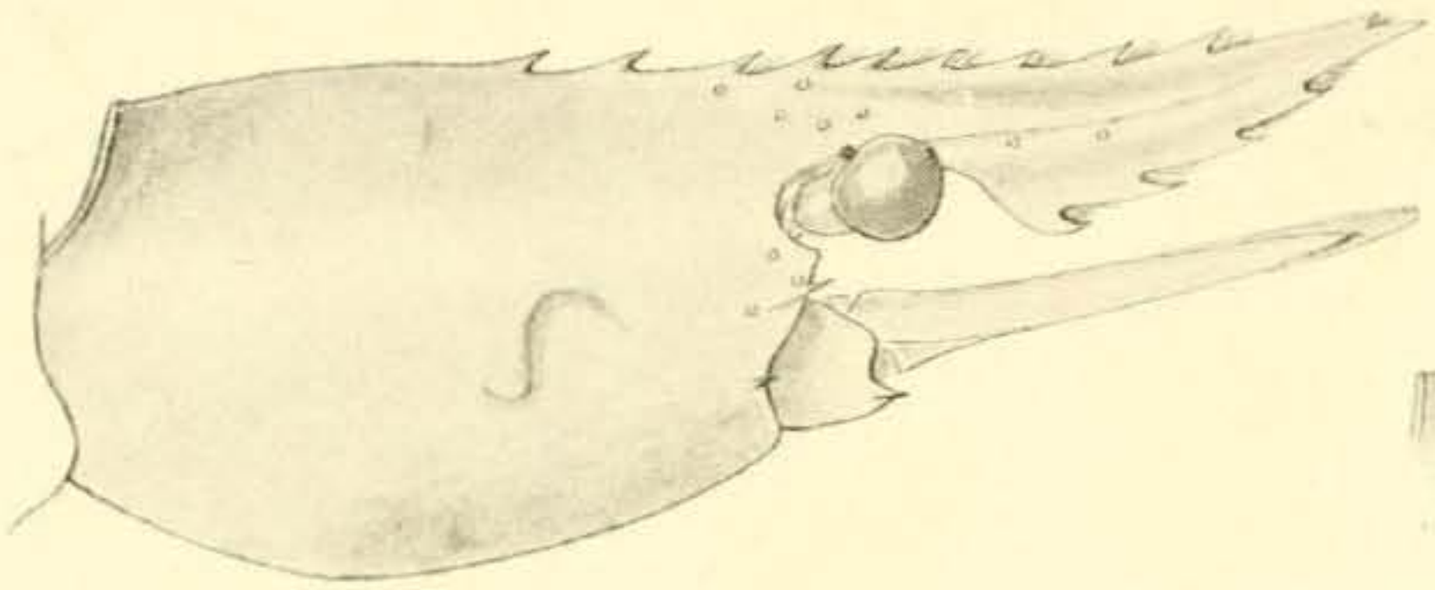
FIG. 3—3*n*. *Leander longirostris* (H. MILNE EDW.). — The figures 3—3*j* are taken from specimens collected in the Hollandsch Diep, near Numansdorp. — 3, 3*b*, 3*c* cephalothorax, rostrum etc. of adult, ova-bearing females, long 71 and 68 mm., × 2; 3*a* extremity of rostrum of the first female, × 13; 3*d* caudal fan and the two preceding segments of an adult, ova-bearing female, long 69 mm., × 3; 3*e* antennal region of an adult ova-bearing female, long 70 mm., × 3; 3*f* antennular flagella of an adult, egg-bearing female, long 69 mm., × 10; 3*g* scaphocerite of this female, × 3; 3*h* mandibular palp of an ova-bearing female, long 72 mm., × 25; 3*i* right leg of the 2d pair of an ova-bearing female, long 69 mm., × 3; 3*j* chela of this leg, × 5; 3*k* right leg of the 2d pair of a male, long 60 mm., from the Hollandsch Diep, × 3; 3*l* right leg of the 2d pair of a young male, long 53 mm., from the river Sheldt, near Antwerp, × 3; 3*m* chela of this leg, × 5; 3*n* left leg of the 2d pair of one of the specimens from Oran, which in 1890 have been described by Dr. ORTMANN under the name of *L. Edwardsii*, × 3.

FIG. 4*a*—4*d* *Leander serratus* (PENN.). — 4*a* Mandibular palp of an adult female from the Straits of Calais, 4*b* of an adult ova-bearing female from Rovigno, × 17; 4*c* left leg of the 2d pair of an adult female, long 98 mm., from the Straits of Calais, 4*d* of the larger female, long 105 mm., from Rovigno, × 2.

FIG. 5. *Leander serratus* (PENN.), var. *Treillianus* (RISSO). Mandibular palp of the female without eggs from the Gulf of Naples, × 17.

FIG. 6. *Leander xiphias* (RISSO). Mandibular palp of a specimen, long 66 mm., from the Gulf of Naples, × 17.

l.



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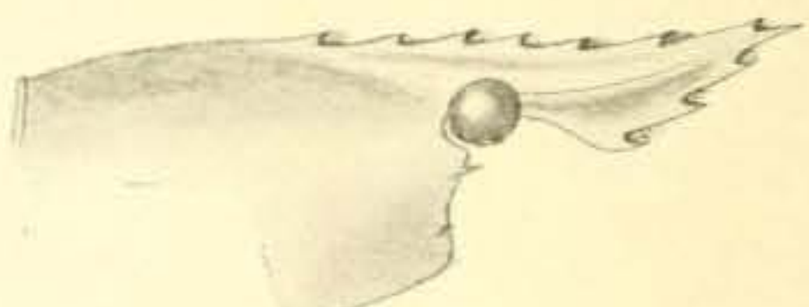

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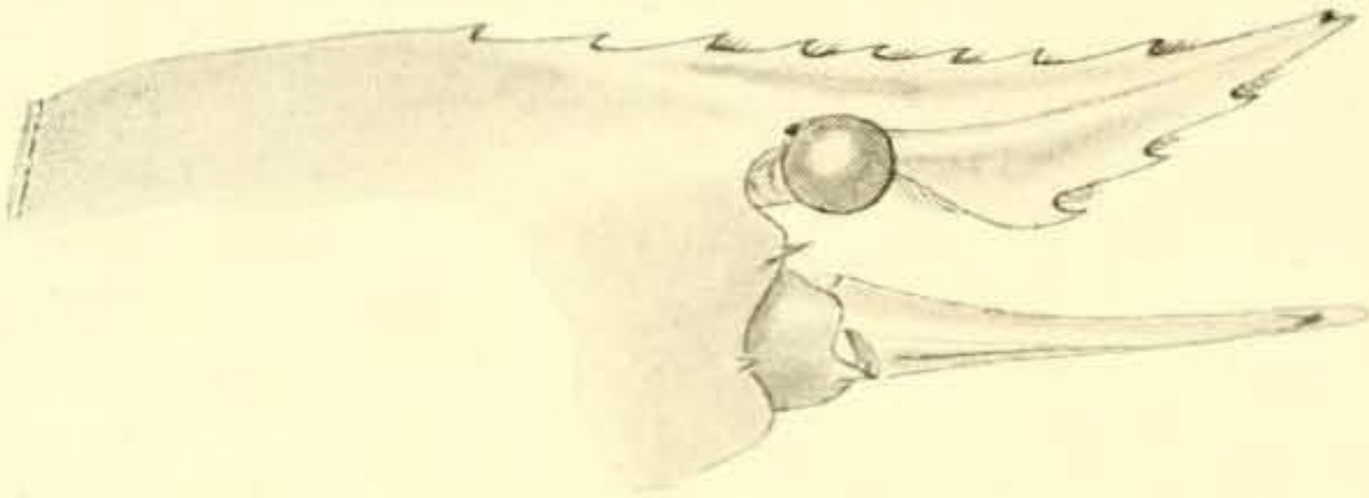
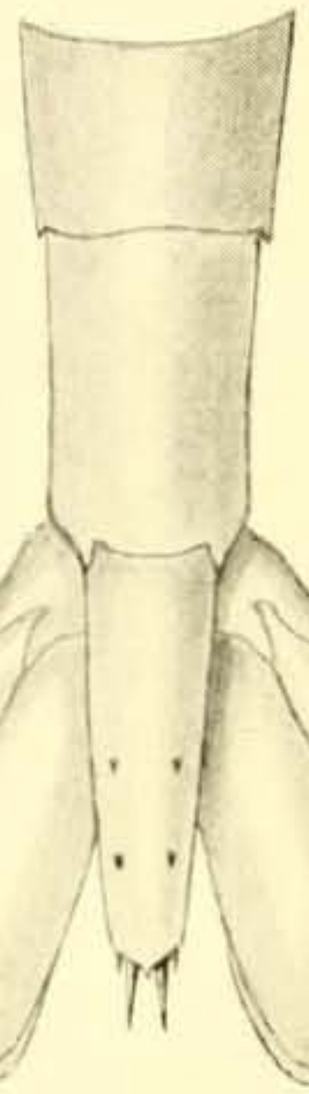


l.d.



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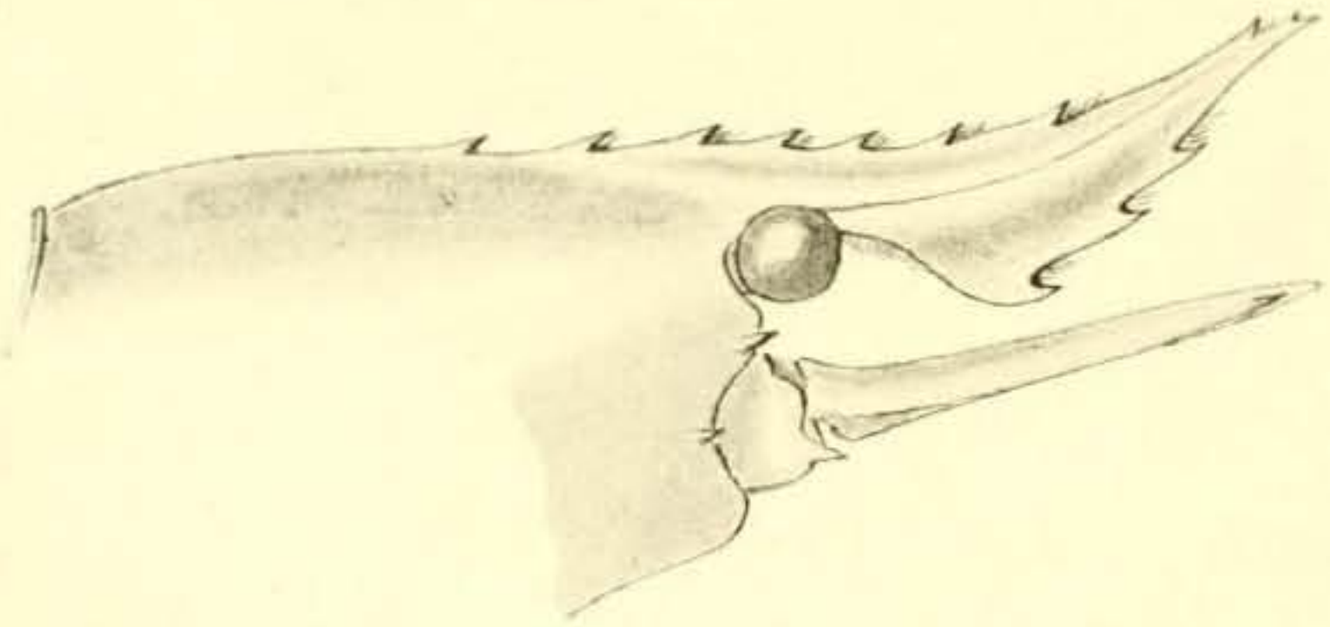

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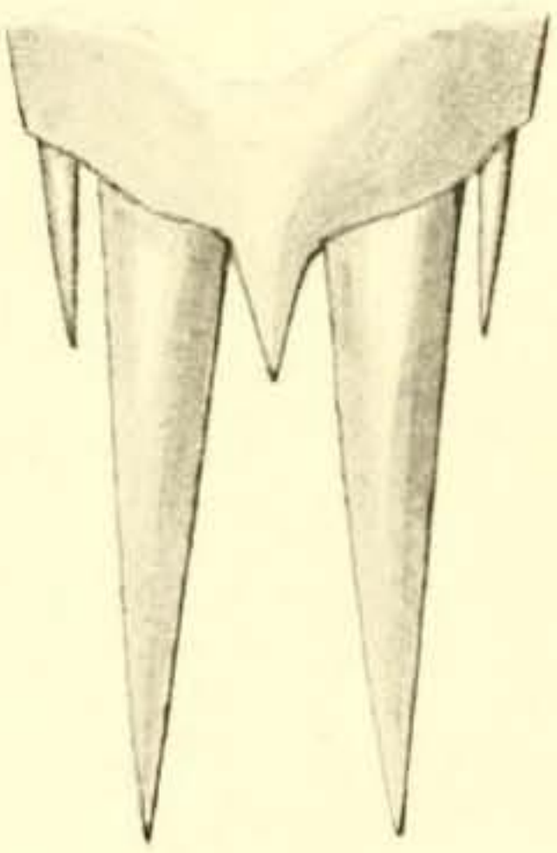

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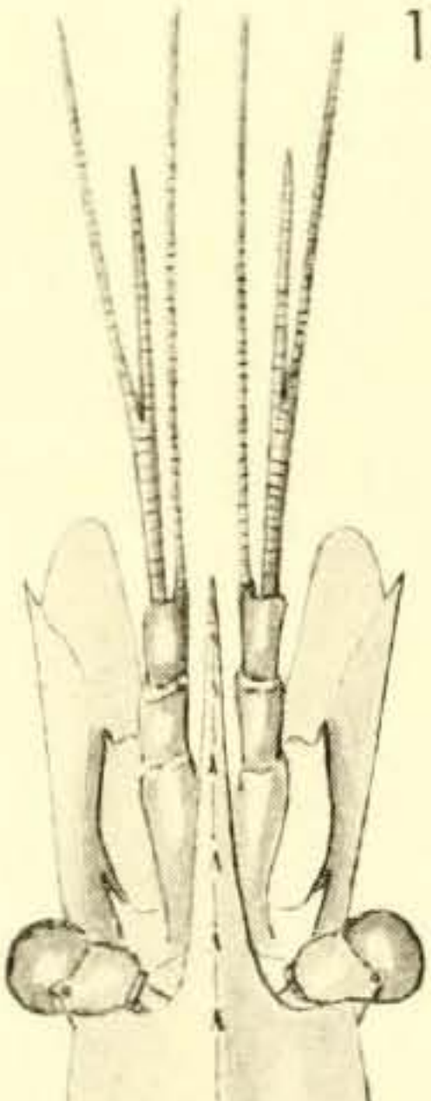

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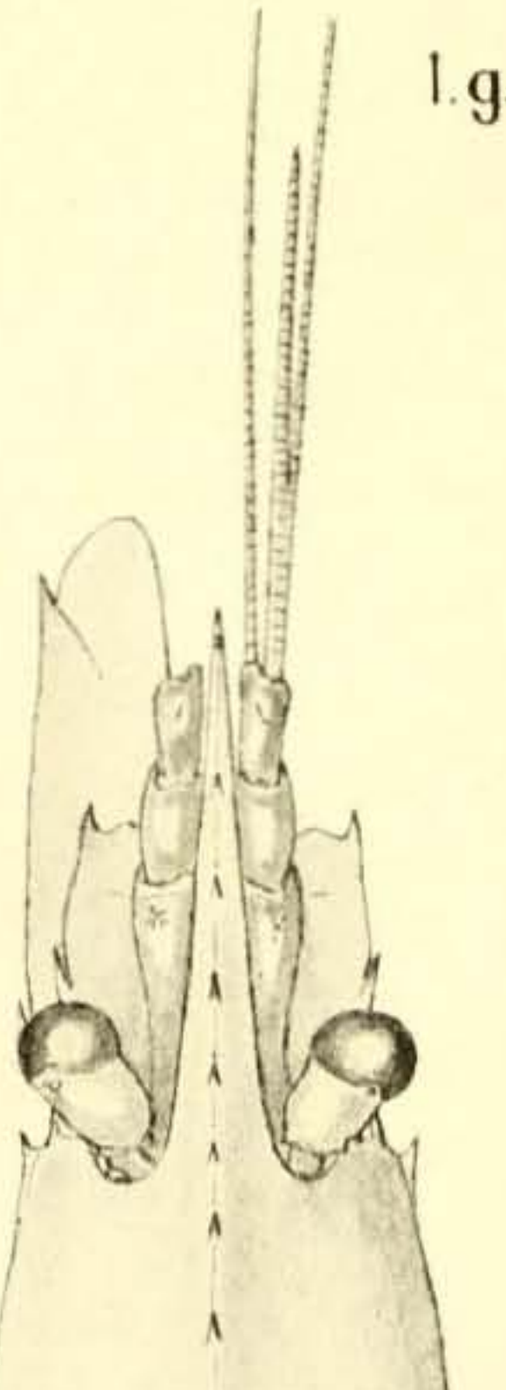

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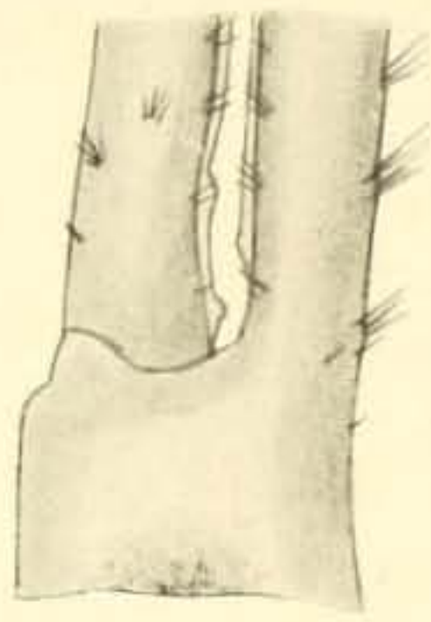
l.k.

l.l.

l.m.



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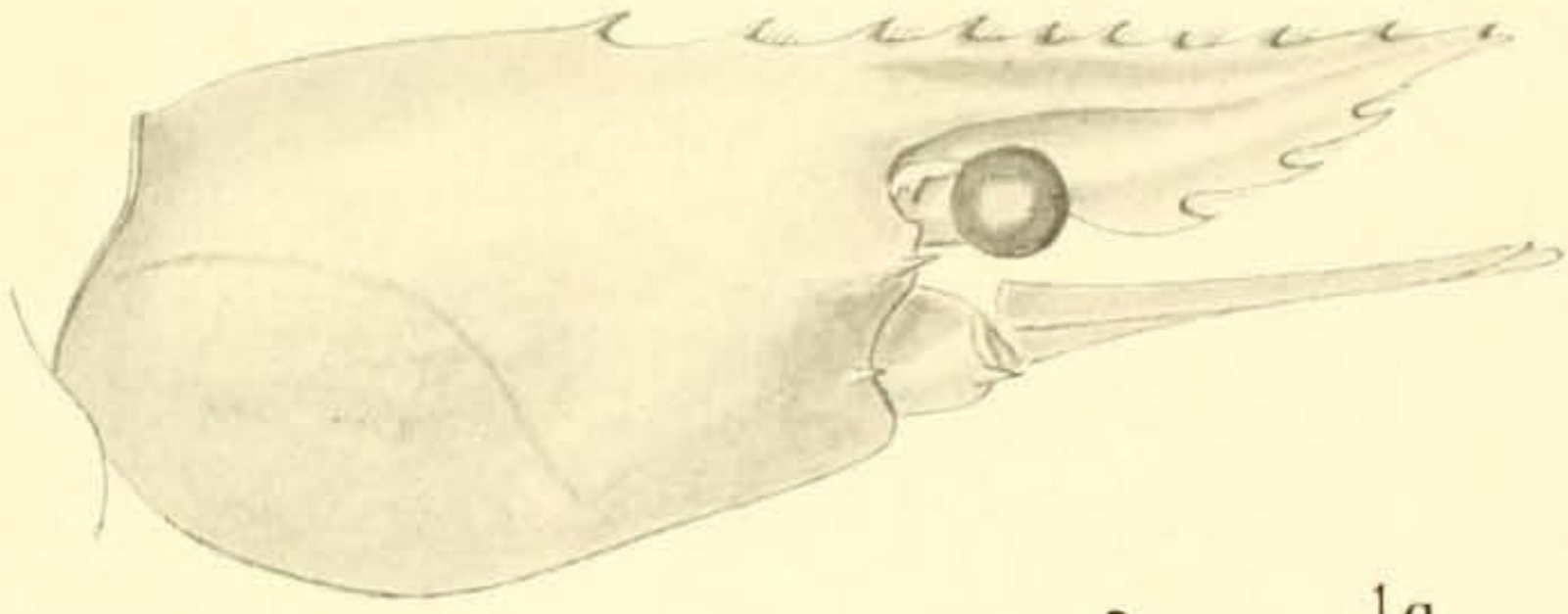
l.o.



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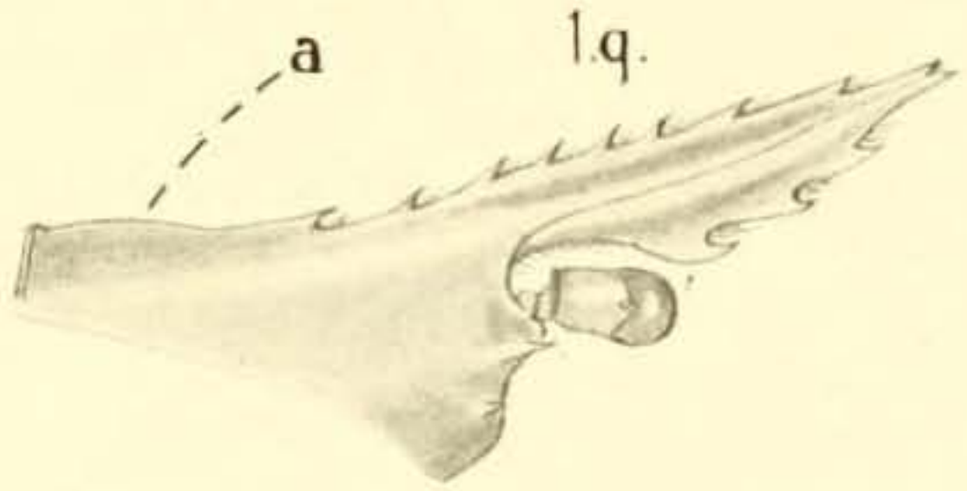

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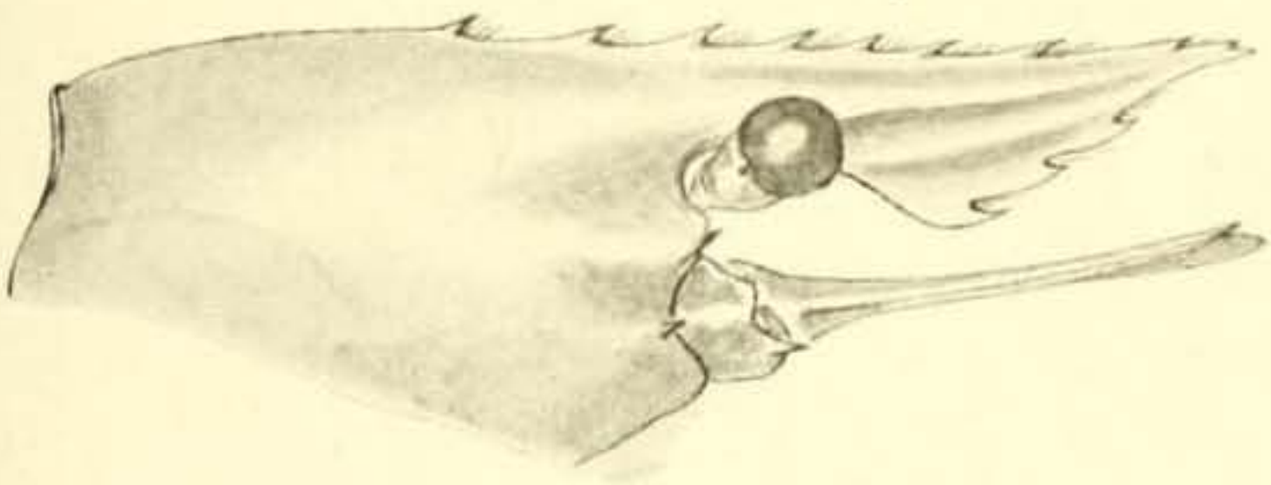

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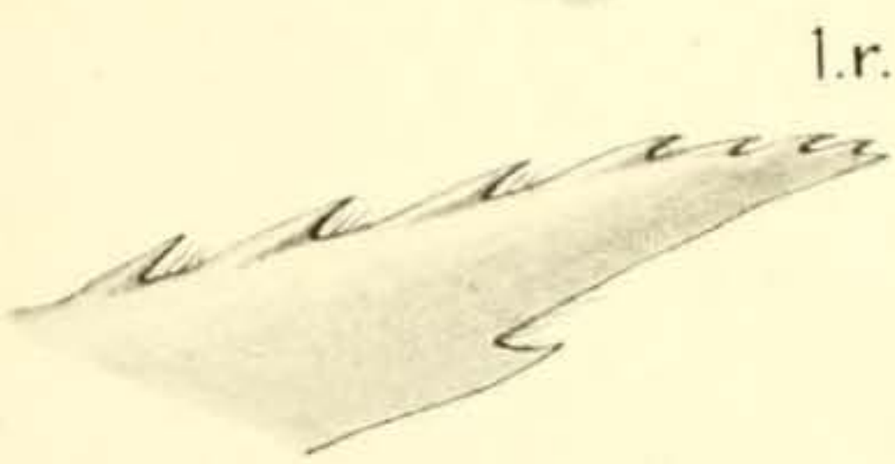

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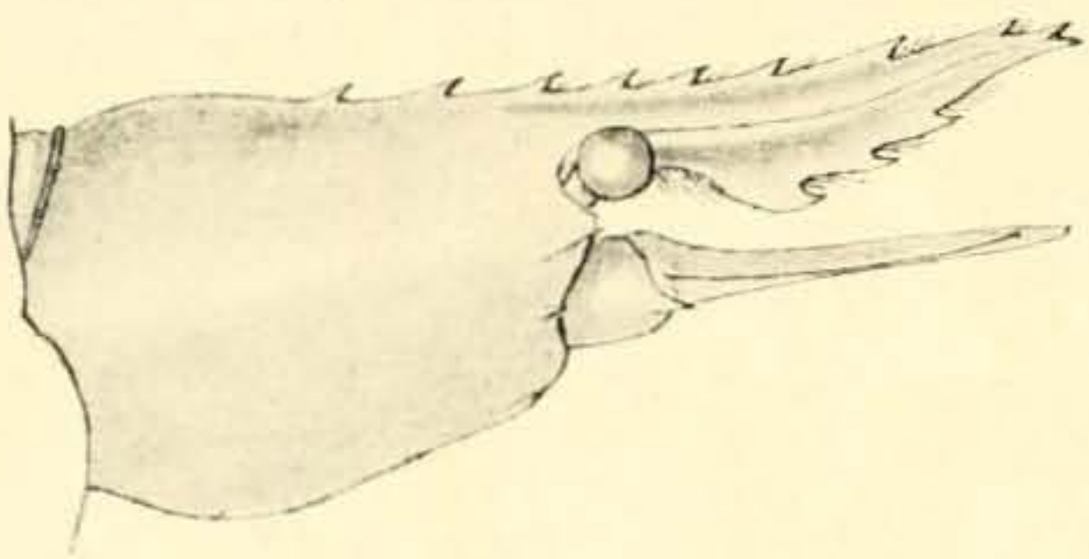
1.w.



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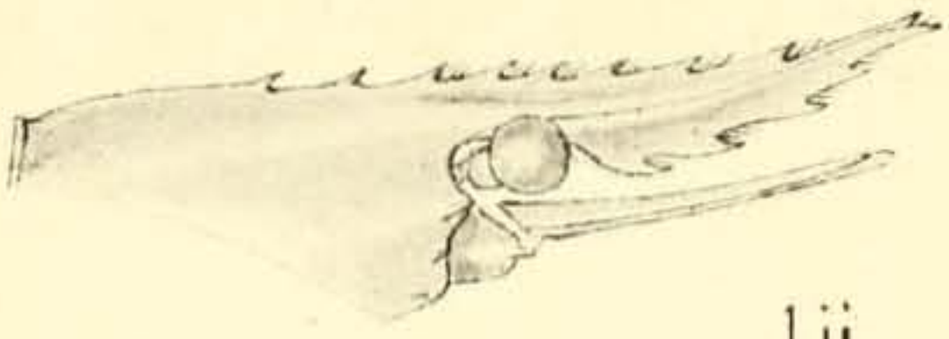

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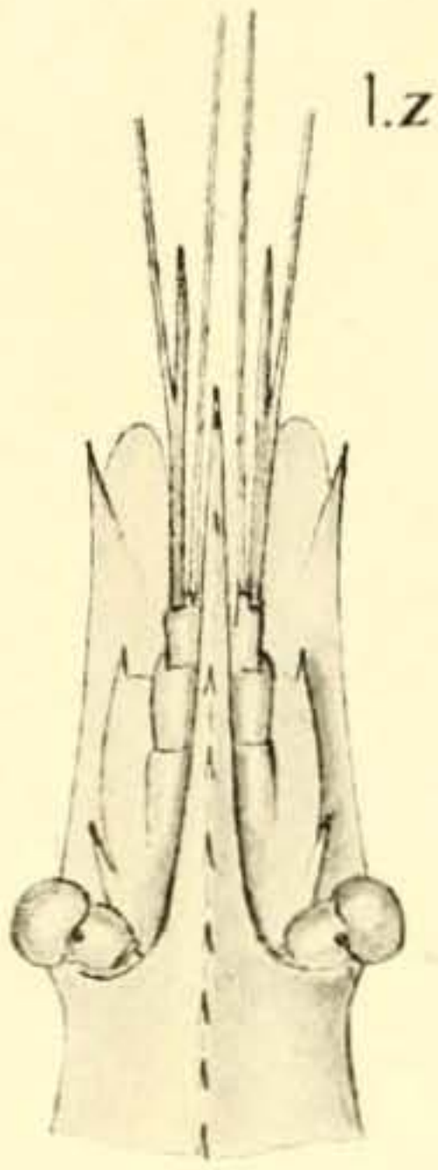

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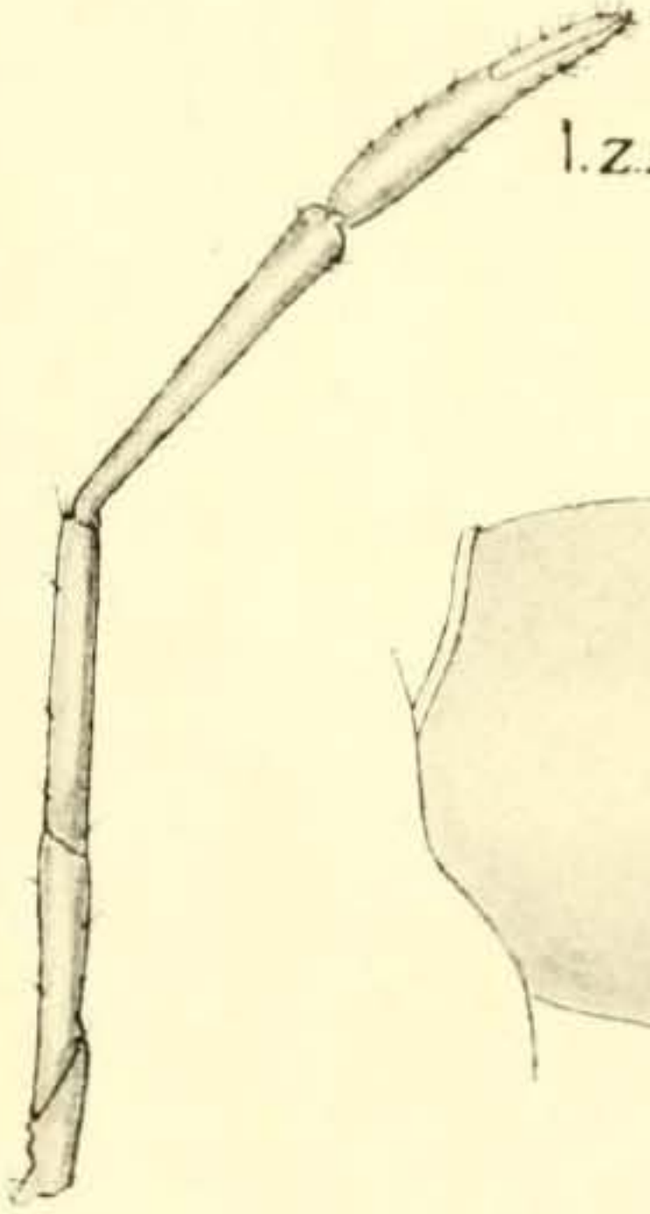

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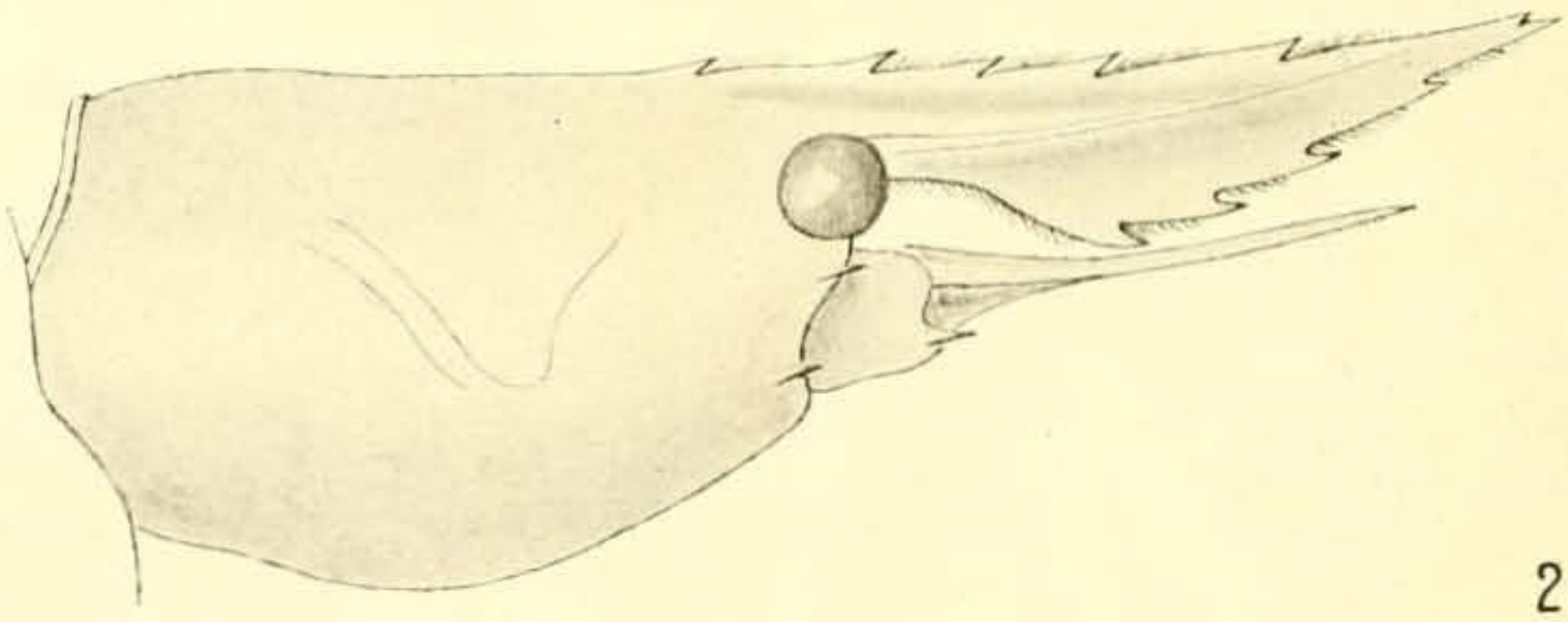

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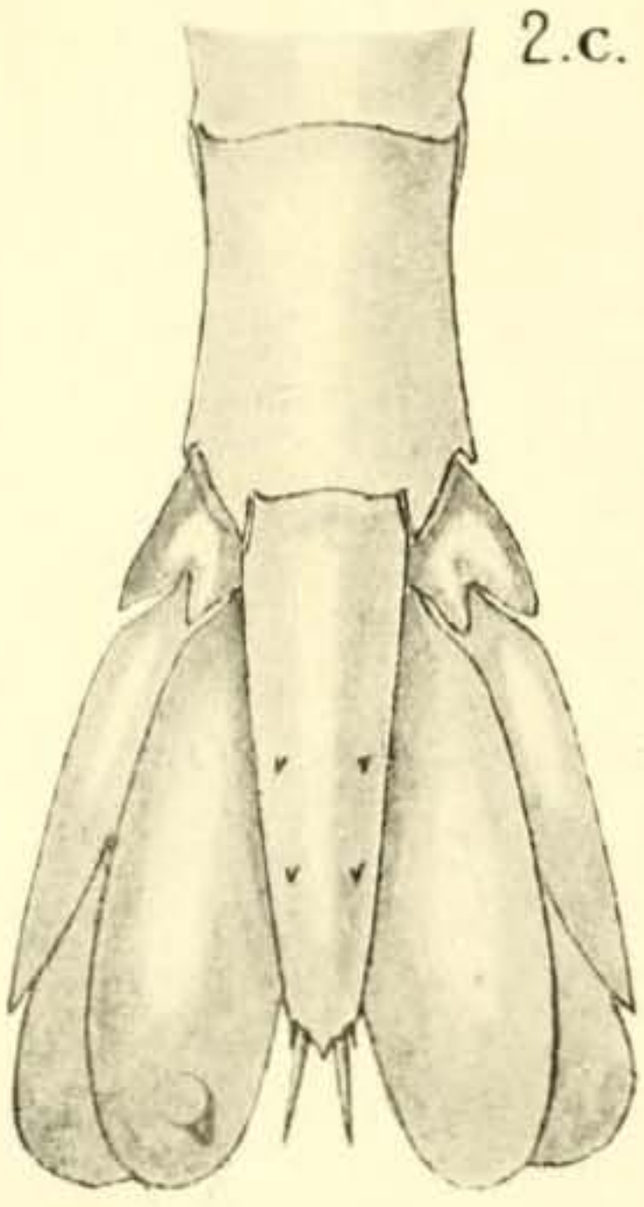
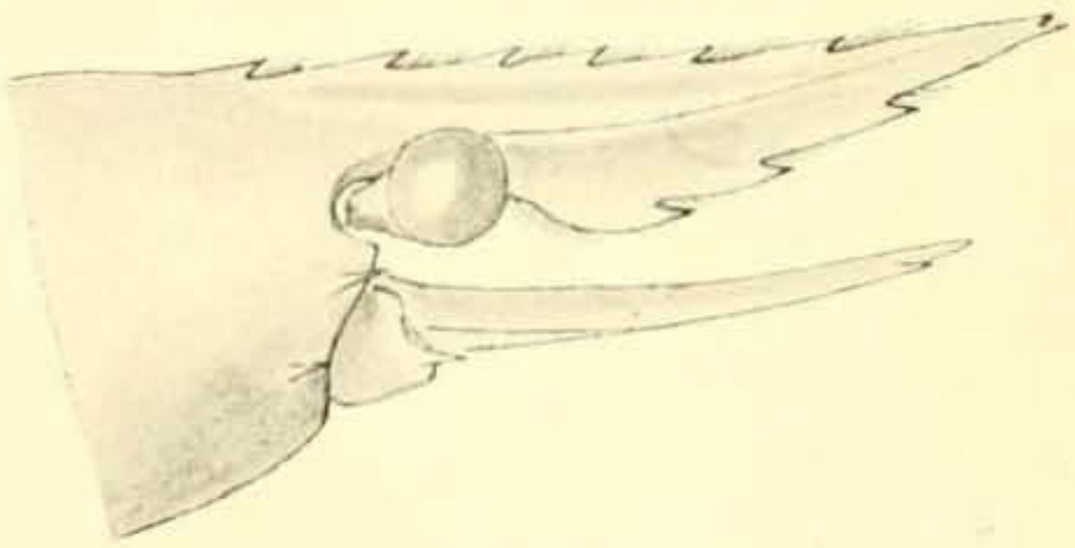
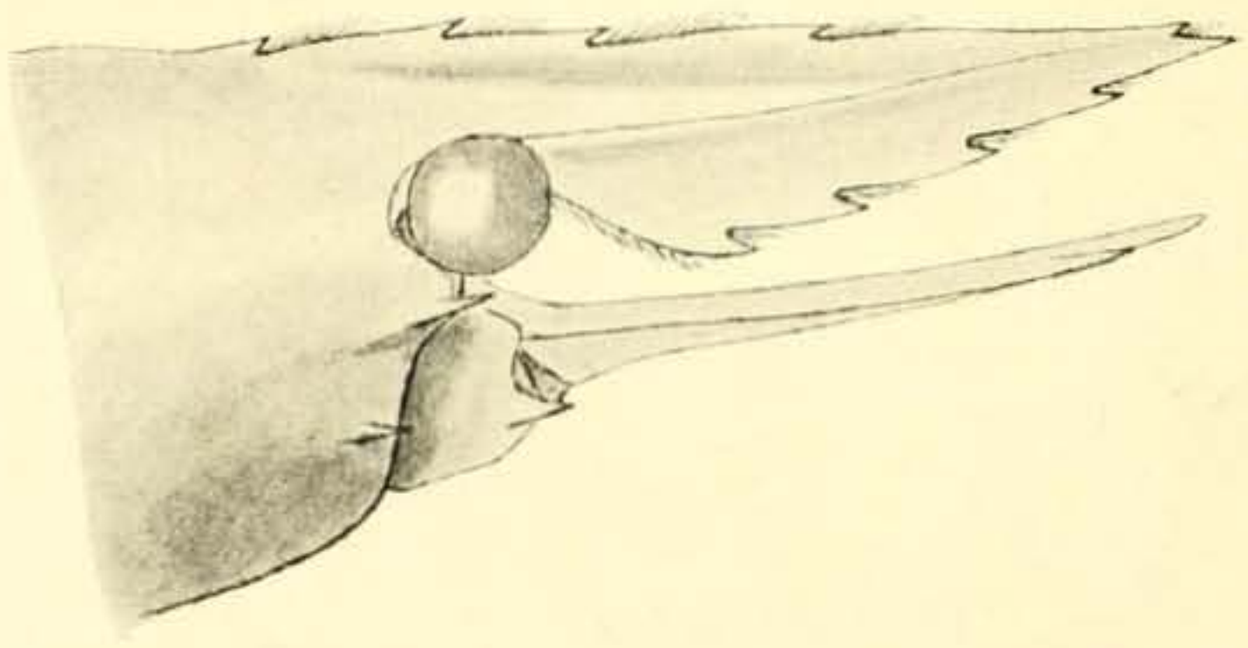


2.a.



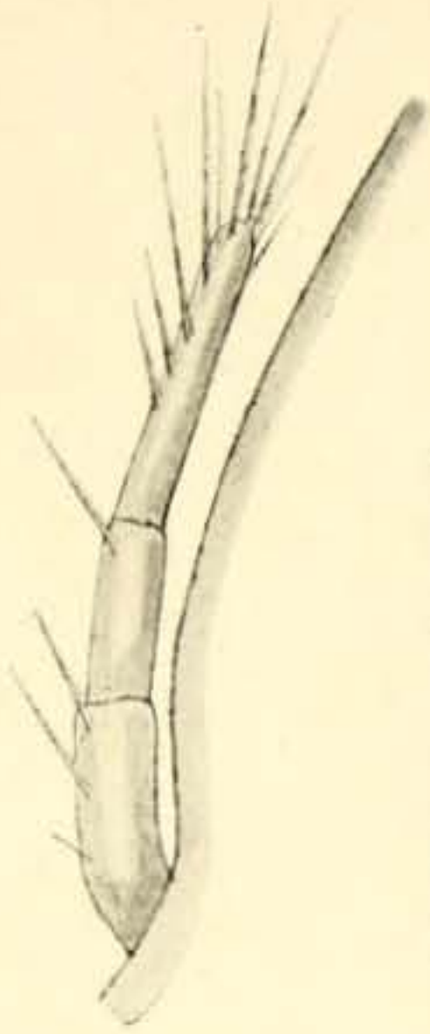
2.b



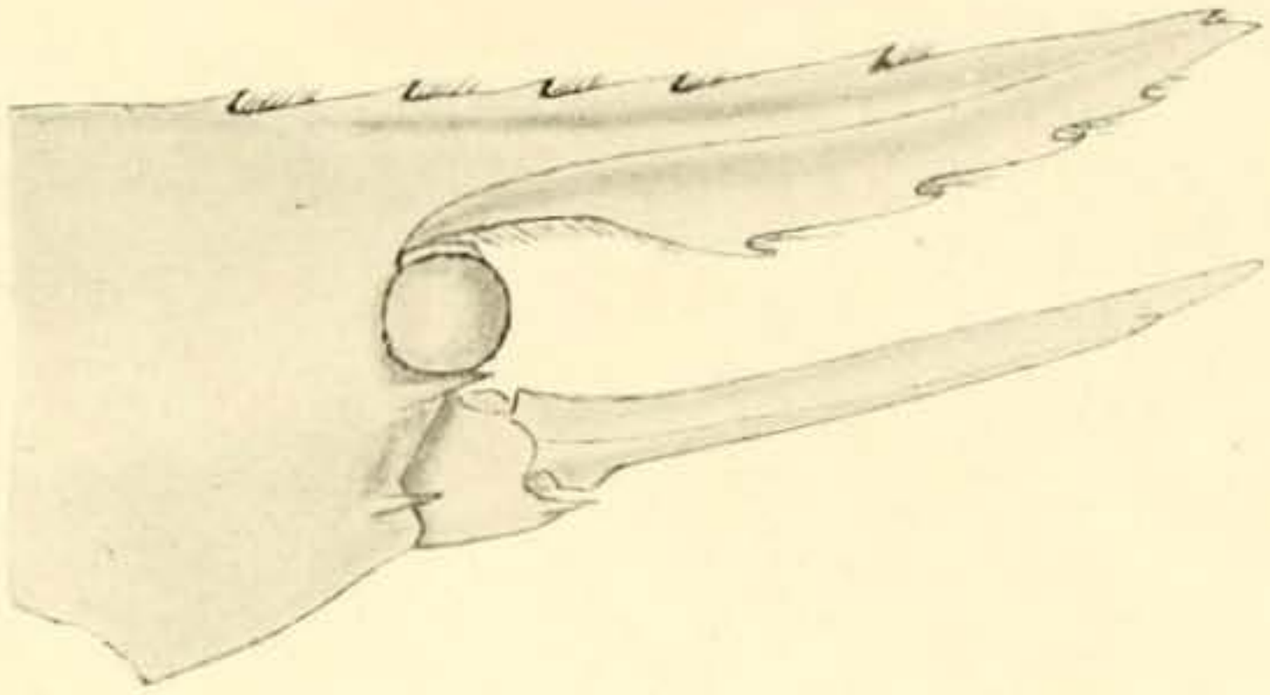
De Man del.

2.d.

2.f.



2.g.



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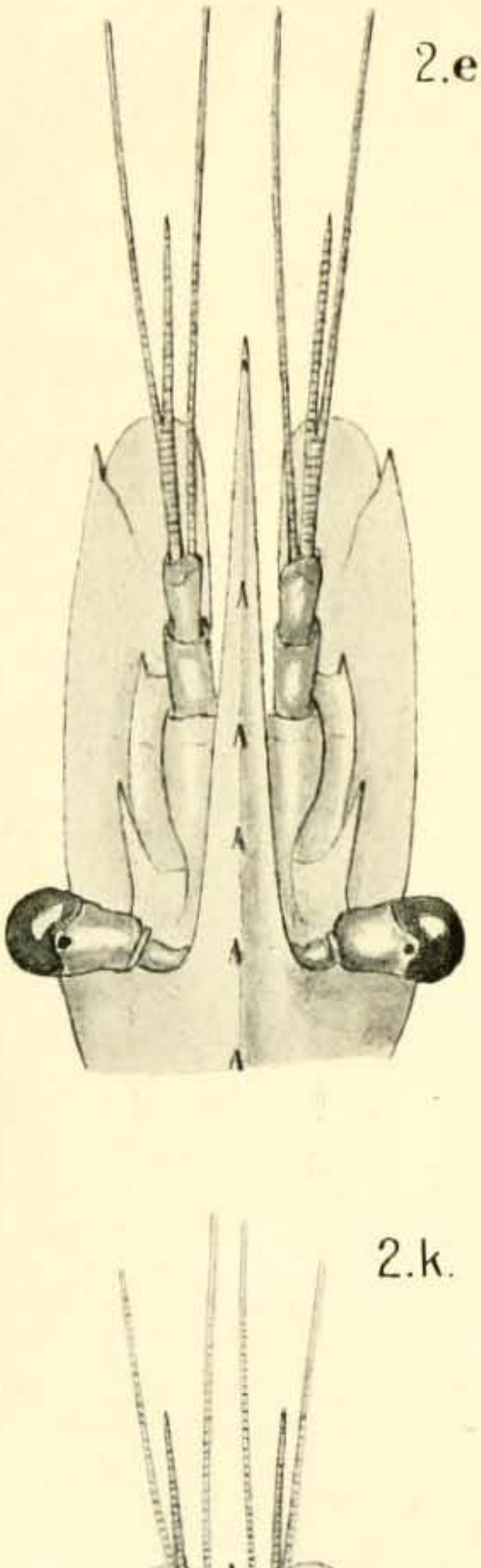
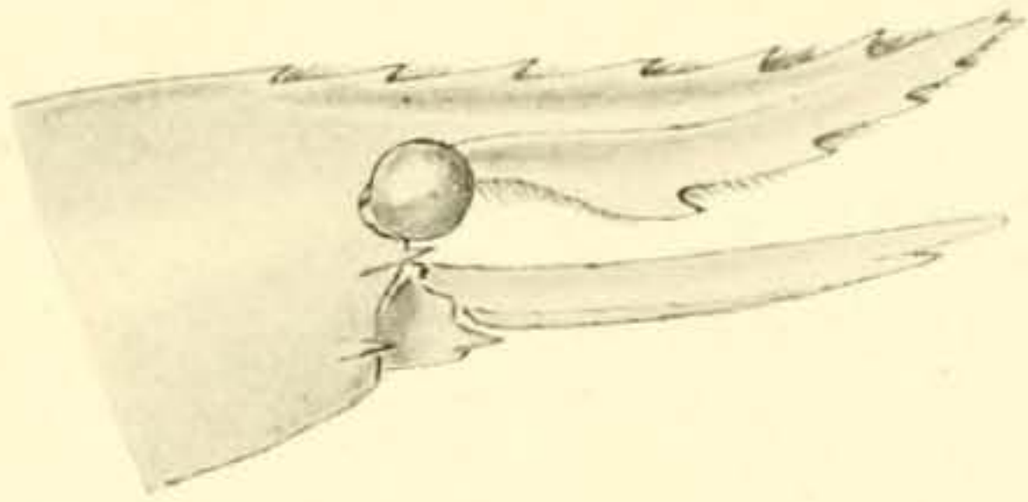
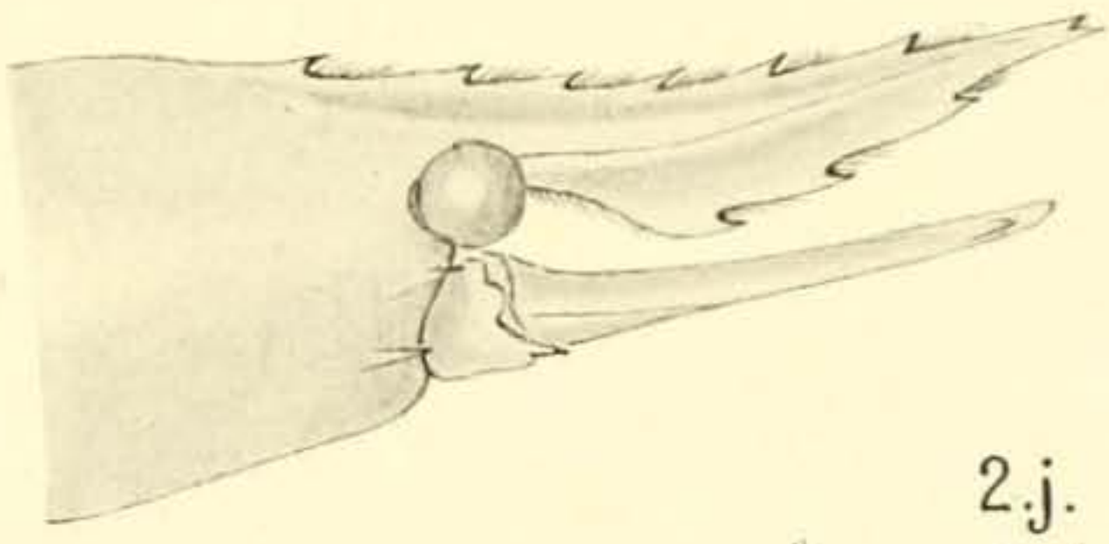


2.h.



2.i.



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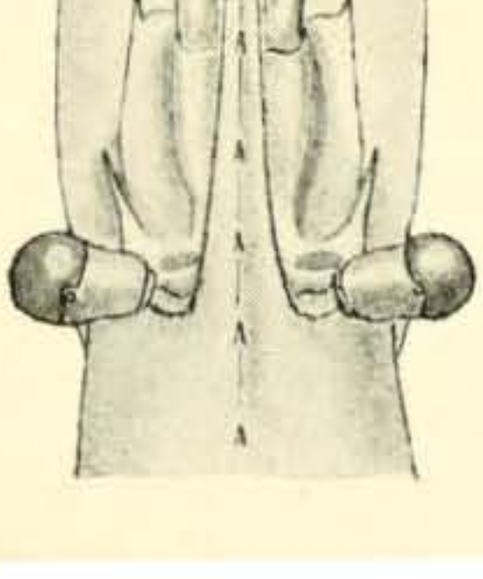
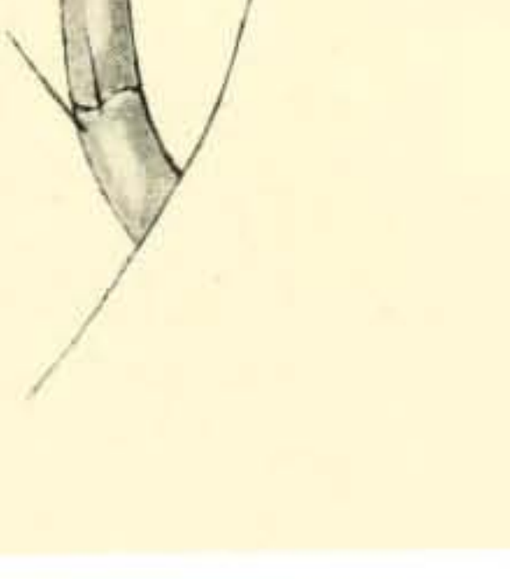
2.k.



2.l.



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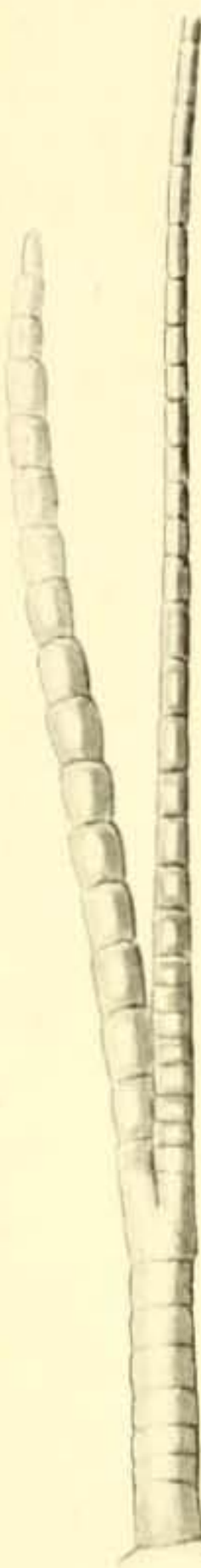
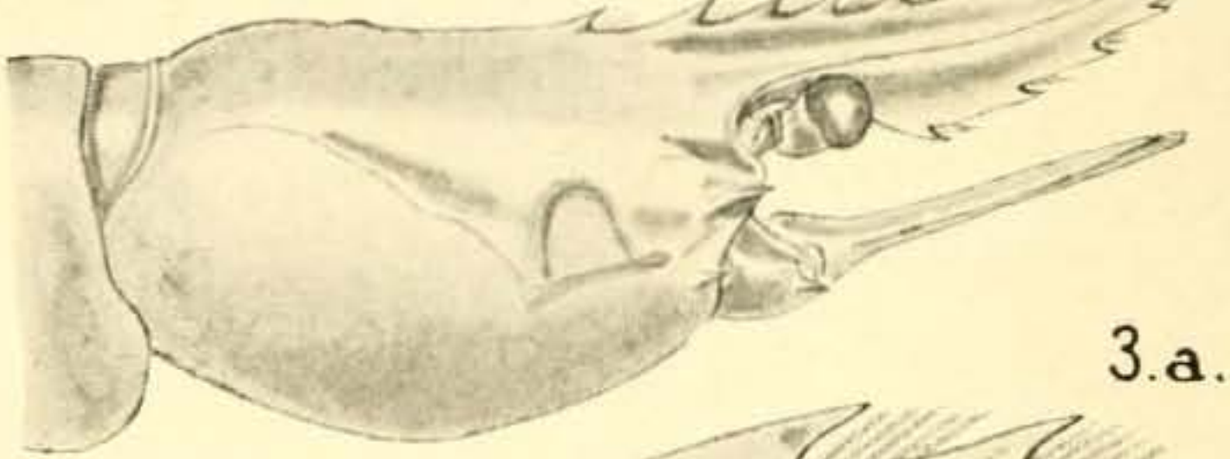


2.n.

2.o.

2.p.

3.



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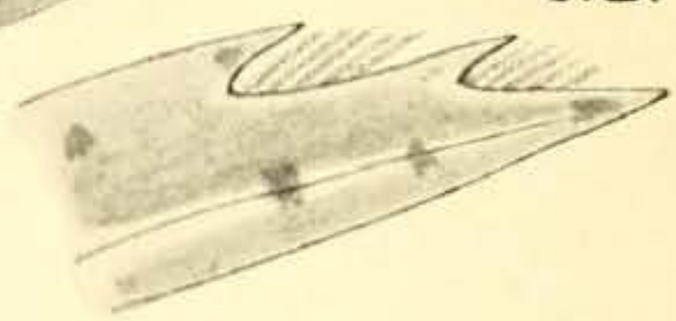
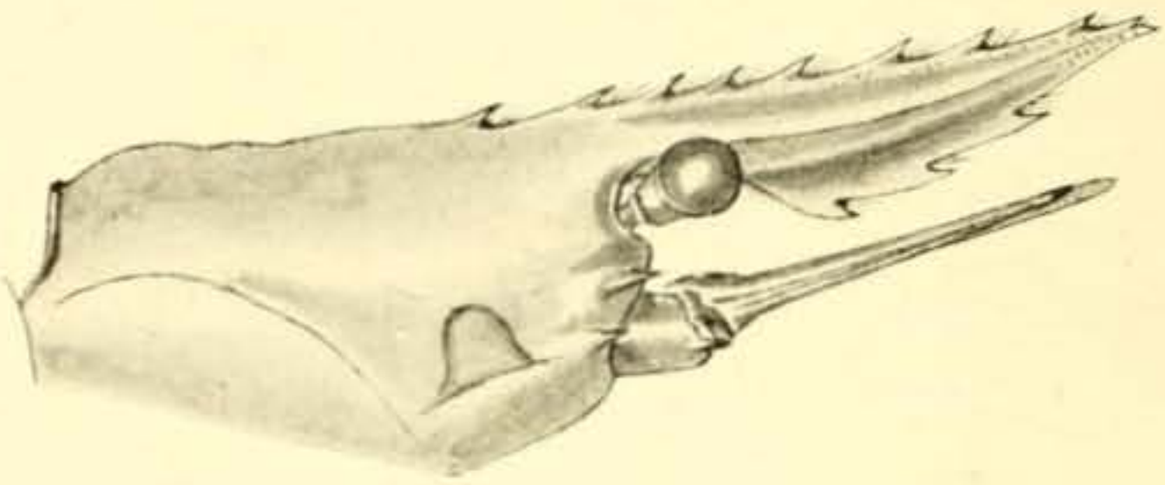


3.b.



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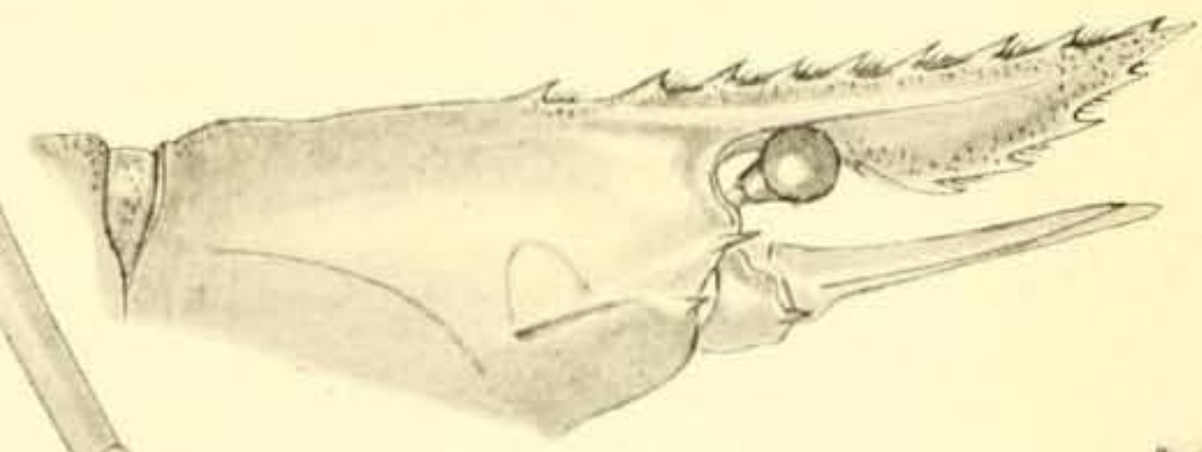

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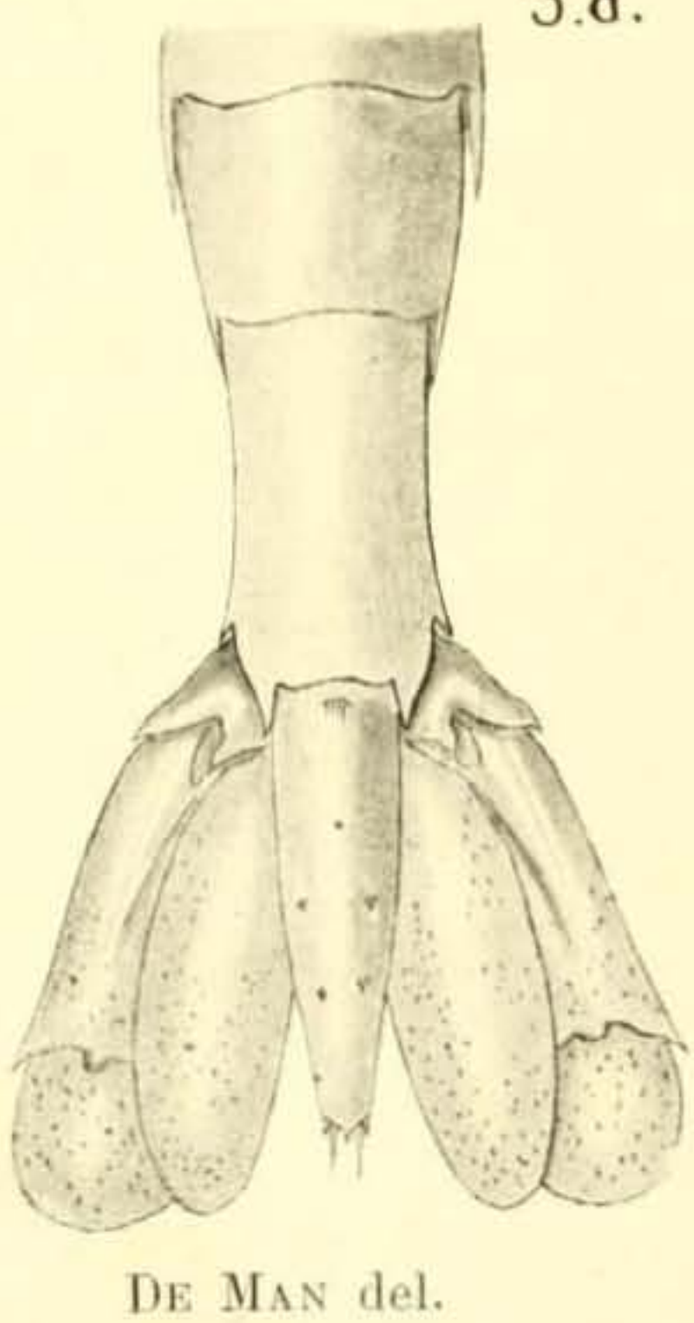

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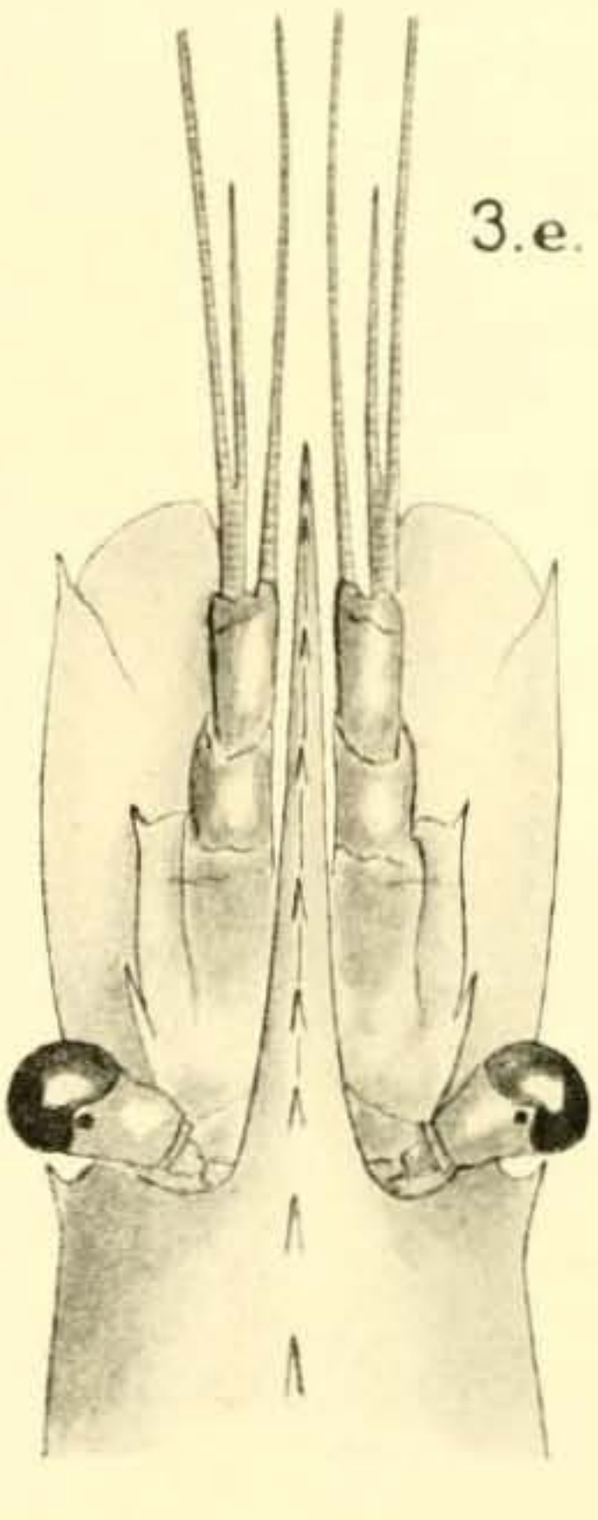

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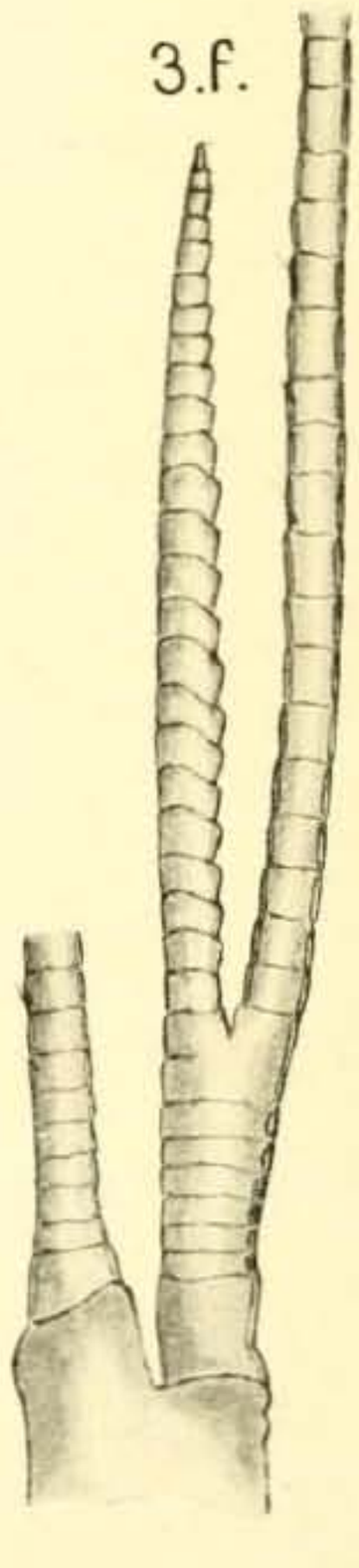

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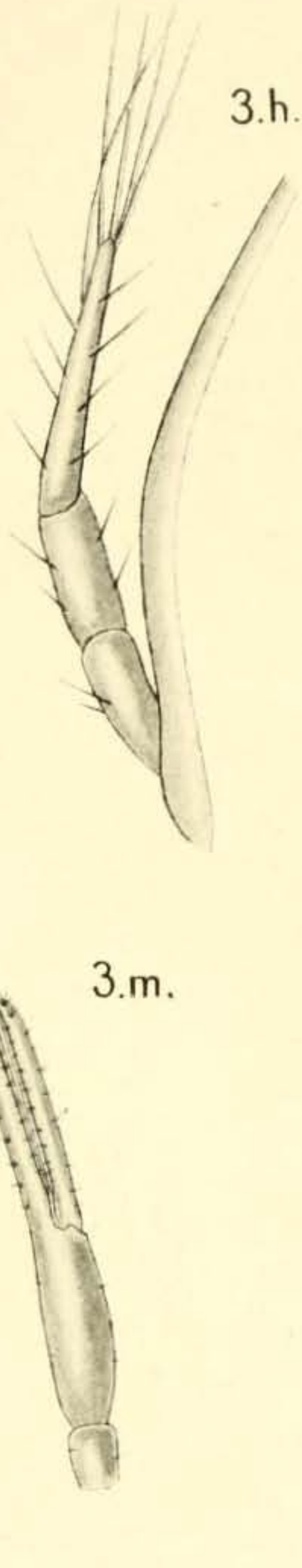
3.g.

3.h.



3.i.

3.j.

3.k.

3.l.

3.m.

3.n.

4.a.

4.b.

4.c.

4.d.

5.

6.