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Report on the Schizopods collected by Mr. George Murray, F.R.S., during the Cruise of the 'Oceana' in 1898. By E. W. L. HOLT and W. M. TATTERSALL, B.Sc.

[Plates I. & II.]

THE material dealt with in the following paper was collected in November 1898 during the cruise of the 'Oceana' in deep water off the west coast of Ireland some 200 miles west of Valentia. The area in which the collections were made lies between lat. 52° 4′ 5″ N. and 52° 27′ 6″ N., and long. 12° 27′ W. and 15° 53′ 9″ W., the depth of water varying from 453 to 1835 fathoms. This region is thus partly within and partly without the British Area as defined by Norman.

The method of collecting was by open serial tow-nets fished horizontally at known depths and hauled, still fishing, to the surface. It is obvious therefore that part of the catch of any net may have been made during its descent or ascent. We have thus no reliable guide as to the exact depth at which a species was caught, though a reasonable inference of the inhabitants of the various zones of water can be obtained

by comparisons of the contents of the different nets in each vertical series.

The classification and terminology used in the present report are the same as those recently used by us in dealing with Schizopods from the Atlantic slope *.

The species of Schizopods taken by the 'Oceana' number nine, as follows:—

Division EUCARIDA, Calman.

Order EUPHAUSIACEA, Boas.

Family **Euphausiidæ**, Dana.

Subfamily EUPHAUSINÆ, H. & T.

Genus *Euphausia*, Dana.
E. pellucida, Dana.

Genus *Meganyctiphanes*, H. & T.
M. norvegica (M. Sars).

Subfamily NEMATOSCELINÆ, H. & T.

Genus *Thysanoessa*, Brandt.
T. longicaudata, Kröyer.
T. gregaria?, G. O. Sars.

Genus *Stylocheiron*, G. O. Sars.
S. Suhmii, G. O. Sars.
S. abbreviatum, G. O. Sars.

Division PERACARIDA, Calman.

Order MYSIDACEA, Boas.

Family **Mysidæ**, Dana.

Subfamily LEPTOMYSINÆ, Norman.

Genus *Katerythrops*, H. & T.
K. Oceanæ, H. & T.

Family **Lophogastridæ**, G. O. Sars.

Genus *Gnathophausia*, Willemoes-Suhm.
G. drepanephora, H. & T.

Family **Eucopiidæ**, G. O. Sars.

Genus *Eucopia*, Dana.
E. australis, Dana.

* 'Report Inland and Sea Fisheries of Ireland for 1902 and 1903,' pt. ii. App. iv. [1905].

Of these species two were found to be new to science, viz. *Katerythrops Oceanæ* and *Gnathophausia drepanephora*. Descriptions and figures of these have already appeared (H. & T. *loc. cit.*), but it has been thought advisable to give brief diagnoses in the present report as well.

Three of the above species were taken by the 'Oceana' for the first time in British waters, viz.:—

Euphausia pellucida.
Thysanoessa gregaria.
Stylocheiron Suhmii.

Stylocheiron abbreviatum and *Eucopia australis* were only taken in those hauls made outside the British Area, and so cannot be admitted to the British list on the evidence of the 'Oceana' collections, though both species have since been met with in British waters (H. & T. *loc. cit.*).

Schizopods occurred in thirty out of a total of forty * hauls with the tow-nets—a very fair proportion. It is interesting to note that no Schizopods occurred in the surface-hauls at any of the stations, nor in any net fished at less than 230 fathoms, while seven of the nine species were taken only in those nets towed at greater depths than 500 fathoms. Very few hauls were made, however, at less depths than 500 fathoms, which, in so far as Schizopods are concerned, is to be regretted, since many of the species captured have been shown to belong essentially to the upper strata by the collections made in the Bay of Biscay in July 1900 by Dr. Fowler. It would have been interesting to have seen whether this holds for the same species in November, in so far as it may be legitimate to compare July of 1900 with November of 1899. It is possible that the absence of Euphausians from the surface and upper waters may be explained by the consideration that most of the 'Oceana' hauls were made during the daytime, and we have evidence from Dr. Fowler's collections that certain Euphausians, such as *Euphausia pellucida*, rise to the upper strata by night and sink by day; or, if this be not admitted as fully proven, it is at least certain that the more active forms are exceedingly difficult to catch in the upper strata during daylight, especially in ordinary fine-mesh silk tow-nets, such as were used by the 'Oceana.' We are unable to conclude that the absence of Schizopods from the nets fished from 230 fathoms or less furnishes material evidence of the distribution of

* Including some hauls made at St. 1, soundings 89 fath., in which no Schizopods were taken.

Table showing the Occurrence of

N.B.—(*a*) *l.* denotes larva.
(*b*) Larvæ not identified occurred in the following hauls:—4 *a*, 2 *Furcilia*; 4 *b*, 1 *Furcilia*;
(*c*) The numbers given under the heading "Fathoms" indicate the depth at which the net

Date.	Station.	Net.	Fathoms.	*Euphausia pellucida.*	*Meganyctiphanes norvegica.*	*Thysanoessa longicaudata.*
Nov. 19th, 1898.	Lat. 52° 4′ 5″ N. Long. 12° 27′ 0″ W.	2 *b*	270	1. 7 mm.	.....	.....
		2 *c*	270	.....	.....	.....
		2 *d*	374	3. 8·5 mm. 10·0 mm. 14·0 mm.	.....	.....
		2 *e*	464	1. 5·5 mm.	.....	.....
		2 *f*	620	2. 4 & 11 mm.	.....	.....
		2 *g*	650	1. 15 mm.	2. 23 & 26 mm.	1. 6 mm. 2 *l.*
Nov. 20th, 1898.	Lat. 52° 27′ 6″ N. Long. 15° 40′ 0″ W.	4 *b*	790	2. 6 & 9 mm.	.....	.....
		4 *c*	920	1. 10 mm.	.....	6. 6–9 mm.
		4 *d*	1065	2. 8 & 13 mm.	.....	7. 7–10 mm.
		4 *e*	1170	10. 6–15 mm.	.....	13. 7–10 mm
		4 *f*	1275	4. 3. 7–10 mm. 1. 18 mm.	.....	21. 7–10 mm.
		4 *g*	1370	2. 6·5 & 8·5 mm.	.....	.....
		4 *h*	1470	2. 14 mm.	.....	8. 8–10 mm. 1 *l.*
		4 *j*	1570	3. 2. 10 mm. 1. 7 mm.	.....	7. 8–9 mm.
		4 *k*	1670	7. 6. 7–10 mm. 1. 18 mm.	.....	12. 7–10 mm.
		4 *l*	1770	1. 11·5 mm.	.....	.....
Nov. 21st, 1898.	Lat. 52° 18′ 1″ N. Long. 15° 53′ 9″ W.	5 *b*	500	8. 6–16 mm.	.....	1. 8 mm.
		5 *c*	810	2. 1. 15 mm. 1. 5 mm.	.....	2. 9 mm.
		5 *d*	950	1. 15 mm.	.....	10. 8–10 mm.
		5 *e*	1070	3. 8–15 mm.	.....	14. 6–9 mm.
		5 *f*	1190	.....	.....	9. 7–9 mm.
		5 *g*	1300	1. 11 mm.	.....	6. 8–10 mm.
		5 *h*	1410	.....	.....	15. 7–9 mm.
		5 *j*	1510	8. 8–15 mm.	.....	12. 7–9 mm.
		5 *k*	1610	.....	.....	12. 7–10 mm.
		5 *l*	1710	4. 7–19 mm.	.....	4. 8–9 mm.
Nov. 22nd, 1898.	Lat. 52° 20′ 0″ N. Long. 15° 7′ 9″ W.	6 *b*	230	.....	.....	.....
		6 *d*	375	1. 7 mm.	.....	.....
		6 *f*	510	7. 6–14 mm.	.....	1. 8 mm.
		6 *g*	560	2. 1. 15 mm. 1. 5 mm.	.....	21. 8–10 mm. 2 *l.*

Schizopoda in the several Hauls.

4 *k*, 1 *Calyptopis*; 6 *d*, 1 *Calyptopis*.
was towed, though not necessarily the depth at which the contained organisms were captured.

Thysanoessa gregaria.	*Stylocheiron Suhmii.*	*Stylocheiron abbreviatum.*	*Katerythrops Oceanæ.*	*Gnathophausia dregancphora.*	*Eucopia australis.*
.....	1. 6 mm.	.....	.....	.....	.....
.....	2. 5 & 7 mm.	.....	.....	.....	.....
.....	1 *l.*	.....	.....	.....	.....
.....	2 *l.*	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	8. 8 mm. 1 *l.*	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	2. 6 mm. 4 *l.*	.....	.....	.....	.....
.....	4 *l.*	.....	.....	.....	1. 33 mm.
.....	1. 7 mm.	.....	.....	.....	.....
1. 10 mm.	1. 8 mm. 2 *l.*	.....	.....	.....	.....
.....	2 *l.*	.....	.....	.....	.....
1. 8 mm.	1. 6·5 mm. 1 *l.*	.....	1. 6 mm.	.....	.....
3. 7–9 mm.	1. 7 mm. 1 *l.*	.....	.....	.....	.....
3. 7–9 mm.	.....	.....	.....	.....	.....
.....	1 *l.*	.....	.....	1. 39 mm.	.....
3. 5–8 mm.	9. 6–8 mm. 1 *l.*	.....	.....	.....	1. 15 mm.
.....	1. 6·5 mm. 1 *l.*	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
.....	3. 4·5–6 mm. 1 *l.*	.....	.....	.....	.....
.....	1. 6 mm. 1 *l.*	.....	.....	.....	.....
.....	3. 6–8 mm. 2 *l.*	.....	.....	.....	1. 12 mm.
.....	2 *l.*	1. 20 mm.	.....	.....	.....
3. 5–7 mm.	4. 5–7 mm. 2 *l.*	.....	.....	.....	.....
2. 7–8 mm.	1 *l.*	.....	.....	.....	.....
3. 7–8 mm.	2. 6 & 7 mm.	.....	.....	.....	1. 12 mm.
.....	1 *l.*	.....	.....	.....	.....
.....	1. 7 mm.	.....	.....	.....	.....
2. 7 & 8 mm.	3. 6–7 mm. 1 *l.*	.....	.....	.....	.....
.....	3. 6–8 mm. 3 *l.*	.....	1. 4 mm.	.....	.....

these forms in the upper strata. In the work of the 'Helga' the only net which has been found really efficient for their capture at or near the surface, even at night, has an opening of about 16 square feet (about eight times that of an ordinary ring tow-net), with a mesh of mosquito-netting or the largest size of grit-gauze, which permits of hauling at a speed which would burst fine bolting-silk.

The details of each haul in which Schizopods occurred, together with the total number and size of the examples taken, are set forth in the table (pp. 4–5).

Euphausia pellucida, Dana.

This species occurred in twenty-five out of thirty hauls in which Schizopods were taken. None of the specimens reached the full size of the species. The 'Oceana' collections first demonstrated the existence of *E. pellucida* in British waters. *E. bidentata,* Sars, is probably the name most strictly applicable to the North Atlantic form of *E. pellucida.*

Meganyctiphanes norvegica (M. Sars).

Only two specimens of this rather common form were taken by the 'Oceana.' They occurred in net 2 *g* fishing from 650 fathoms to the surface. Station 2 was the station nearest land, and the absence of this species from the hauls at the more westerly stations suggests that the latter were beyond the most seaward limit of its distribution at the time. It is, however, an active form which might well avoid small tow-nets.

We have found this species common off the west coast of Ireland.

Thysanoessa longicaudata (Kröyer).

Synon. *T. tenera,* G. O. Sars.

This was by far the most abundant Schizopod taken by the 'Oceana' in point of numbers, though in the number of hauls in which it occurred it is surpassed by both *Euphausia pellucida* and *Stylocheiron Suhmii.* All the specimens were more or less badly damaged, and out of a total of 150 not one had a perfect leg of any kind left. It occurred in twenty out of thirty hauls, fishing from 500–1770 fathoms to the surface.

Thysanoessa gregaria ?, G. O. Sars.

Specimens occurred in nine hauls, in nets fishing between 500–1700 fathoms and the surface. We have noted (*loc. cit.*) that the specimens diverge slightly from Sars's description of the type. Probably they will prove referable to Hansen's *T. parva.*

Stylocheiron Suhmii, G. O. Sars.

Synon. See Hansen, Bull. Mus. Ocean. Monaco, no. 30 (1905).

S. Suhmii occurred in twenty-five out of thirty hauls, in nets fishing between 270–1770 fathoms and the surface. It was one of the commonest Schizopods taken by Mr. Murray, who collected it in British waters for the first time. Several larvæ of this species in all stages of development were also captured during the cruise.

Stylocheiron abbreviatum, G. O. Sars.

Synon. *S. chelifer,* Chun.

A single male example of this species, measuring 20 mm., occurred in net 5 *h,* fishing from 1410 fathoms to the surface. This is much larger than Chun's specimens, which measured only 14 mm., but examples of nearly equal size were captured by Dr. Fowler in the Bay of Biscay.

Katerythrops Oceanæ, H. & T.

This is one of the new species taken by the 'Oceana.' Descriptions and figures which have already appeared (H. & T. *loc. cit.*) are reproduced, and brief diagnoses of the genus and species are repeated below.

Katerythrops, H. & T.

Characters of the pleopods in the adult male uncertain; pleopods of the female unknown. Other characters as in *Meterythrops,* S. I. Smith, except:—

Antennal scale considerably reduced in length in proportion to peduncles of antenna and antennule, narrow and feeble, its outer margin naked, entire, terminating in a small spine, setæ few, confined to the apex and distal third (approximately) of the inner margin.

Telson possibly without the median setæ.

Katerythrops Oceanæ, H. & T. (Pl. I.)

Form robust. *Carapace* much wider than the pleon, almost entirely covering the thoracic segments; anterior margin obtusely rounded; cephalic region inflated and posteriorly defined by a well-marked cervical sulcus. *Pleon* with the last segment almost as long as the two preceding segments taken together. *Eyes* small, remote from each other, subpyriform, the proximal part the broader; visual area restricted to less than the distal half; cornea not so wide as the last joint of the antennular peduncle; pigment after preservation in formalin reddish buff. *Peduncle of antennule* at least a fifth longer than the last segment of the pleon, proportionally stout, its last joint about equal to the two preceding, beset dorsally between the insertions of the flagella with a bidentate tubercle, of which the denticles are nearly in the same dorso-ventral plane. *Antennal scale* very short, narrow, and somewhat outwardly curved; outer margin entire, naked, terminating in a feeble spine; apex produced considerably beyond the spine, subacute, setæ confined to the apex and to about the distal third of the inner margin; length of scale more than four times (about $\frac{14}{3}$) the greatest width, slightly less than the combined length of the last two joints of the antennal peduncle, and but little exceeding the length of the last joint of the antennular peduncle. *Antennal peduncle* long and proportionally stout, combined length of the last two joints greater than that of the last joint of the antennular peduncle.

Exopodites of the thoracic limbs very well developed, with unusually large flagella. *Endopodites* of the first four pairs moderately long and stout; the tarsus in the third and fourth pairs consisting of three joints, and succeeded by a well-developed dactylus; setæ not more plumose than in *Parerythrops* &c. *Pleopods* of all five pairs biramous in the male, the inner ramus bifid. *Telson* subtriangular, shorter than the last segment of the pleon by about two sevenths of the length of the latter, its sides entire and slightly inflected; apex narrowly truncate, armed with two pairs of rather slender spines, of which the inner are considerably the longer and stouter; a median pair of setæ possibly present. *Outer uropod* the longer, its length including basal articulation slightly greater than the combined length of the fifth and sixth segments of the pleon. *Length* of the type specimen (an immature male) 6 mm., including antennular peduncles and uropods.

A single specimen of this species occurred in each of two hauls—6 *g*, fishing from 560 fathoms to the surface, and 4 *h*, fishing from 1470 fathoms to the surface. It is evidently one of the few known oceanic or strictly pelagic Mysids.

Gnathophausia drepanephora, H. & T.

This is the second of the new forms discovered by Mr. Murray. Descriptions and figures of this species have already appeared. The figure is reproduced and a brief diagnosis is given below. It belongs to a new section of the genus *Gnathophausia*, which may be described as follows:—

Genus Gnathophausia, Willemoes-Suhm.

(Trans. Linn. Soc. Lond. ser. 2, Zool. vol. i.)

Section 4*.

Infero-posterior corners of carapace produced into a spine. Dorsal keel interrupted anteriorly. Supraorbital spine small. Antennal scale not jointed at apex. First thoracic legs with distinctly developed exopodites. Epimeral plates of last segment not united on the ventral face.

Gnathophausia drepanephora, H. & T. (Pl. II.)

Form of body slender. *Carapace* not very large; dorsal spine about as long as first segment of pleon; infero-posterior corners produced into a spine, bluntly serrulate on ventral edge, nearly reaching fourth segment of pleon; upper lateral keel present; dorsal keel unarmed; cervical sulcus rather distinct; rostrum elongate and slender, as long as the carapace without the infero-posterior spines, distinctly denticulate on all three edges; supraorbital and antennal spines well defined, but small. Branchiostegal projections of moderate proportions, but distinctly pointed. Anterior segments of *pleon* without dorsal spines; epimeral plates produced posteriorly into pointed lappets. *Eyes* very narrow, cornea scarcely at all expanded, pigment (as preserved in formol) rather pale brown. Outer flagellum of *antennule* in male expanded and flattened at the base, which is beset on the inner side with a brush-like fringe of fine curling setæ. *Antennal scale* of moderate size, about four times as long as broad, tapering distally and very obliquely truncate; inner angle produced into a sharp point, outer edge with (about) three denticulations distally. *Telson* large and massive,

* In sequence to Sars's Sections 1–3.

with the terminal spines crescent-shaped and denticulate along the upper face; lateral margins armed for the usual distance with large spines, separated from each other by intervals occupied by a few smaller spines. *Uropods* shorter than telson; the proximal joint of outer uropod terminating externally in a spine about one fourth as long as distal joint. *Colour* red. *Length* 39 mm.

The only known specimen was taken in net 4 *l*, fished at 1770 fathoms and thence to the surface.

Eucopia australis, Dana.

A single specimen was taken in each of four hauls, in nets working between 500–1710 fathoms and the surface. One of the examples measured 33 mm. in length, which is not, however, quite the full size of the species, since it is known to reach at least 50 mm.

Previous to the 'Oceana' cruise the only record of this species from near our coasts is one by Calman, who records its capture by the R. I. A. expedition in 1888 off the west coast of Ireland in 1020 fathoms. We have since recorded it from soundings of less than 1000 fathoms.

EXPLANATION OF THE PLATES.

Plate I.

Katerythrops Oceanæ, H. & T.

Fig. 1. Immature male. Dorsal view.
Fig. 2. Immature male. Lateral view.
Fig. 3. Antennal scale with peduncle.
Fig. 4. Endopodite of the leg of the first pair.
Fig. 5. Pleopod of the first pair, ventral view.
Fig. 6. Telson.

Plate II.

Gnathophausia drepanephora, H. & T.

Fig. 1. Male. Lateral view.
Fig. 2. Base of antennular flagellum of male.
Fig. 3. Antennal scale.

[The Plates are reproduced from the 'Report on the Sea and Inland Fisheries of Ireland,' pt. ii. Appendix iv., 1905.]

Note added in Press.—Hansen's Preliminary Report on the Schizopoda of the 'Princess Alice' appeared while this paper was in the press. In correcting proofs we have adopted his view of the synonymy of the species mentioned.