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On some new and rare Entomostraca from the Scottish Seas.

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[Plates II.-IV.]

THE Entomostraca described here were obtained in collections made from time to time by the Fishery Steamer 'Goldseeker' while carrying on work in connexion with the international scheme for the investigation of the North Sea and adjacent waters, and under the directions of Professor d'Arcy W. Thompson, C.B., F.L.S., the representative for Scotland on the International Committee.

For permission to publish these notes I am indebted to Professor Thompson.

CALANOIDA.

Xanthocalanus tenuiremis, sp. n. (♂).

(Pl. II. figs. 1-7.)

A specimen of a male *Xanthocalanus* was obtained in a

gathering of Crustacea from 1140 metres, collected by the 'Goldseeker' at Station 53, about 70 or 80 miles north by west of the Butt of Lewis ($59^{\circ} 36'$ N. lat., 7° W. long.). As this specimen represents what may be either an undescribed species or the undescribed male of some species the female of which is already known, the following particulars concerning it may not be without interest.

The specimen has a general resemblance to *Xanthocalanus borealis*, G. O. Sars, and measures about 2.5 mm. in length (fig. 1).

Rostrum of moderate size and bifurcate, the segments are elongate, stout at the base, but taper towards the pointed extremities (fig. 1 a).

Antennules wanting; the antennæ, which are also slightly imperfect, resemble those of *X. borealis* (fig. 2).

Mandibles stout, with a strong masticatory part; the tooth on the inner aspect of the biting-edge is broad and massive and projects somewhat beyond the others (fig. 3); the mandible-palp, which is stout, is slightly imperfect (fig. 4).

First maxillipeds stout, each of them armed with two or three long and stout setiferous spines and a number of elongated plumose bristles, and there is also present the characteristic fascicle of sensory filaments (fig. 5).

The four pairs of swimming-feet were all more or less imperfect: fig. 6 represents what remains of the fourth pair.

The fifth pair has the left leg greatly elongated and slender, so that it is only a little shorter than the entire length of the cephalothorax. The basal joint of this leg is moderately stout and rather longer than the right leg; the next three joints are subequal and considerably longer than the basal joint, and each is more slender than the joint that precedes it; the end joint is very small and terminates in a bifurcated process, as shown in the enlarged figure (fig. 7 a). The right leg is short and rudimentary, and appears to be composed of three (or four) joints (fig. 7).

Remarks.—This species appears to be a true *Xanthocalanus*. The structure of the antennæ, and especially of the first maxillipeds and of the fifth pair of thoracic legs, agrees with the characters common to the species of this genus. The first maxillipeds are each furnished with a terminal fascicle of slender sensory filaments as in *X. borealis*, but with no sheaf-like bundles as in *Amalophora*; they are also armed with two strong, elongated, and more or less setiferous spines, besides a number of plumose setæ. Further, in the fifth pair of thoracic feet the right leg is very short, while the left is slender and elongated as in *X. borealis*. In the species

now described, however, the structure of the elongated left leg differs from that of any of the others known to me in the proportional lengths of the various joints and in the peculiar armature of the terminal one. The mutilated condition of the only specimen observed prevents a more detailed account being given, but the characters available are, taken together, sufficient to distinguish this form from its confreres.

*Amalophora claviger**, sp. n.

(Pl. III. figs. 1-11; Pl. IV. figs. 13-17.)

Cephalothorax moderately elongated; forehead rounded; rostrum bifurcate, with moderately long tapering branches; abdomen composed of five segments, caudal rami very short. Length about 4.7 mm. (Pl. III. fig. 1).

Antennules rather longer than the cephalothorax, moderately slender and composed of twenty-five joints; first and second joints somewhat dilated, the next four small, subequal, the sixth to the twelfth more or less coalescent, thirteenth and fourteenth small, the fifteenth to the nineteenth rather longer than the preceding two joints or those that follow, as in the formula, which shows approximately the proportional lengths of the various joints:—

Number of the joints	1	2	3	4	5	6	7	8	9	10	11	12	
Proportional lengths of same ..	17	.12	.7	.8	.7	.8	38	.	
	13	14	15	16	17	18	19	20	21	22	23	24	25
	9	.9	.14	.15	.16	.15	.15	.12	.9	.8	.11	.11	.6

See also the drawing (Pl. III. fig. 3).

Antennæ small, inner branch much shorter than the outer (Pl. III. fig. 4).

Mandibles small, narrow, elongated, distal end somewhat constricted, biting end obliquely truncated and armed with small denticles; mandible-palp small (Pl. III. fig. 5; Pl. IV. fig. 13).

First maxilliped small, furnished with a dense fascicle of sensory filaments and a number of setæ as shown in the drawing (Pl. III. fig. 6). Second maxillipeds also small, elongated, and sparingly setiferous (Pl. III. fig. 7).

The four pairs of swimming-feet are somewhat similar to those in *Xanthocalanus borealis*, G. O. Sars. The fifth pair has also a general resemblance to those of the same species,

* *Claviger*, carrying a club; referring to the club-like form of the left leg of fifth pair.

but there are structural differences which at once distinguish this 'Goldseeker' Calanoid from *Amallophora typica*, T. Scott, which it somewhat resembles. The left leg of the fifth pair is elongated and slender, as in the fifth pair of *A. typica*, and the first and second joints are moderately stout, but the second joint is about one and a half times longer than the first, while the first and second are together rather less than half the entire length of the leg; the third joint is very slender and about one and a half times longer than the second; the fourth joint is scarcely half as long as the third, and becomes somewhat dilated towards the distal end; the distal half of this joint is hollow on the exterior edge and assumes a spoon-like form to receive the end joint, which is folded back upon the fourth and is greatly attenuated towards the distal extremity, and terminates in a minute hook; the end joint bears several minute setæ on its inner edge, and a small seta projects from the end of the fourth joint (Pl. IV. figs. 15-17). The right branch is very short and reaches slightly beyond the first joint of the left branch; it consists of five joints, but the three end ones are very small (Pl. IV. fig. 15).

Hab. 'Goldseeker' Station 53 (lat. 59° 36' N., long. 7° W.); depth 1140 metres, August 17th, 1908. A few male specimens only observed.

Remarks.—Though the form here described approaches somewhat closely to *Amallophora typica*, the structure of the fifth pair of thoracic legs is decidedly different; the left leg differs not only in the proportional lengths of all the joints, but also in the form and armature of the end joint.

It may be remembered that *Amallophora typica* has been relegated to the genus *Xanthocalanus* by Dr. Giesbrecht, but though it agrees with that genus in some particulars, as, for example, in the structure of the fifth pair of thoracic legs, it differs in other respects, and notably in the armature of the first maxillipeds, which possesses a character distinct from that observed in described species of that genus. In the typical *Xanthocalanus* (*X. agilis*, Giesb.) the first maxillipeds are provided with a number of slender sensory filaments, but they have no large and conspicuous sheaf-like bundle of delicate threads inextricably mixed together as in *Amallophora*. This genus I therefore retain for the two species mentioned here, viz. *Amallophora typica* and *A. claviger*.

Neoscolecithrix kœhleri, Canu.

1896. *Neoscolecithrix kœhleri*, Canu, Ann. Univ. Lyon, vol. xxvi. p. 426, pl. xviii. figs. 1-9.

1898. *Scolecithrix k ahleri*, Giesbrecht, Das Tierreich, 6 Lief. (Copepoda) p. 46.

1905. *Oothrix bidentata*, Farran, Ann. Rep. Fish. Ireland, 1902-03, pt. ii. App. ii. (1905) p. 42, pl. x. figs. 15-18, pl. xi. figs. 1-10.

This appears to be a true deep-water species; it was moderately common in two of the 'Goldseeker' gatherings, one from 1140, the other from 1100 metres, collected in lat. $59^{\circ} 36' N.$, long. $7^{\circ} W.$, and lat. $59^{\circ} 25' N.$, long. $7^{\circ} 33' W.$, in August 1907.

Having had the privilege of examining well-developed specimens of both the male and female of this species, I am convinced that *Oothrix bidentata* is identical with *Neoscolecithrix k ahleri*, and also that the species is not a true *Scolecithrix*, and that Canu's name should therefore be restored.

Genus PSEUDOTHARYBIS, nov.

Resembling *Tharybis*, G. O. Sars, in general appearance. Female antennules composed of twenty-four joints. Antennæ with the inner ramus considerably shorter than the outer. Mandibles with the biting edge truncated and armed with stout teeth. Maxillæ somewhat expanded, masticatory lobe broadly truncate and furnished with several setiferous spines. First maxillipeds without sensory filaments, otherwise nearly as in *Tharybis*. Second maxillipeds and swimming-feet also nearly as in that genus. Last pair of legs triarticulate, end joint with a spiniform extremity, and with two stout spines on the outer margin.

Pseudotharybis zetlandicus, sp. n., ♀.
(Pl. II. figs. 8-13; Pl. III. figs. 12-18.)

Body robust; forehead broadly rounded; rostrum short, bifurcated, furca short, broadly triangular, somewhat divaricated, and with a moderately wide space between them (Pl. II. fig. 9). The first cephalothoracic segment more than half the length of the cephalothorax; the lateral angles of the last segment are produced into sharp tooth-like processes, which are slightly divaricate. Abdomen short, with short furcal rami (Pl. II. fig. 8).

Length 3.8 mm.

Antennules (Pl. II. fig. 10) somewhat shorter than the cephalothorax and composed of twenty-four joints, the proportional lengths of which are nearly as in the formula:—

Number of the joints	1	2	3	4	5	6	7	8	9	10	11		
Proportional lengths of ditto..	20	16	8	8	8	8	9	13	8	8	8		
	12	13	14	15	16	17	18	19	20	21	22	23	24
	10	11	11	11	10	10	10	7	7	6	7	7	3

Antennæ not very elongated, moderately stout, inner ramus considerably shorter than the outer (Pl. III. fig. 12).

The mandibles, which somewhat resemble those of the species last described, have a strongly toothed masticatory edge (Pl. II. fig. 11).

The three inner marginal lobes of the first maxillipeds are each furnished with two apical setæ, coarsely plumose and elongated, and a shorter reflexed seta; the next two lobes terminate in long slender and slightly curved spines (Pl. III. fig. 13).

The five terminal joints of the second maxillipeds are short and furnished with a number of rather slender bristles (Pl. III. fig. 14).

The swimming-feet are somewhat similar in structure to those of the species previously described. The first pair are moderately stout, but much smaller than the next pair, and the spines on the outer distal angles of the three joints of the outer ramus are not very strong (Pl. III. fig. 15). The outer ramus of the second pair is moderately elongate and broadly lamelliform; the marginal spines are strong, rather long and setiferous, but the apical spine is comparatively short and stout and coarsely serrated on the outer edge (Pl. III. fig. 16). The outer rami of the third and fourth pairs are narrower than that of the second, and the marginal spines more slender; the terminal spine is moderately stout and coarsely serrated on the outer edge, the number of teeth being about eighteen. The integument of the inner branches is covered more or less with minute denticles (Pl. III. fig. 17).

The fifth pair of feet are small and symmetrical, each consists of a single three-jointed branch; the third joint, which is rather longer than either of the other two, is produced anteriorly into a moderately long spine and is armed with two other spines, one near the proximal end of the outer margin and the others on the outer distal angle (Pl. III. fig. 18). The first and second joints are without conspicuous armature.

Hab. 'Goldseeker' Station 53 (lat. 59° 36' N., long. 7° W.), 1140 metres deep, collected in August 1907. One or two specimens only obtained; no male observed.

In the same gathering with the species just described were others already known to science, such as *Arietellus plumifer*, G. O. Sars, a highly coloured form with densely plumose tail-setæ; *Chirundina streetsi*, Giesbrecht, described from specimens collected off the west coast of North America in lat. 35° N., long. 125° W.; *Candacia norvegica*, Boeck; *Gaetanus latifrons*, G. O. Sars; *Megacalanus longicornis*

(G. O. Sars); *Metridia princeps*, Giesbrecht; and various others to be described later.

Halocypridæ.

Genus EUCONCHÆCIA, G. W. Müller, 1890.

Euconchæcia d'arcy-thompsoni, sp. n.

(Pl. III. fig. 19; Pl. IV. figs. 1-12.)

Shell, seen from the side, oblong; length scarcely equal to twice the width. Dorsal margin nearly straight, each valve terminating posteriorly in a small pointed process, while in front the rostral projection, which is distinctly bifid, is bounded beneath by a deep sinus, as shown in the drawing (Pl. IV. figs. 1 & 2); ventral margin nearly parallel with the dorsal and slightly but evenly rounded; posterior end sub-quadrangular; anterior end boldly curved; shell-gland near the postero-dorsal angle, as shown in the drawing (Pl. IV. fig. 2).

Length of the shell represented by the drawing about 4.7 mm.

The antennules are each provided at the apex with a dense fascicle of very slender bristles and with three (or four) setæ; two of these setæ are long and slender, but of unequal length, one being much more elongated than the other (Pl. IV. fig. 5).

Antennæ similar to those in *Euconchæcia chierchieæ*, G. W. Müller; the secondary branch on the right side is armed with a strong hook (Pl. IV. fig. 6), that on the left side is also provided with a hook, but it is much smaller than the other.

Mandibular foot nearly as in *Conchæcia elegans*, the masticatory part armed with several small teeth (Pl. IV. fig. 7).

First foot slender and moderately elongated, end joint very small, with one long and moderately stout seta and two other smaller ones (Pl. IV. fig. 9). Second foot considerably shorter than the first (Pl. IV. fig. 10).

Caudal lamina somewhat similar to that of *E. chierchieæ*, Müller, except that it is armed with eight spines; the principal spine exhibits the same number of articulations as that of the caudal lamina in the species named. Copulatory organ rather narrow and elongated (Pl. IV. figs. 11 & 12).

The female does not differ greatly from the male, except that the rostral hood-like projection at the anterior end of the shell is not bifid as in the male (Pl. IV. fig. 4) and that the accessory branch of the antenna has no hook-like appendage

(Pl. III, fig. 19). In the female dissected the ova were numerous and small. The shell in both sexes ornamented with faint delicate reticulations. The groups of glands situated near the postero-dorsal angles of each of the two valves, as indicated in the drawing (Pl. IV, fig. 2), are quite distinct.

Hab. 'Goldseeker' Station 53, lat. $59^{\circ} 36' N.$, long. $7^{\circ} W.$, 1140 metres deep, collected in August 1907. Two adult males and one female, and other two smaller specimens which appear to be young males.

Remarks.—The occurrence of this *Euconchœcia* at Station 53 appears to be of interest, as it differs so much in size and in other respects from *E. chierchia*, G. W. Müller, the only other species of the genus. *E. chierchia* was described from specimens collected by Dr. Chierchia off the Brazilian coast in lat. $19^{\circ} S.$ and long. $39^{\circ} W.$; these specimens measured about 1.2 mm. in length*. The same species was described and figured in the Report on collections made by John Rattray in the Gulf of Guinea, under the name of *Halocypris aculeata*; the size of the specimens from these collections was about 1 mm.† It has also been recorded from Cruz Bay by Dr. G. S. Brady, who gives the size of the male as 1.1 mm. and of the female as .85 mm.‡ The 'Goldseeker' specimens are thus about four times the size of *E. chierchia*. Moreover, in both the adult males the rostral projection of both valves of the shell is distinctly bifid, as shown in the drawing (Pl. IV, fig. 2), but in the shell of the adult female the rostral projection is not bifid. One other point of interest is the large brush of delicate filaments at the apex of the antennules in both the male and female. The brush at the apex of the antennules in *E. chierchia* is described by Dr. Brady as consisting "of about twenty setæ." In the 'Goldseeker' specimens the brush consists of several times twenty setæ. I have not counted the number of setæ, for they are so numerous, so delicate, and so crowded together, that the counting of them would be a somewhat serious task—in a small fragment broken off from one of the brushes at least forty setæ were counted.

Owing to the differences mentioned I am inclined to ascribe the 'Goldseeker' specimens to a distinct species, for which I propose the name of *Euconchœcia d'arcy-thompsoni*, after Prof. d'Arcy W. Thompson, C.B., Director of the Scottish International Investigations.

* "Ueber Halocypriden," Zoologisch. Jahrb. Bd. v. p. 277, pl. xxviii. figs. 1-10 (1890).

† Trans. Linn. Soc. vol. vi. p. 142, figs. 5, 6, 33, 34, 38 (1894).

‡ Trans. Zool. Soc. vol. xvi. p. 190, pl. xxii. figs. 9-15 (1902).

Several other interesting Halocyprians have been obtained in collections made by the 'Goldseeker,' such as *Conchæcia elegans*, G. O. Sars, *C. borealis*, G. O. Sars, *C. obtusata*, G. O. Sars, *C. daphnoides*, Claus, *C. imbricata*, G. S. Brady, *Halocypria* (?) *globosa*, Claus, several species belonging to the Cyprinidæ, and others which will be described later.

EXPLANATION OF THE PLATES*.

PLATE II.

Xanthocalanus tenuiremis, sp. n.

Fig. 1. Male, side view; "a," the rostrum. 2. One of the antennæ (imperfect). 3. Mandible. 4. Mandible-palp. 5. First maxilliped. 6. Fourth pair of swimming-feet (imperfect). 7. Fifth pair; "a," the extremity of long branch (greatly enlarged).

Pseudotharybis zetlandicus, gen. et sp. n.

Fig. 8. Female, dorsal view. 9. Rostrum. 10. One of the antennules. 11. Mandible and palp. 12. One of the maxillæ. 13. Abdomen, ventral view.

PLATE III.

Amalophora claviger, sp. n.

Fig. 1. Male, side view. 2. Rostrum. 3. One of the antennules. 4. One of the antennæ. 5. Mandible-palp. 6. First maxilliped. 7. Second maxilliped. 8. Foot of first pair. 9. Foot of second pair. 10. Foot of third pair. 11. Foot of fourth pair.

Pseudotharybis zetlandicus, gen. et sp. n.

Fig. 12. One of the antennæ. 13. First maxilliped. 14. Second maxilliped. 15. Foot of first pair. 16. Foot of second pair. 17. Foot of fourth pair. 18. Foot of fifth pair.

Euconchæcia d'arcy-thompsoni, sp. n.

Fig. 19. Accessory branch of antenna, female.

PLATE IV.

Euconchæcia d'arcy-thompsoni, sp. n.

Fig. 1. Shell of male, side view. 2. Shell with the valves opened out. 3. Shell of female seen from below. 4. Anterior end of opened valves of same, to show rostral projection. 5. Antennule. 6. Accessory branch of antenna, male. 7. Mandibular foot. 8. Maxilla. 9. Foot of first pair. 10. Foot of second pair. 11. Caudal lamina. 12. Copulatory organ of male.

Amalophora claviger, sp. n.

Fig. 13. Mandible. 14. Fifth pair of feet. 15. End joint of long branch of fifth pair (greatly enlarged). 16. Another view of the same joint. 17. Abdomen.

* Figures drawn with a "Zeiss" camera, and all enlarged.





