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COPEPODA PARASITICA FROM THE BELGIAN COAST,

by J. H. Schuurmans Stekhoven Jr. (Utrecht).

A small collection of parasitic copepoda, recently received from the Royal Belgian Museum of Natural History at Brussels (1), contained amongst a lot of material, well known to any parasitologist, some specimens of special interest, more in particular the different stages of *Lernaeocera lusci*, which throw some light on the development of the antlers. I think it best to treat the material in systematic order.

Order I. **CYCLOPIFORMES.**

Family: CHONDRACANTHIDAE.

Genus: **Acanthochondria** Oakley.

Species: *Acanthochondria soleae* (Kroyer).

(Pl. I, II, fig. 1-3)

No. 2. D_1C_2 IG. 10248. Mer du Nord 7224 à l'extérieur du Stroombank par le travers du phare d'Ostende jusque par le travers du Spanjaardsduin; Chalut crevettier, 23. 7. 1927, 3 ♀♀ with adhering ♂♂ on *Pleuronectes flesus*.

(1) This material has been collected during the exploration of the North Sea by this Museum under the direction of Prof. G. Gilson.

No. 8. D_1C_2 IG. 10248. Mer du Nord 7225. Sur le banc de Wenduyne par le travers de Raverzyde jusque par le travers de la brêche de Breedene; Chalut crevettier; 5 ♀♀ on the gills of *Pleuronectes flesus*.

No. 10. Same locality as 8, likewise 5 ♀♀ on *Pleuronectes flesus*.

No. 19. D_1C_2 IG. 10248. Estacade Est à Ostende, 5. 5. '34 (297) 9412; 9 ♀♀, 8 of which with egg strings, with adhering ♂♂ on a specimen of *Pleuronectes flesus;* 9 + 4 ♀♀ on a second specimen of *Pleuronectes flesus*.

No. 1. D_1C_2 IG. 10248. Mer du Nord 7592 à l'extérieur de Wenduyne par le travers du Coq jusque par le travers du Phare d'Ostende (Chalut crevettier), 23. 6. 1930; 1 juv. ♀ on *Onos mustela*.

No. 13. D_1C_2 IG. 10248. Mer du Nord 7224, à l'extérieur du Stroombank, par le travers du phare d'Ostende jusque par le travers du Spanjaardsduin (Chalut crevettier), 23. 7. '27; 2 juv. specimens on *Onos mustela*.

This species brought me some difficulties. The general aspect of the females in question was identical to that of *Acanthochondria depressa* the common parasite of *Pleuronectes flesus,* whereas *Acanthodondria soleae* generally occurs on *Solea vulgaris*.

The ♀ (5.5 mm. in length, length of eggstrings 5 mm.) has a genital segment, which is constricted in the middle. There is a longitudinal brownish stripe which begins at the distal end of the head and reaches almost the foreborder of the thorax. The latter shows constrictions and an indication of thoracomers, but there exist no transverse furrows on the same like in *A. depressa*.

The mandibles (Mn) and the second maxillae (Mx2) of the ♀, are almost identical to those of *depressa* as depicted by OAKLEY in his figure 4 B. The spine on the basal article of the Mx2 is particulary strong like in *depressa*. The terminal article bears 9 strong teeth which are separated from the basal-article by a rather wide distance. The exopodite of the mandibles bears 2 spines, the exterior of which is very strong; the interior, which is much smaller, is placed near to the exterior one. In this character the present species diverges from *A. depressa*. The maxillipedes possess a subterminal article fringed with distinct setae,

which fringes are prolonged along the lateral borders of the same.

Terminal article of the *mxp.* more or less sharply pointed. The first antennae rather short, basal article somewhat inflated, terminal article set off against the former by a shallow constriction, with a terminal spine and some slender setae A_2 (Pl. I, fig. 4, 6) with strong hooks. Thoracopods like in *A. depressa.*

The ♂ (Pl. II, fig. 1, 2) which, according to OAKLEY, affords the best characters for the identification of the species, is barely 1 mm. long. The antennae bear strong terminal hooks; the antennulae (A_1) show an indication of articulation in the slight constriction in the middle. Closer study reveals that there are in reality 4 articles (Pl. I, fig. 8) of which the terminal one ends with 3 spiniform setae. The oral appendages (Pl. I, fig. 9) are almost identical to those of the ♀, but of smaller size. The above mentioned exopodite only bears as far as I could observe only one relatively strong spine. Thoracic legs laminate, eggshaped each with a terminal and a subterminal spine and moreover with a subterminal very long seta. The latter surpasses in length that of the uniarticulated legs. These legs ressemble most the figure given by OAKLEY for *A. soleae* (Fig. 5, C). It is for that reason that I have brought our specimens to this species. The young ♀ (Pl. II, Fig. 3, A, B) found on *Onos mustela* are almost identical to those of the ♀ of *Pleuronectes flesus,* except that there is a terminal fucca, which the fullgrown female does not possess any longer. These young females are 1 1/2 mm. long. It is worth while to point to the analogon in development in the *Lernaeidae,* which possess as intermediate host a Pleuronectid. The latter harbours the juvenile forms of *Lernaeocera,* whereas the fullgrown *Lernaeocera* occurs on *Gadidae.* Here the reverse is the case. A juvenile *Acanthochondria* is found on a representant of the *Gadidae,* whereas the fullgrown form feeds on a *Pleuronectes flesus.*

Dr. C. L. OAKLEY whom I submitted the specimens from *Onos mustela* for a comparison with his type specimens, wrote me : To my surprise, the specimens from *Onos* agree in all respects (as far as I can see) with *Acanthochondria soleae.* This is rather surprising, as to my knowledge, in English waters *A. soleae* is strictly confined to *Solea vulgaris* and no *Acanthochondria* is reported from *Onos.* So the new host is of great interest.

Order **CALIGIFORMES.**

Family CALIGIDAE.

Genus **Caligus** O. F. MULLER.

1. **Caligus rapax** MILNE EDWARDS.

No. 24. D_1C_2 IG. 8187. 1 ♀ with attached to it parasitic Trematode, a case much alike to that described by BRIAN in his Parasitologia mauretanica. (See there.)

No. 5. D_1C_2 IG. 10248. Mer du Nord, 7224, à l'exérieur du banc de Stroombank. Par le travers du phare d'Ostende jusque par le travers du Spanjaardsduin (chalut crevettier), 23. 7. 1927; adult *Chalimus* on fin of *Pleuronectes flesus.*

No. 25. D_1C_2 IG. 8187. Exp. I, Mer 4. *A. Chalimus.*

2. **Caligus diaphanus** NORDMANN.

No. 9. D_1C_2 IG. 10248. Mer du Nord, 7580. 1 ♀, 1 ♂. Dans le Vaarwater par le travers du Coq (Chalut crevettier) on the gills of *Trigla gurnardus.* 13. 5. 1930.

Genus **Lepeophtheirus** NORDMANN.

1. **Lepeophtheirus pectoralis** (O. F. MULLER).

No. 3. D_1C_2 IG. 10248. Mer du Nord, 7224, à l'extérieur du Stroombank, par le travers du Phare d'Ostende jusque par le travers du Spanjaardsduin; Chalut crevettier; 23. 7. '27; 42 ♀♀ on *Pleuronectes flesus.*

No. 6. D_1C_2 IG. 10248. Mer du Nord, 7225. Sur le banc de Wenduyne par le travers de Raverzyde, jusque par le travers de la brêche de Breedene (Chalut crevettier); 7 ♀♀ on the gills of *Pleuronectes flesus.*

No. 10. D_1C_2 IG. 10248. Mer du Nord, 7225. Same locality as 6. 29. 7. '27; 2♀♀ on *Pleuronectes flesus.*

No. 11. D_1C_2 IG. 10248. Mer du Nord, 7227; same locality as 6. 11. 8. '29 on the skin of *Rhombus maximus.*

No. 12. D_1C_2 IG. 10248. Mer du Nord, 7224; same locality as 3. 23. 7. '27; 4 ♂♂, 3 juv. ♀♀ on *Pleuronectes flesus.*

No. 19. D_1C_2 IG. 10248. Ostende estacade Est, 5. 5. '34, 297; 18 ♀♀ were collected from 2 specimens of *Pleuronectes flesus* on a pectoral fin; of these 8 ♀♀ sat close together.

Family LERNAEIDAE.

Genus **Lernaeocera** DE BLAINVILLE.

1. **Lernaeocera branchialis** L.

(Pl. II, fig. 4-7).

Adult females.

No. 14. D_1C_2 IG. 10248. Estacade d'Ostende, 21. 8. '29; 1 ♀ on *Gadus morrhua* in the branchial cavity.

No. 18. D_1C_2 IG. 10248. Estacade Est d'Ostende; 5. 5. '34, 297. Each of both specimens of *Gadus morrhua* was parasitised by 2 ♀♀ of *Lernaeocera branchialis,* situated in symmetrical position to the longitudinal axis of the fish. The antlers of the parasite had reached, the neighbourhood of the heart and were surrounded by blood.

One of the ♀♀ (Pl. II, Fig. 4) could be extracted from its host in almost intact state and showed an asymmetrical development of the antlers, like often occurs in the representants of this family. The medio dorsal antler (Med. d.) bifurcates; each of both branches of the same show a secundary bifurcation. The left lateral antler (L. lat.) is elongated and bears at its distal end some ramifications, which possibly may have the meening of bifurcations, although this cannot be stated with certainty since some of these secundary bifurcations are only present as knoblike elevations.

The right lateral antler (R. lat.) is nothing but a short outgrowth of the lateral wall of the head. The mentioned ♀ possesses a neck, of 1 1/2 mm. which is curved perpendicular to the face of the genital segment.

In the 2^d specimen (Pl. II, Fig. 5) the dorsal antler only has started its longitudinal growth. It protrudes far from the neck and follows the vertebral colum of the host in the direction of the heart, giving off a ventral ramification near its distal end. The lateral antlers have developed asymmetrically; the right one is a short knoblike elevation, the left, much longer than the

right, is to be seen in fig. 5 in the neighbourhood of the oral opening. In another specimen (Pl. II, Fig.6) the head has made a bend so that it now takes a position parallel to the upper border of the genital segment, whereas the shorter left lateral antler points sidewards and the bifurcated right lateral antler bends downwards. The dorsal antler remains unbranched. The fourth ♀ studied by me had a very short knoblike dorsal antler, and two lateral antlers of almost identical size. Here the position as well as the development of both antlers was strictly symmetrical whereas in the other females, there is a tendency to asymmetrical development of the same. Most times the dorso-median antler takes the lead. Thus the female becomes firmly fixed to the ventral side of the vertebral column and meets there the great blood vessels. Moreover the secundary ramifications which the dorsal antler gives off, help to fix, the parasite more intimate in the tissues of the host. Provisionally I might state that the ramification of the antlers in *L. branchialis* begins allways quite a distance from the head, whereas the antlers in both *L. minuta* and *L. lusci* possess ramifications, more close to the root of the antlers. But how queer it seems the true fixation takes place by means of the body surface in the neighbourhood of the antennae. Apparently the secretion of the antennal glands sticks the parasite to the bony case. At the spot were both meet the tissues of parasite and host show a brown discoloration. The antennae in the shape of small elevations can be found with some difficulty only.

Juveniles.

No. 16. D_1C_2 IG. 10248. Mer du Nord, 9227. Position initiale 51°19' N., 2°54'55'' E. Position finale 51°26' N., 2°59'25'' E.

2 Specimens of *Pleuronectes flesus* with young specimens of *Lernaeocera*. Up to the present we dont yet know the distinctives between the juveniles of *Lernaeocera branchialis, Lernaeocera lusci, Lernaeocera minuta* and *Lernaeocera phycidis*. Even SCOTT's figures of the young of *Lernaeocera branchialis* give us no characteristic which can be used for the distinction of the juveniles and for the fully developed specimens of all known species. Such a characteristic must enable us not only to identify the juvenile females and males on their intermediate host, but also to be sure about the identity the fullgrown female, when it has reached a state of parasitism, accompanied by morphological degeneration and loss of specific characters. In the fullgrown

parasitic female on the definite host, the shape of the second maxillae might be a character of primary importance because it is found in both juveniles and fullgrown animals.

For the purpose of giving a basis for future comparation I will give here a couple of figures of the second maxilla of the juvenile ♀ and ♂. Characteristical are the clawlike dorns, at the distal end of the propus in the ♀. In the ♂ these dorns fail. Here the dactylus is comparatively longer than in the ♀ (Pl. II, Fig. 7 A & B).

2. **Lernaeocera minuta** T. SCOTT.

1 ♀. D_1C_2 IG. 10248. Mer du Nord, 6136. No. 7.

Par le travers de la Brêche de Breedene jusque par le travers du Coq. Près de l'Estran (Chalut crevettier), 18. 10. '23. Branchies de *Gobius minutus*. This ♀ is 4 mm. long from the head till the bend of the genital segment. The 4 pairs of thoracopoda are distinctly to be seen but in reduced state.

3. **Lernaeocera lusci** (BASSETT-SMITH).

Syn. **Lernaeocera phycidis** LEIGH-SHARPE.

(Pl. III, IV, V, Fig. 1-6.)

11 ♀♀ from No. 1 D_1C_2 IG. 10248. Mer du Nord, 7592.

A l'extérieur de Wenduyne par le travers du Coq, jusque par le travers du Phare d'Ostende (Chalut crevettier), 23. 6. 1930; on *Onos mustela*.

1 ♀ from No. 4 D_1C_2 IG. 10248. Mer du Nord, 7227; à l'extérieur du Banc de Wenduyne par le travers de Wenduyne jusque par le travers de la brèche de Breedene (Chalut crevettier); 5. 8. 1927. On the gills of *Onos mustela* L.

No. 13. D_1C_2 IG. 10248. Mer du Nord, 7224, à l'extérieur du Stroombank. Par le travers du phare d'Ostende jusque par le travers du Spanjaardsduin (Chalut crevettier); 23. 7. '27; 6 spécimens on *Onos mustela* A.; 10 specimens on *Onos mustela* B; all females.

In 1933, LEIGH-SHARPE has described as new 1 ♀ which he announces with the following words: « To make matters more complicate I have found a *Lernaeocera* with the antlers of *L. branchialis* and the body form of *L. lusci*, which I am assigning to a new species as follows: *Lernaeocera phycidis* n. sp. Host: *Urophycis blennoides:* » Follows the description.

I may assume that the size of this animal falls in the range of variation of *Lernaeocera lusci*, allthough LEIGH-SHARPE gives no dimensions of the specimen in question.

Comparing the antlers of both his figures that of *Lernaeocera lusci* and *Lernaeocera phycidis* there seems to be at first sight a rather great difference, but LEIGH-SHARPE points to the fact — in his description of a ♀ of *Lernaeocera lusci* — that the antlers and horns of the *Lernaeidae* cannot be regarded as important characters owing to the variability of their configuration and degree of bifurcation, « and further he speaks about a malformation which results when one or more antlers come into contact with a bone ». This malformation is in so far characteristic in *Lernaeocera* that it takes the form of one antler elongating enormously, running parallel to the bone, and becoming very unlike the others, a phenomenon, which I met also in *Lernaeocera branchialis*. (See there.)

The terminal portion of the genital segment of *L. phycidis* is longer and more fingershaped than in *lusci* where it has assumed the shape of a carrot (Pl. III, 1, 2, 3, 5A). The anal opening is terminal; here the abdomen possesses a terminal slit (Pl. III, Fig. 5 C). About the shape of the second maxillae of *Lernaeocera phycidis* nothing is known.

A thorough study of the present material, which was carefully dissected out of the tissues of the host, aroused some doubt about the validity of LEIGH-SHARPE's new species.

At the same time the present material throws some new light upon the development of the female after it has anchored itself in the definite host. Usually the parasite takes hold of the host by clinging to the walls of the branchial chamber and forcing its way with the antlers into the tissues of the host, but sometimes we may meet specimens, which have penetrated through the skin of the body outside the gill chamber, particularly in those hosts where the branchial chambers have been filled up with quite a series of parasites, so that there remains no more place for newcomers. In this case newcomers bore their antlers through the skin, which does not evoke great surprise, since the skin of the Gadidae is very soft and probably can be dissolved easily by the secretions of the antlers (?), which are filled up with vacuolate cells (Pl. III, Fig. 6). The fact however that most parasites are found in the gill chambers leads us to assume that the female *Lernaeocera* after leaving its intermediate host and after having reached the definite host, find the branchial chambers

by stimuli, possibly rheotaxis, which urge the parasite in the direction of the gill chamber where the resistance against waterconcurrents reaches its minimum. So the parasites are distributed symmetrically over both branchial chambers. As soon however as both gill chambers are filled up, newcomers find no suitable spot in there and so they penetrate the skin outside the branchial chambers but still in the neighbourhood of the latter.

The present material enables us to build up quite a series of development stages.

The youngest form (Pl. III, Fig. 2) has apparently reached the definite host shortly before the fish in question was caught.

This ♀ bends its head on its breast, at both sides of which the slender setae of the thoracopods (Pl. III, Fig. 7) are to be seen. The terminal end of the trunk is hardly swollen.

The neck is sinuous and curved perpendicular to the trunk. There is a dorsal horn only, which gives the animal the outlook of a unicorn. No lateral horns are visible as yet. Pl. III, Fig. 8 depicts a second maxilla of the same female, which appears to be distinct from that figured in Pl. II, Fig. 7 A. Another ♀ (Pl. III, Fig. 3), the neck of which runs parallel to the gill arch, whereas its genital segment is hidden by the gill filaments has reached a state of development, which hardly surpasses that of the first mentioned ♀. The length of this ♀, measured from the anterior end till the bend of the in the trunk is 5 mm., from the bend in the trunk till the end of the genital segment 3 1/2 mm. Total length 8 1/2 mm. The more developed state of this animal manifests itself by the loss of the terminal setae of the thoracopods. The right lateral antler remains short, is bifid, whereas the left lateral antler is seen in the background on Pl. III, Fig. 4. It could not been made out if there is a median antler or not.

Pl. IV, Fig. 1 depicts a female head of slightly divergent character. It apparently belonged to an animal, which had reached the host only shortly before. The dorsal antler only has developed enormously, following in its course a bone, which it embraces at its distal end. (Confer the bifurcation which is to be seen.)

The eye is still visible as a black pigmentspot (O.). The head is elongate conical and terminates into the oral cone with its suckerlike oral opening, surrounded by a couple of flaps. The neck in this ♀ is extremely short. The thoracopode still are in the possession of their terminal setae. The antennae (A_2) are

found slightly superior to the eyespot. The trunk in this ♀ is already slightly swollen.

I may point to a phenomenon often observed in parasites, which being slender in the beginning, become more and more sacklike afterwards. A similar phenomenon the ♀ of *Heterodera marioni* shows. Here the young ♀ is relatively slender but swells enormously after the parasite has reached the host. (Confer S. S. 1934.) In *Heterodera* the swelling of the trunk also begins to manifest itself after the slender ♀ has fixed itself in the tissues of the host. This penetration is accompanied by strong longitudinal growth, just as in *Lernaeocera*.

Female 4 (Pl. III, Fig. 5 A) is not quite intact, the median antler being broken off in part. The head is depicted in front view with the antennal plate, which serves the fixation of the animal. All four pairs of thoracopods are to be seen. The maxillae 2 are shown in Fig. 5 B. The genital segment is slightly bifid at its terminal end.

In none of the 4 mentioned females eggstrings were found. All other ♀♀ were in full production of ova, some had already passed this stage, the eggstrings of them being empty or nearly devoid of ova. Like in *L. branchialis* (Confer above, page 5), the neck may show a torsion (Pl. III, Fig. 1).

I will not depict nor describe all specimens studied by me, but wil give only a short survey of the development of the antlers. ♀ 5 (Pl. IV, fig. 2) seen from the dorsal side possesses a median horn which has been broken off in part, it surpasses in length by far both lateral horns. The right lateral antler is bifurcated, the left lateral horn remains unbranched. Eggstrings are present. From this scheme (3 antlers of which the dorsal generally surpasses in length both lateral horns) the antlers develop by bifurcating and branching enormously. This bifurcation is shown by all 3 antlers. It leads to secondary, tertiary, quaternary branches and so on. Not often both lateral antlers entangle. In another case a female embraced a neighouring female by means of its lateral antlers. Thus the animals in question become tightly fixed to their host, which envelops the antlers with a case of connective tissue. The series of figures Pl. IV, Fig. 3-Pl. V, Fig. 6 shows how the system of fixation becomes more and more complicated. Sometimes the lateral antlers take the lead in bifurcation (Pl. IV, Fig. 4, 5), in which case the dorsomedian antler follows behind. In other cases the latter has developed much further than the lateral ones (Pl. IV, Fig. 6), each of which not often is in a

different state of development; in other cases all 3 antlers are almost in the same stage (Pl. IV, 7, & Pl. V, Fig. 3).

The complication of this bifurcation goes so far that the animal in question cannot be loosened from the host but with the greatest difficulty and mostly not without breaking off portions of the terminal bifurcations of the antlers.

The degree of bifurcation depends apparently on the time the parasite remains fixed in the host. It is as if the antlers branch and branch in order to explore continually new fields of tissues of the host. The length of the neck varies and this again depends on the distance the animal has to penetrate from the spot the parasite at first touches the host till it has reached a bone to which it sticks by means of the secretions of the antennal glands (Pl. V, Fig. 5 and 6). If the dorsomedial antler finds no opportunity to embrace a certain bone at the spot were the animal sticks to the latter, it seeks its way till it finds a suitable spot and so we find females with enormously elongated medial horns (Pl. IV, Fig. 2). In the case embracing is possible at the first contact bifurcation begins at once and in this case we get the very complicate pictures, given in the accompanying figures (Pl. IV, Fig. 3, A, B, C, Pl. V, Fig. 2, 3, 4).

LEIGH SHARPE's figure of *Lernaeocera lusci* derived from a female which had not yet penetrated to the bone apparently figures a specimen of which the antlers are missing (broken off?). As far as I can read the figure, there is only the antennal plate left (Compare my Pl. V, Fig. 2) or if there are in reality antlers, than the dorsomedian antler has only started its bifurcation whereas none of the lateral antlers are formed as yet. LEIGH SHARPE however ist not right in assuming that a penetration to the bone gives rise to malformed specimens. Than as far as my experience goes with the material at hand the penetration to the bone and the fixation against the bone by means of the secretion of the antennal glands is a quite normal process. Also SCOTT's ♀ is not an abnormal one in the sense LEIGH SHARPE attributes to this word. The degree of bifurcation may vary, but bifurcation takes place after a conspecific scheme. The mode of bifurcation in *Lernaeocera lusci* is much more complicate and more strict than in *Lernaeocera branchialis* so that when a sufficient material is at hand, the antlers do afford specific characters. When one compares the series of figures given in this paper for *Lernaeocera lusci* with the figure LEIGH SHARPE gives for *Lernaeocera phycidis* it is clear that the modes of bifurcation of *Lernaeocera*

phycidis and *L. lusci* are quite identical and that the only difference between both species consists in the shape of the genital segment which is more fingerlike in *phycidis,* but carrotshaped in *lusci.*

Till other distinctives are brought about, we cast some doubt if LEIGH SHARPE's species is a valid one, the more since it agrees in nearley in all points with the picture we could give here for *L. lusci.*

4. **Lernaeocera brevicollis** n. sp.

(Pl. V, fig. 7)

1 ♀ No. 15 D_1C_2 IG. 10248. Mer du Nord, 7224. A l'extérieur du Stroombank, par le travers du phare d'Ostende. jusque par le travers du Spanjaardsduin (Chalut crevettier) ; 23. 7. '27, on *Cottus scorpius.*

The ♀ in question is of a *Lernaeocera* type. It measures 8 mm. from the base of the antennal plate till the underside of the bend of the trunk, whereas the length of the genital segment measured from the bend of the trunk till the anal opening is 7 mm.

The animal in question laid deeply imbedded in the host's tissues with the head in the truncus arteriosus. The neck is rather short and thick. The formation of the dorsomedian antlers diverges considerably from what we see in the other species of *Lernaeocera.* Dr. C. L. OAKLEY who was so kind to compare the specimen in question with his material, wrote me in respect with this point: « I know of no *Lernaeocera* with more than 3 well-developed primary horns, and there seems little doubt, that this has four. Unlickely till so far we possess only the type specimen and future research will have to proove in how far variation occurs in the species at hand. The lateral horns of the specimen in question show signs of bifurcation. Further material of this parasite is urgently wanted.

Genus **Lernaeenicus** LESUEUR.

1. *Lernaeenicus sprattae* SOWERBY.

All specimens of *Lernaeenicus sprattae* were found on *Clupea sprattus* on the common spots as well on the eye as on the skin.

Specimens of this parasite were found in the following samples :

No. 17. D_1C_2 IG. 10248. Saison 1933-1934, Nov. and March.

No. 20. D_1C_2 IG. 10248. Côte belge, 7301.

No. 21. D_1C_2 IG. 10248. Côte belge, 20. 4. '34.

No. 22. D_1C_2 IG. 10248. Côtes française et belge, 1933/1934.

REFERENCES.

1. Brian, A., 1924. *Parasitologia mauretanica.* Matériaux pour la faune parasitologique en Mauritanie. Bull. du Comité d'études historiques et scient. de l'Afrique occidentale franç. Juillet-sept. 1924, 1-66.

2. Leigh Sharpe, W. H., 1933. *A second list of parasitic copepoda of Plymouth* with a description of 3 new species. Parasitology 25, 113-116.

3. Oakley, C. L., 1930. *The Chondracanthidae.* Ibidem, XXII, 182-200.

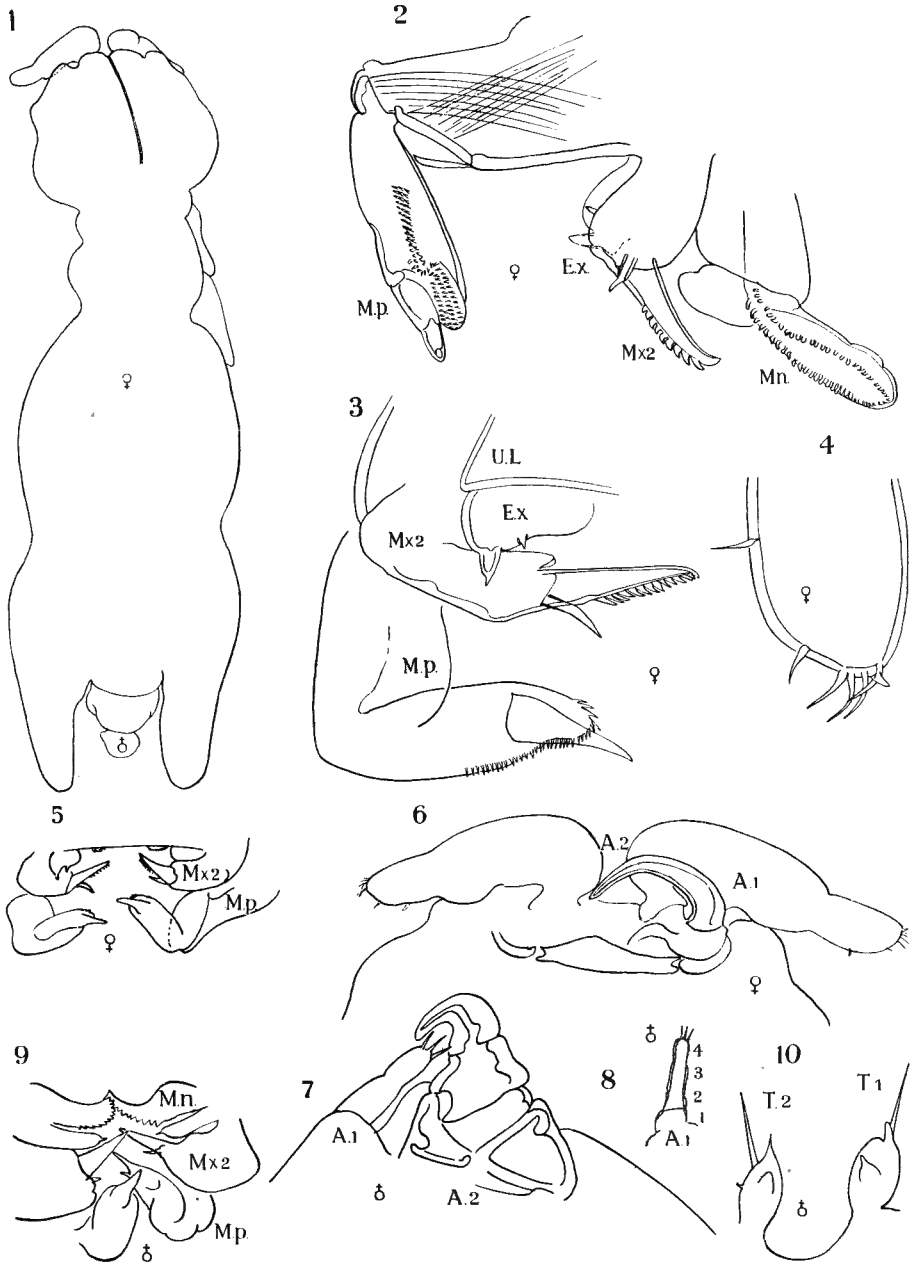
4. Van Oorde-De Lint, G. & Schuurmans Stekhoven, J. H. Jr., 1935. *Copepoda parasitica in Grimpe-Wagler.* Tierwelt Nord- u. Ostsee (under Press).

5. Schuurmans Stekhoven, J. H. Jr., 1934. *Ueber die Sinnesphysiologie von Lepeophtheirus pectoralis u. Acanthochondria depressa.* Zt. f. Parasitenkunde. Bd. 7: 336-362.

6. — ,1934. *Heterodera marioni au Congo belge.* Bull. du Mus. roy. d'Hist. nat. de Belgique. T. X, N° 36, Oct. 1934.

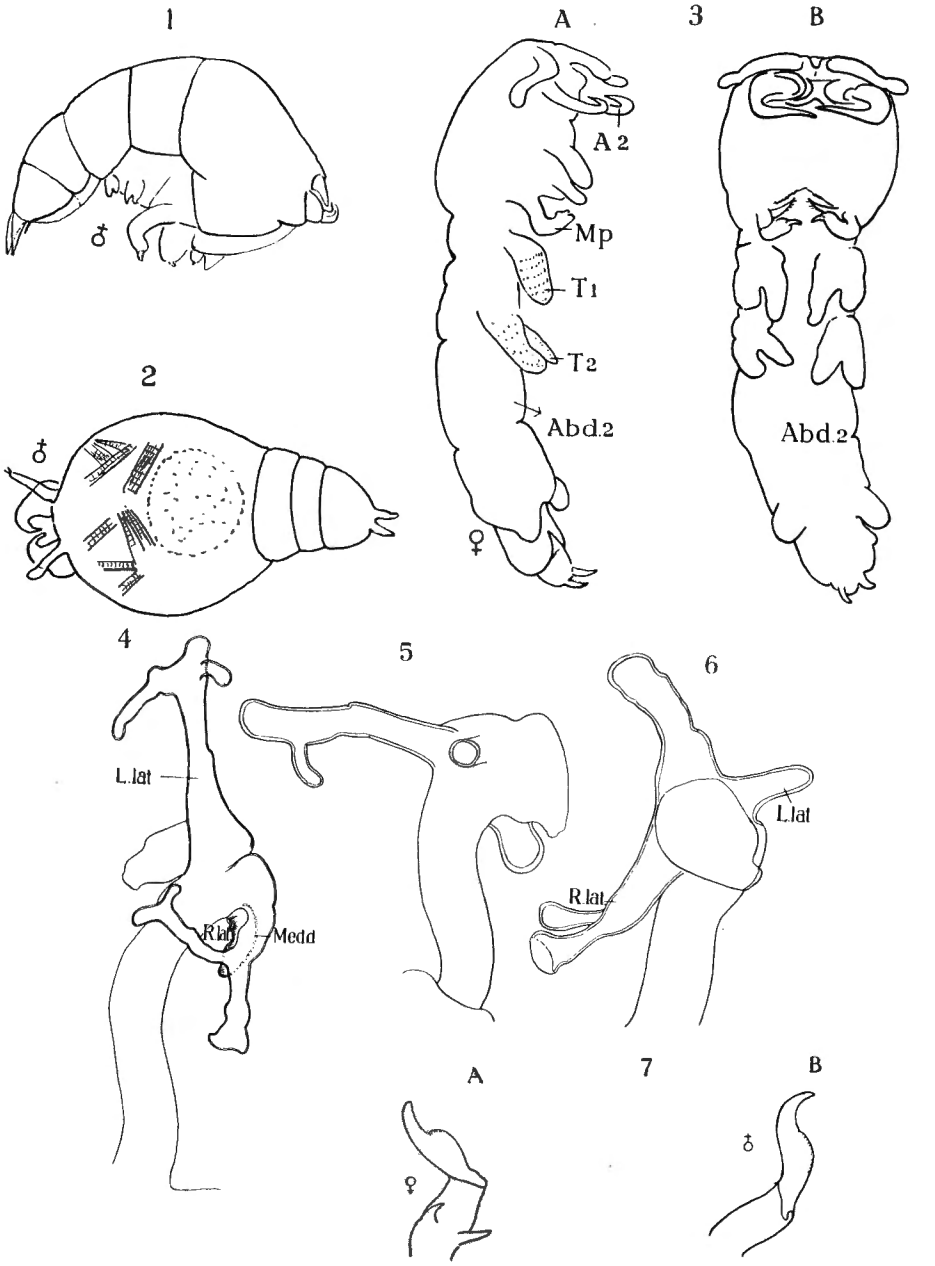
7. Scott, Th. & A. *The british parasitic copepoda.* Ray. Soc., 1913.

Utrecht, 25 November 1934.



Acanthochondria soleae (KRÖYER).

1. ♀ dorsal view with adhering ♂; magnification Oc. 1, Obj. 3 ×.
2, 3. Preparation of the oral appendages. Mn. = Mandibles, Mx. 2 = second pair of maxillae, Mp = maxillary palps, Ex = exopodite of mandibles, U. L. = upper lip.
4. Tip of antennulae.
5. Oral appendages of a female ventral view, magnification Oc. 6, Obj. A. Lettering as in 2, 3.
6. Antennulae (A.1) and Antennae (A.2) of a female ventral view, magnification Oc. 6, Obj. D.
7. ♂ A1 & A2 of a male; magnification Oc. 6, Obj. D.
8. ♂ A1.
9. ♂ Oral appendages; magnification Oc. 6, Obj. A.
10. ♂ Thoracopods 1 & 2 (T1 & T2); magnification Oc. 6, Obj. D.

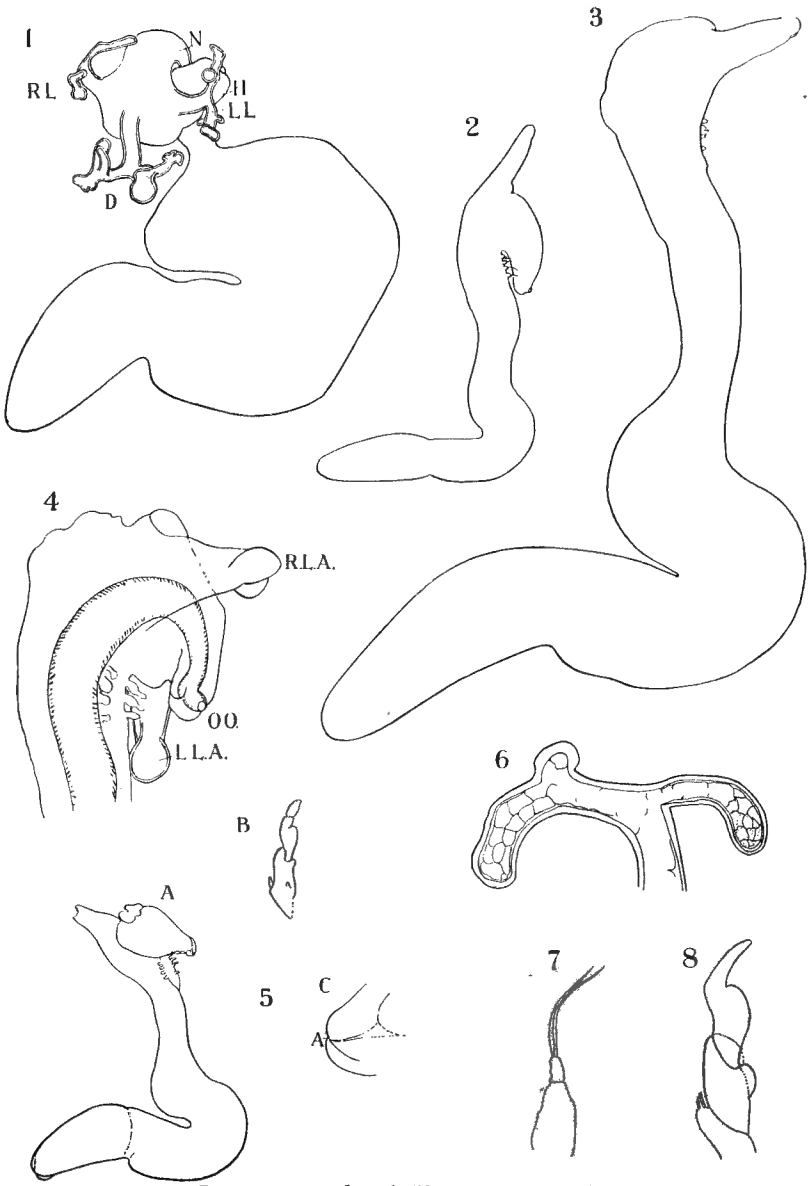


Acanthochondria soleae (Kröyer).

1. ♂ of the same species, lateral view; magnification Oc. 6, Obj. D.
2. ♂ dorsal view.
3. Young ♀ of the same species; A - lateral view, B - ventral view.

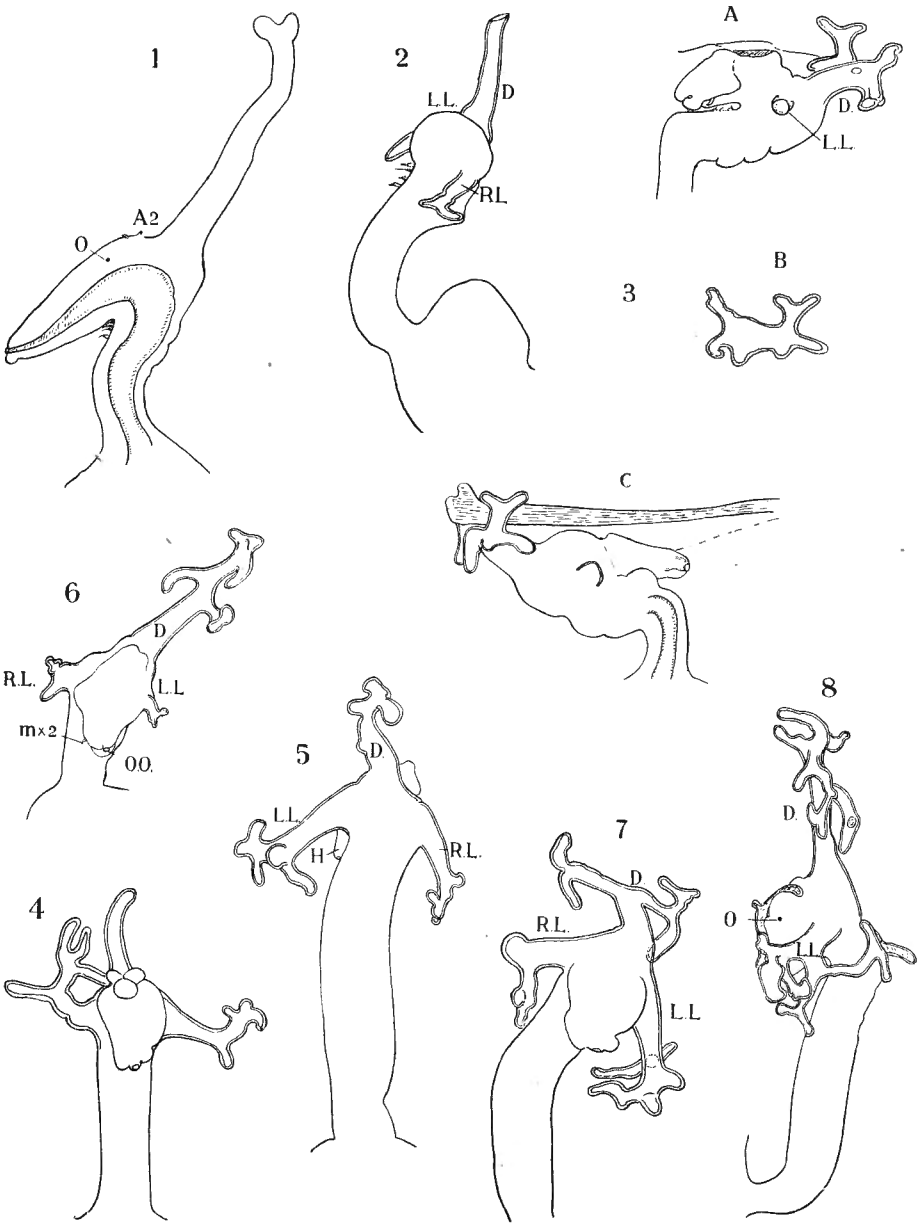
Lernaeocera branchialis L.

4. Asymmetrical development of the antlers.
5. Another ♀ of which the dorsomedial antler reached a further state or development than both lateral antlers.
6. A ♀ of which the neck shows distinct torsion.
7. A Mx2 of a young ♀; magnifiaction Oc. 1, Obj. D; B - the same of a ♂.



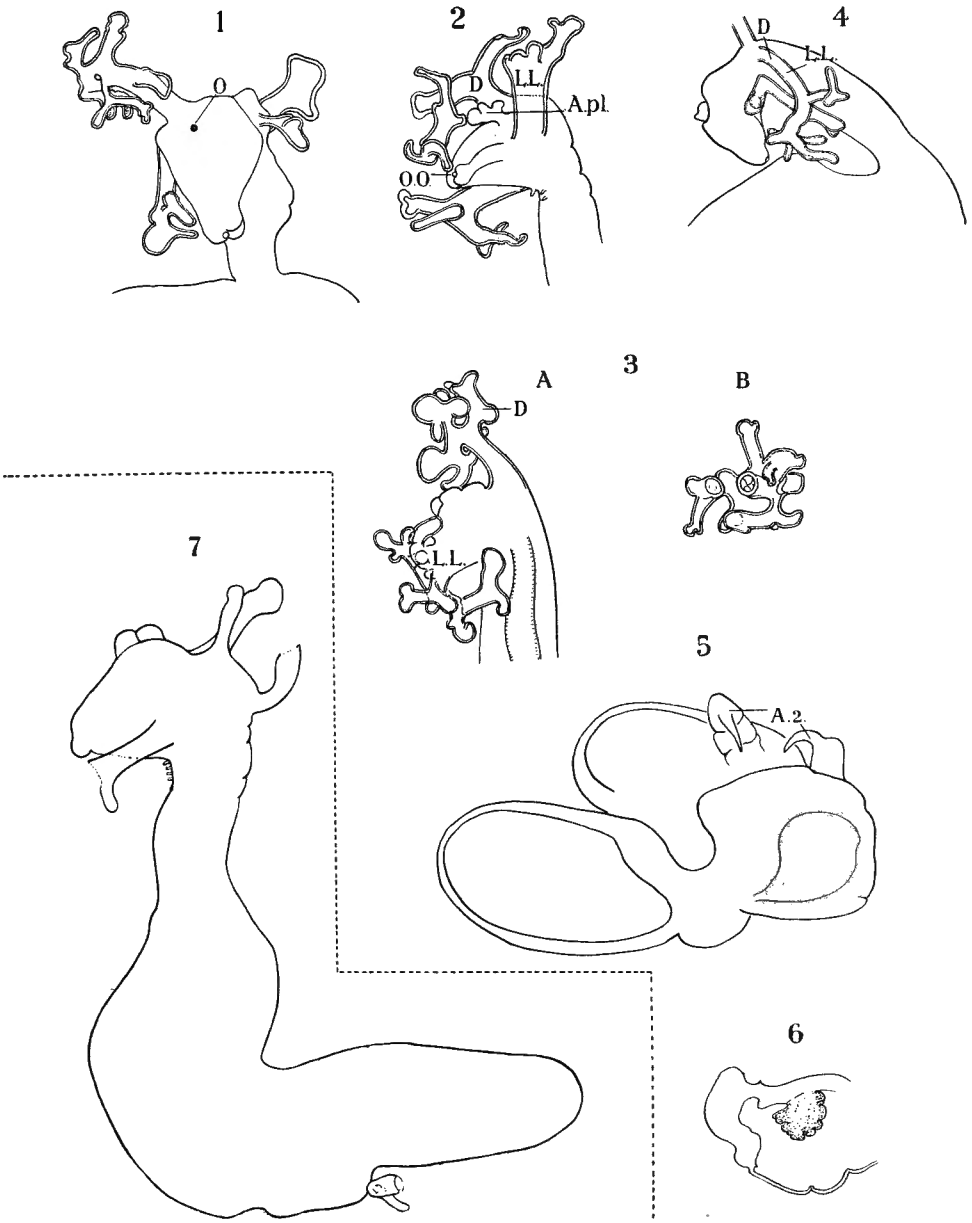
Lernaeocera lusci (Bassett-Smith).

1. A fully developed ♀ with its neck (N) showing strong torsion. H. = head; D. = mediodorsal; L. L. = left lateral; R. L. = right lateral antler. Magnification Oc. 1, Obj. A, all other heads same enlargement.
2. Youngest ♀ observed.
3. A sligthly older stage.
4. Head of the same ♀ more enlarged.
5. A - ♀ with distinct antennal plate and a mediodorsal antler which has been broken off; B - Mx2 of the same ♀; C - anal cleft and anal opening (A).
6. Tip of one of the antlers with the vacuolated cells.
7. 4th Thoracopod.
8. Mx2 of the ♀ depicted in Fig. 2; magnification Oc. 6, Obj. D.



Lernaeocera lusci (Bassett-Smith).

1. Head of a young stage of development with distinct Eye (O) and antennae (A2).
2. ♀ with short lateral and a rather long mediodorsal antler.
3. Mode of fixation of the ♀ at the bony case by means of the mediodorsal antler which bifurcates strongly; A - seen from the lateral side; B - the mediodorsal antler seen from in front view; lateral antlers almost undeveloped; C - preparation from the bone with the mode of fixation.
4. Mediodorsal antler unbranched, lateral antlers branched, antennal plate distinct.
5-8. All kind of variations to this scheme of branching of the antlers (A. pl. = antennal plate; o. o. = oral opening). Follow pl. V, fig. 1-4.



Lernaeocera lusci (Bassett-Smith).

1-4 (Following Pl. IV, fig. 5-8.)
6. Antennal gland; Obj. A, Oc. 1.
5. Antennal plate (A. pl.) with Antennae (A2); magnification Oc, D, Obj. 1.
Fig. 7. — *Lernaeocera brevicollis* n. sp.
General view.

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