

## PLATE XXIV.

- Figs. 1 and 2. Top and side view of the pelvis of the supposed hybrid fowl. Half natural size.
- Figs. 3 and 4. Corresponding views of the pelvis of *Ocydromus australis*. Only reduced two-thirds natural size.
- Fig. 5. The sternum of the supposed hybrid seen from below. Of half natural size.
- Fig. 6. Similar view of the sternum of *O. australis*, but of natural size.
- Fig. 7. Side view of sternum of the said hybrid. Half natural size.
- Fig. 8. The same of *O. australis*, but of natural size.
- Fig. 9. Right scapula (*sc*), coracoid (*c*), and furcula (*f*), with (*h*) hypocleidium, of the supposed hybrid fowl. External view, reduced half natural size.
- Fig. 10. The same bones of *Ocydromus*. Of natural size.

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ART. XLIII. — *Parasitic Copepoda of New Zealand, with Descriptions of New Species.*

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[Read before the Otago Institute, 12th November, 1889.]

Plates XXV.–XXIX.

OUR knowledge of those forms of *Crustacea* which constitute the order *Copepoda* is limited—as far as this colony is concerned—to what is contained in papers of mine published in former volumes of the New Zealand Institute “Transactions”—viz., “On the New Zealand *Entomostraca*,” vol. xi., pp. 251–263; and “New Zealand *Copepoda*,” vol. xv., pp. 93–116. The forms referred to there belong to the free-swimming section of the order, or, if parasitic, they are only ectoparasites, attaching themselves for a limited period of time to the outside of the body of their host, and not losing the power of free movement. Those to which I wish to draw attention in this paper are sedentary creatures (except in very young stages), living in the mouth-cavity, or among the gills or the muscular tissue, or even in the alimentary canal of their hosts, and exhibiting varying degrees of retrogression in their development. Indeed, in the very greatly degraded forms belonging to the families *Condracanthina* and *Lernæopodidæ*, the external form and structure have become so altered and degenerated that it is only by a study of the individual development that their affinities can be determined. In the present paper no attempt in this direction is made. The object is merely to record the occurrence of various species of these parasites, and thus to widen the ever-extending field of our knowledge of the fauna of these islands.



The material available for my purpose has been derived from various sources. Several specimens have been secured by myself, chiefly on fishes bought for household use. A few were obtained during a whaling cruise by the captain of the barque "Splendid"; unfortunately there is no record with these to show from what host the specimens were taken. Mr. A. Hamilton has very kindly sent me, from time to time, specimens taken from various fishes caught at Napier. Lastly, Professor Parker placed at my disposal the material accumulated in the Otago Museum by himself and Professor Hutton.

The only species hitherto described from New Zealand seas are five in number, and belong to as many distinct genera. It is rather remarkable that Heller, during the stay of the "Novara" in Auckland, should only have obtained three species, when it is considered how much attention he paid to this order. The forms now recorded and described bring up the number of species to 24, and of genera to 16, and include representatives of all five families of parasitic *Copepoda*. It is evident that these represent only a small proportion of the species which may be looked for in our seas. No doubt many more species will be discovered as the habits and life-histories of the fishes of the colony are more closely investigated. The present contribution is a mere starting-point.

#### Fam. CALIGIDÆ.

##### Genus *Lepeophtheirus*, Nordmann.

1. *Lepeophtheirus huttoni*, n. sp. Plate XXVIII., fig. 10, *a-c*; Plate XXIX., *a-m*.

*Male*.—Body flat and depressed. Cephalothorax semi-orbicular, abruptly truncate behind; outer margin with a finely plumose fringe. Frontal lobe slightly hollowed in the middle of the front margin; distinctly separated at the sides from the cephalothoracic shield. Hind portion of thorax hardly half the width of the cephalothorax. Fourth segment with wide semi-lunate dorsal lamellæ. Genital segment about as broad as preceding, produced posteriorly into two wing-like projections, each bearing at its outer extremity a pointed and toothed appendage. Abdomen long, narrow, and 2-jointed. Caudal lamellæ hardly shorter than last joint of abdomen.

*Female*.—Body somewhat arched above. Cephalothorax narrowed in front, and gradually broadening out behind, its posterior extremity being curved inwards. The whole of the margin is somewhat turned inwards. The hind part of the body is rather narrower than in the male, and the lamellæ of the fourth segment are not so greatly developed.



The oviferous tubes are broken off in my specimens, so that I cannot estimate their length.

The *first antennæ* are very small and 2-jointed; the terminal joint consisting of a slender tapering seta, while the basal one broadens out to its junction with the frontal lamella, with the incurved margin of which it appears to be anchylosed. The *antennæ* of the *second pair* are in the form of strong claws, 2-jointed, and with the joints somewhat flattened. The *mouth sucker* is stout and rather distinctly segmented in the middle. At its sides stand a pair of bifurcate teeth, which are strong, chitinous, and dark-brown in colour: from their position these are probably modified maxillary palps. The *first foot-jaws* are long and slender, the second joint tapering to a long weak extremity, and bearing a slender seta. The *second foot-jaws* are strong and 2-jointed. The *sternal fork* is bifurcate; the upper branch on each side rather short and rounded; the lower again shortly 2-branched at its extremity.

The *legs* of the *first pair* are 1-branched; branch 2-jointed (unless the basal joint, which appears to be anchylosed to the sternum, be considered to be a third). The terminal joint bears three plumose setæ on its outer margin, and at its extremity a long nearly-straight spine and two 3-pronged spines. These latter are very peculiar and anomalous organs, and quite unlike any appendages I have seen in other animals of this class. I have accordingly given figures of them considerably magnified (Plate XXVIII., fig. 10, *b*).

The *legs* of the *second pair* are 2-branched. Outer branch 2-jointed and in a continuous line with the basal joint, stretching transversely across the body of the animal; its terminal joint bears 4 strong chitinous spines directed outwards, 1 short (plumose) seta at its extremity, and 3 short and 1 long setæ directed inwards. (All the setæ on the legs of these animals—unless otherwise specified—are beautifully plumose.) The inner branch is 3-jointed, and stands at right-angles to the outer: its first joint bears a seta on the inner margin; the second has 2 setæ, also on the inner margin, and has the outer margin a little dilated; the last joint bears 6 setæ, which diminish in length from within outwards.

The *legs* of the *third pair* are 2-branched, somewhat similar to the preceding pair, but having very large and wide basal plates. Outer branch with 2 powerful hooked chitinous spines on the first joint, and 3 small spines and 5 setæ on the second joint. Inner branch with the first joint simple, rounded, and fringed on the margin; second joint widely dilated on the outer margin, and with a long seta on the extremity of the inner margin; last joint very small, rounded, and with 3 short setæ.



The *legs* of the *fourth* pair are 1-branched. Branch apparently 2-jointed, with the second joint bent nearly at right angles to the first. On magnifying it, however, more strongly, this terminal joint is itself seen to be 3-jointed: the first and second of these smaller joints each end in a spine on the outer margin, while the last bears 3 spines at the extremity. All three joints are fringed on their outer margin by a comb-like row of fine teeth. Perhaps this 3-jointed part is really the branch, the preceding segment being the elongated basal joint. At any rate, in figures of numerous species given by Kroyer this character is very persistent.

The *caudal lamellæ* are very long and slender, many times longer than they are broad. Their anterior part, for over a third of their length, is much broader than the posterior two-thirds. Each is furnished with several short spines, especially near the extremity. The last abdominal segment also bears two spines on the median line, which mark the position of the anus.

The total length of the animal, to the extremity of the caudal lamellæ, is 12–13mm.

*Hab.* Found, along with *Penella*, on a sword-fish, *Histiophorus herschelii*. (Otago Museum.)

### Genus **Nogagus**, Leach.

1. *Nogagus elongatus*, Heller ("Reise der 'Novara': Crustacea," vol. ii., p. 206; pl. xx., fig. 5).

This species, which is fully described and figured in detail by Heller in the report of the *Crustacea* collected during the voyage of the Austrian frigate "Novara," is probably, as he suggests, the male of *Pandarus dentatus*, having been taken along with that species from a shark caught at Auckland. Indeed, it is almost certain that the genus *Nogagus* consists only of the males of the various forms, of which the females are described under the generic names of *Pandarus*, *Echthrogaleus*, &c.

2. *Nogagus validus*, Dana (?).

This species is recorded by Dana as taken from a shark, north-east of New Zealand. The following is the brief description given:—

"Carapace a little oblong, oval; second segment with the sides prolonged backwards, third and fourth transverse, subequal, half as wide as carapace. Feet of second pair very short, cheliform, immovable; finger short, truncate, movable finger obtuse. Abdomen 2-jointed, anterior segment subquadrate. Posterior angles a little prominent, second segment short, transverse, the angles obliquely truncate. Caudal



stylets rather large, lamellar or little oblong; setæ three, plumose."

It is impossible from such a description to recognize the species referred to. I regret also, in absence of Dana's work, that I am unable to give exact references of this species. The same remark applies to *Pandarus brevicaudis* and *Speciligus curticaudis*, referred to further on.

Genus **Dinematura**, Burmeister (*Dinemoura*, Latreille).

1. *Dinematura affinis*, M.-Edw. ("Hist. Nat. de Crustacées," vol. iii., p. 465; pl. 38, figs. 15-18).

This species is briefly described by M.-Edwards as follows:—

"Species extremely like the preceding (*D. alata*), but having the posterior margin of the elyroid plates sinuous, the terminal lobes of the thorax somewhat narrowed and without the horny tooth at the end, and the abdominal appendages of the female large, oval, as long as the abdomen itself, but not exceeding the thorax. From New Zealand seas."

I have not met with this species, which is figured by M.-Edwards, and is very different in appearance from the following three species described by me.

2. *Dinematura hamiltoni*, n. sp. Plate XXV., fig. 1, a-j.

*Male*.—Whole body somewhat elevated dorsally. Cephalothorax rather square in front, nearly half as long as body, a little broader than long, rounded behind and ending in rather obtuse angles. Frontal lamina extending across about two-thirds of the cephalothorax. Penultimate segment of thorax short, with rounded lateral lobes. Last thoracic segment nearly three times as long as broad, with wide lateral wings. Genital segment short. Abdomen nearly square, only one joint apparent from above. Caudal lamellæ elongate. Fourth pair of feet 2-branched, each branch 2-jointed, terminal joint furnished with short, simple, soft spines.

Length of body, 9mm.

*Female*.—Whole body rather flattened. Cephalothorax two-thirds as long as body. Dorsal lamellæ of penultimate thoracic segment only two-thirds as long as hind portion of body; ultimate thoracic segment relatively shorter than in male. Fourth pair of feet 2-branched, each branch consisting of two rather large rounded lamellæ.

Length of body, 12-15mm.; length of oviferous tubes, 30-35mm.

The *antennæ* of the *first pair* are normally formed, the 1st broad flat joint being furnished with numerous stout fringed spines; the 2nd joint ends in several smaller spines and one longish seta. The *antennæ* of the *second pair* are apparently



3-jointed, the 2nd joint being however very indistinctly marked by a short spine. The *oral proboscis* is normally developed; the extremity of the mandibles ends in a finely-serrate margin; the palp is 2-jointed. The *first foot-jaws* are long and slender; the terminal hook-like joint bears about its middle a stout, fringed, blunt spine, and somewhat nearer the end a tuft of 5 setæ. The *second foot-jaws* very stout and indistinctly 2-jointed.

All the *thoracic feet* are 2-branched. In the *first* pair both branches are 2-jointed: the outer branch has a large basal joint produced rather obliquely into a tooth-like spine; the 2nd joint bears 4 spines and 3 plumose setæ: \* in the inner branch the 2nd joint bears 3 setæ. In the *second* pair both branches are 3-jointed: of the outer branch the 1st joint is elongated and bears a long seta on the inner margin; the 2nd is finely fringed along its outer edge—which ends in a stout spine—and bears a seta on its inner edge; while the terminal joint bears 3 spines and 5 setæ: of the inner branch the joints are subequal in length; the 1st bears on its inner margin one long seta, the 2nd bears 2 on the same margin, while the last has 6. In the *third* pair the outer branch is 3- and the inner 2-jointed; in the outer the 1st joint ends in a spine on the outer margin and carries a long seta on the inner; the 2nd joint is shorter, but otherwise similar; the 3rd ends in 3 spines and bears 5 setæ on its inner margin: of the inner branch the 1st joint is terminated on its inner margin by 2 long setæ, while the 2nd joint has 4 such setæ.

The *fourth* pair of feet in the *male* consists of 2 short branches, each 2-jointed, but having no plumose setæ; in the outer branch the 1st joint is obliquely produced into a short spine on its outer margin, the 2nd joint bears 7 spines; in the inner branch the 1st joint ends in a spine on its inner side, and the 2nd bears 4 spines.

In the *female*, the same limb consists of 4 broad, flat, gill-like lamellæ, each branch bearing a short rounded, and an elongated oval, lobe; the margin of all these lobes is quite entire, and has no trace of spines or setæ.

Each *caudal lamella* has its outer edge incurved and produced into a tooth, from below which a short spine springs; the inner edge is smooth and rounded, while the extremity bears 3 spines.

Colour dark greyish-brown.

*Hab.* Found on a large shark (species not stated) by Mr. A. Hamilton, of Napier, after whom I have much pleasure in naming the species.

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\* Unless otherwise specified all the setæ on the thoracic feet of *Dinematura* are finely fringed, like feathers.



3. *Dinematura neo-zealanica*, n. sp. Plate XXV., fig. 2, a-d; Plate XXVI., fig. 1, a-c.

*Male*.—Body nearly quite flat. Cephalothorax nearly round and half as long as the body, posterior angles acute and curved inwards. Penultimate thoracic segment short, curved posteriorly, and rather acute at the outer margins. Last thoracic segment nearly as broad as long, posterior margins ending in a short tuft of setæ. Abdomen not half as long as preceding segment, and only one-third as broad, 2-jointed; 1st joint short, 2nd nearly quadrate. Caudal lamellæ half as long as last segment of thorax, narrow. Feet of *fourth* pair 2-branched, each branch furnished with plumose setæ.

Length, 5–6mm.

*Female*.—Body flattened. Cephalothorax not half as long as body, rounded at its posterior lateral angles, the posterior margin strongly toothed on the back. Dorsal lamellæ of the penultimate thoracic segment wing-like, nearly square, as broad as the cephalothorax, and reaching back to the genital segment. Dorsal lamellæ of last thoracic segment oblong, rounded and smooth, reaching almost to end of caudal lamellæ. (The extremely broad, wing-like lamellæ of this species give the females a very square form.) Fourth pair of feet 2-branched, each branch 1-jointed, joints flattened and furnished with a few very short spines.

Length, 9–10mm.; length of oviferous tubes, 20–25mm.

The *first antennæ* are normal; the flattened 1st joint however bears more numerous fringed spines than is the case in the preceding species; the elongated 2nd joint ends obliquely and bears 5 simple slender spines. The *second antennæ* are similar to those of the preceding species, but are more strongly hooked, and are distinctly 3-jointed. In the *foot-jaws* of the *first* pair the two joints are sub-equal in length, the basal one being considerably the stoutest; the 2nd joint at about two-thirds of its length bears a curved fringed spine, much smaller than the corresponding organ in *D. hamiltoni*, and distinctly jointed on to a short stalk; behind it, on the joint which bears it, is a roughened tubercle; the slender continuation of this 2nd joint is provided with a finely-serrated fringe reaching nearly to the end, which is strongly hooked. The *foot-jaws* of the *second* pair are very stout, and in the *males* end in a strong horny hook, which is brown-coloured, and so contrasts in a marked manner with the whitish-yellow colour of the rest of the body.

All *four pairs of feet* are 2-branched. In the *first* pair both branches are 2-jointed: the outer branch has the first joint nearly as long as the inner branch; its outer margin is dilated, and ends in a stout spine; the 2nd joint has 4 spines and



3 setæ: of the inner branch, the 1st joint has entire margins, the 2nd is finely serrated on the outer margin, and bears 3 long setæ directed inwards. The *second* pair has both its branches 2-jointed, but the outer branch has traces of a division in its terminal joint: in this branch the 1st joint ends in a spine on the outer and a seta on the inner margin: the 2nd joint has a seta on the middle of the inner margin (which probably marks the division-line between the 2nd and 3rd joints), 5 setæ round the extremity, and 4 spines on the outer margin, which is also furnished with a finely-serrated fringe: in the inner branch the 1st joint ends on the inside in a seta, while the 2nd joint bears 7 setæ towards its extremity. The *third* pair of feet has both branches 3-jointed: the outer branch has the 1st and 2nd joints each ending in a spine on the outer and a seta on the inner margin; the 3rd joint has 3 spines on the outer margin and 5 setæ round the extremity: the inner branch has its 1st joint provided with a seta on the inner margin, the 2nd joint with a spine on the outer and a seta on the inner margin, and the 3rd has 4 setæ round the extremity. The *fourth* pair of feet in the *male* has the outer branch 3-jointed, and the inner 2-jointed: in the former the 1st and 2nd joints end in a strong spine on the outer and a seta on the inner margin; the 3rd joint has 3 teeth on the outer margin, and 4 setæ at the extremity: in the inner branch the 1st joint ends in a long seta on the inner margin, and the 2nd has 4 setæ; both joints are finely fringed on the outer margin. In the *female* each branch consists of a single joint, but the outer is deeply notched as if showing traces of a division: the outer branch is oval in form, its outer margin being produced about the middle into a strong spine; towards the end it bears 4 or 5 spines and has traces of denticulation along its inner margin: the inner branch is shorter than the outer, and is also denticulated with about 7 slight notches.

The last thoracic segment in the *female*, when seen ventrally, ends in a pointed lobe on each side, which projects beyond the extremity of the dorsal lamellæ, and reaches as far back as the end of the caudal lamellæ.

*Hab.* Numerous specimens of this species were obtained for me by the captain of the whaling barque "Splendid," presumably off a shark; unfortunately he omitted to record the host.

4. *Dinematura carcharodonti*, n. sp. Plate XXVI., fig. 2, a-d.

*Female*.—Body only slightly arched upwards. Cephalothorax one-third as long as body, nearly round, rather broader than long, with a very distinct marginal flange; posterior angles sub-acute. Hind portion of the body long and narrow,



very distinctly separated from the front portion by a narrow constriction between the 2nd and 3rd thoracic segments. Frontal lamina distinct, extending across more than half the front of the carapace. The dorsal lamellæ of the penultimate thoracic segment are square-shaped in front and rounded behind. Under them the dorsal lamellæ of the last thoracic segment project to twice their length on their outer margins, the inner being much shorter. The abdominal segments also bear rounded lamellæ, which are greatly developed and project over the bases of the caudal lamellæ. The hind part of the body is considerably inflated below. The abdomen is very short, and nearly square in shape. Caudal lamellæ very similar in appearance to those of *D. hamiltoni*.

Colour, nearly white. Length, 20–22mm.; length of oviferous tubes, about 50mm.

Both pairs of *antennæ* have a close resemblance to the same organs in the preceding species. The *foot-jaws* are very similar to those of *D. hamiltoni*, the terminal portion of the 2nd joint being however more contracted, and the secondary spine jointed on to a short pedicel as in *D. neo-zealanica*. The *feet* are very similar in the number of joints, spines, and setæ to those of the first-named species, differing only in the shape of the joints. In the *first* pair the 1st joint of the outer branch is obliquely pyriform, and is marked on its outer margin by three rudimentary division-lines. In the *second* pair the 1st joint of the outer branch ends in a spine on its outer margin. Those of the *third* pair exactly resemble those of *D. hamiltoni*; while in the *fourth* pair the only difference lies in the form of the lamellæ, which in this species are long and narrow, and bear 1 minute spine on the inner margin of the inner branch, and 5 on the outer margin of the outer branch.

*Hab.* Numerous specimens (of females only) were taken from the ventral surface of the tail of a white shark—*Carcharodon rondeletii*,—and are preserved in the Otago Museum.

This species is very nearly allied to, if not identical with, *D. lamnæ*, Johnston; but the description and figure of that species in Baird's "British Entomostraca," p. 206 (the only accessible one to me), is imperfect and insufficient.

Genus **Echthrogaleus**, Steenstrup and Lütken.

1. *Echthrogaleus braccatus* ("Reise der 'Novara': Zool.," vol. ii., p. 197; pl. xx., fig. 3).

*Dinematura braccata*, Dana ("U.S. Expl. Exped.: Crust.," vol. xi., p. 1370; pl. 95, fig. 4).

The *female* of this species was originally described by Dana. In "The Voyage of the 'Novara'" Heller describes and



fully figures the *male*. Both sexes were taken by Heller off an undetermined species of shark caught at Auckland. I have not met with this species.

Genus **Cecrops**, Leach.

1. *Cecrops latreillii*, Leach. Pl. XXVI., fig. 3, *a-f*.

This well-marked and well-known form appears to be the only species of the genus. M.-Edwards ("Hist. Nat. Crust.," vol. iii., p. 474) records it as being found on the branchiæ of the tunny (*sur les branchies du thon*), but, with this exception, which may have been stated in error, it is invariably found as a parasite on sun-fishes of various species. Thus round the English coasts it is frequently taken on the gills of *Orthogoriscus molæ* (Baird: "Brit. Entomostraca," p. 293). It is also recorded from the same species taken on the east coast of the United States. On the Pacific coast of the States it occurs on the gills of *Diodon*.

The body of this animal is about an inch long, and is thick and short. The carapace bears two rounded prolongations in front, which represent the frontal lamellæ of the preceding genus, and which in this species are rather closely anchylosed to the cephalothorax. The penultimate thoracic segment bears a dorsal shield notched at the posterior margin, which corresponds to the dorsal lamellæ in *Dinematura*. The last segment of the thorax bears a very large dorsal shield, deeply notched on the hind margin, and which extends beyond and completely covers the abdomen. Seen from the underside the abdomen is dilated and 2-lobed behind, and is covered in front by the greatly-enlarged bases of the fourth pair of feet. The *first antennæ* are small, and are produced at the angles of the frontal lamellæ. The *second antennæ* are powerfully developed, and end in strongly-curved brown horny hooks. It is by means of these organs and the powerful hooks of the *second foot-jaws* that the animals attach themselves to their hosts. The *oral proboscis* is relatively very short, as the animal appears to bury itself rather deeply in the tissues of its host. The *feet* are small, and bear either short spines or setæ; but the latter, though often finely serrated along their edges, never bear the feather-like fringes of the same organs in *Dinematura*. In the first *three* pairs both branches are 2-jointed. They do not end in hooks as stated by M.-Edwards, but in each case the short inner branch bears 3 setæ and a few (except in the *first* pair, which has none) short spines on the terminal joint. In the *first* pair the outer branch ends in 3 setæ and 4 spines; in the *second* pair the 1st joint ends in a powerful curved spine, while the 2nd bears several marginal setæ and small spines; in the *third* pair it ends in 2 (or 3) setæ. In the *fourth* pair the basal joint is developed



into a broad flat plate, bearing a very small 1-jointed branch near its outer edge. Inside of this, however, is a very distinct pointed lobe not clearly disarticulated from the basal lobe, which probably represents the imperfectly-developed inner branch of this pair of feet. The caudal lamellæ are extremely small and inconspicuous. The oviferous tubes are hidden in a remarkable manner. Instead of projecting in the form of long filaments, as is the case in most animals of this class, they are looped up into a dense mass, which lies between the abdomen and the dorsal buckler on each side.

*Hab.* Several specimens were obtained from the mouth of a sun-fish (*Orthogoriscus molæ*), which was taken in Otago Harbour. (Otago Museum.)

#### Genus *Pandarus*, Leach.

1. *Pandarus dentatus*, M.-Edwards ("Hist. Nat. de Crust.," vol. iii., p. 469; pl. 38, fig. 19).

This species, originally recorded as taken near Tongatabou, is briefly described by M.-Edwards as follows:—

"Species closely allied to the preceding [i.e., *P. vulgaris*], but having the posterior margin of the carapace nearly straight and strongly toothed in the middle, and the dorsal lamellæ of the first segment of the thorax more rounded and shorter, not quite reaching to the middle of the penultimate thoracic shield; last segment of the thorax and the abdomen as in the preceding species."

Heller ("Reise der 'Novara': Zool.," vol. ii., p. 206) records having taken this species on a shark in Auckland. I have not met with it.

2. *Pandarus armatus*, Heller. Plate XXVII., fig. 1, a-f. ("Reise der 'Novara': Zool.," vol. ii., p. 202; pl. xix., fig. 4.)

This species was described and figured by Heller from female specimens taken from a dog-fish (*Scyllium africanum*), from the Cape of Good Hope. The following is the brief specific diagnosis given by him:—

"Cephalothorax shorter than the rest of the body, somewhat narrow in front, slightly excavated behind, with short angles, posterior margin armed with 10 acute teeth; second segment with elongate-oval wings, 4-toothed behind; two following segments with acute median tubercles placed in front of the incision. Genital segment sub-quadrate, narrower behind, with posterior angles acute, tail oval, styles twice as long. Length of body = 8mm."

The detailed description given by Heller is very full and fairly accurate, as are the drawings of those parts figured. The following are points in which my specimens either differ from Heller's, or which he has not described:—



In the first place, all the specimens examined by me are distinctively coloured, the males being of a uniform yellowish colour, while the females are more or less of a deep-brown hue. In some, nearly the whole upper surface is of a fine blackish-brown colour; in others, the pigment is broken up into scattered but somewhat symmetrical patches on the cephalothorax and various dorsal lamellæ. All my female specimens are about the same size, viz., 8mm., and the oviferous tubes are about the same length.

The *male* form of the species, according to Heller, is not known, though he thinks "it is highly probable that *Nogagus latreillii* is the male, because similar spine-like projections occur along the back in the median line, just as they do in this female form."

M.-Edwards's description of the species ("Hist. Nat. de Crust.," vol. iii., p. 459) is not very satisfactory:—

"*Nogagus latreillii*. Frontal lamella greatly excavate; carapace very large, and exhibiting on the posterior margin on each side, very near the postero-lateral angle, a rounded lobe which appears to belong to the first thoracic segment. The first free articulation of the thorax is terminated laterally by similar lobes, which are however very large and reach to the middle of the penultimate thoracic segment; this segment bears similar small prolongations, which are almost completely hidden under the preceding lobes. Last segment of thorax large, and armed on each side with two great conical prolongations, which are directed conically backwards. Abdomen very short, 2-jointed, and terminated by rather large natatory lamellæ."

Kroyer ("Bidr. t. Kundsk. om Snyltekrebsene," p. 242) describes *N. latreillii* and figures the female. Unfortunately, his descriptions, being in Danish, are incomprehensible to me.

I have drawn (Plate XXVII., fig. 1, c) a specimen of the form taken along with the females of *Pandarus armatus*, and which I assume must be the male of that species. The following is a brief description:—

Cephalothorax rather broader than long, less than half the length of the body; posterior margin nearly straight, and toothed as in female but not so strongly, rather rapidly contracted into somewhat acute arcuate postero-lateral angles. Two succeeding segments short and only slightly produced into lateral wings. Last segment of thorax not more than half as broad as cephalothorax, rather longer than broad. Abdomen about one-third as wide as preceding segment, 2-jointed, last joint the longest, and produced on the median line. Caudal lamellæ half as long again as abdomen, narrow, and each ending in 4 setæ.

Fourth pair of feet 2-branched; inner branch 2-, outer



3-jointed. In the inner branch the 1st joint bears a long plumose seta on its inner margin, and the 2nd joint has 5 plumose setæ round its extremity. In the outer branch, the 1st joint bears a similar seta on the inner margin, while the outer is produced obliquely into a long stout spine; the 2nd joint is similarly furnished though smaller; while the 3rd bears 4 spines on its inner side and 3 spines at its extremity.

Length, about 5mm.

*Hab.* Numerous females and one or two males were obtained by the captain of the whaling barque "Splendid," presumably off a shark. The specimens taken on this cruise were got off the coast between Banks Peninsula and Otago Heads.

3. *Pandarus brevicaudis*, Dana (?).

This species is recorded as taken from a shark north-east of New Zealand. The description given is brief and unsatisfactory.

Genus *Specilligus*, Dana.

1. *Specilligus curticaudis*, Dana.

This is recorded as taken from a shark north-east of New Zealand.

The genus is considered by Professor A. Gerstaecker (Bronn's Thierreich, "Crustacea," p. 724) as very nearly related to, if not identical with, *Nogagus*. The description of the only species as given by Dana is brief and unsatisfactory.

Fam. DICHELESTHINA.

Genus *Anthosoma*, Leach.

1. *Anthosoma crassum*, Steenstrup and Lütken. Plate XXVII., fig. 3.

*Caligus crassus*, Abildgaard.

*Anthosoma smithii*, Leach.

The occurrence of this species in New Zealand is recorded by Mr. T. W. Kirk, in "Trans. N.Z. Inst.," vol. xx., p. 31, the paper being accompanied by a good figure of the animal. The specimens noticed by Mr. Kirk were taken from the gill-covers of the porbeagle shark (*Lamna cornubica*). The description given is taken from Baird's "British Entomostraca," pp. 297-8. The analogies of the cephalic organs given by Baird and Milne-Edwards are not, however, quite correct. The organs which project from the front of the cephalothorax, and which serve to anchor the parasite firmly into the tissues of its host, are not the first pair of foot-jaws, but the second pair of antennæ.



The first foot-jaws are of remarkable shape, and I have figured one of them. They are 3-jointed; the basal joint is stout and strong; the 2nd joint is elongated, flattened, and flanged on the inner side, and produced at the distal end into a pointed knob, round the extremity is a line of short spines surrounding it like a collar; the last joint is in the form of a round knob obliquely striated in a longitudinal direction, and having two lines of short spines which converge at its extremity. I cannot suggest the origin of this remarkable development, or its present use.

*Hab.* Numerous specimens taken from the upper jaw of a porbeagle shark—*Lamna cornubica* (Otago Museum). Also a number from the same kind of shark taken at Napier by A. Hamilton. According to Gould this species has been taken on the mackerel-shark—*Lamna punctata*—on the coast of Massachusetts, U.S.A.

Genus **Lernanthropus**, Blainville.

The animals of this genus are chiefly remarkable for the abnormal development of the third and especially of the fourth pair of thoracic feet, which are produced into the form of cylindrical or lamellate appendages under the body. The first and second pairs are very small. The anterior antennæ are very small, while the second pair are developed into hooked claws by which the animals attach themselves to their host.

Owing to the very varying extent to which the parts of the thorax are developed, there is great diversity of form among the different species.

1. *Lernanthropus percis*, n. sp. Plate XXVII., fig. 2, a-j.

*Female.*—The whole body of this species is about one and a half times as long as it is broad. Seen from above, the head is somewhat distinctly separated from the thorax, and is about subquadrate in form: its lateral margins are slightly dilated into two rounded lobes. The thoracic portion is broadly winged, the first segment showing a shoulder-like protuberance on each side, and the second being produced backwards into acute angles. The dorsal shield is about as broad as the thorax, about half as long as the whole body, rounded behind, and with a slight notch in the middle of the posterior margin.

Seen from below, two-thirds of the lower surface is covered by the large lamellæ of the third pair of legs, which do not, however, reach quite to the extremity of the dorsal shield, but leave exposed the folded-up ends of the oviferous tubes. Genital segment very short. Abdomen short, thick, rounded, and fleshy, very indistinctly 2-jointed (?), with a small notch



and two minute anal papillæ on the posterior margin. Caudal lamellæ very small, 2-(?)jointed, with two minute setæ at the extremity.

Anterior antennæ not seen. Posterior pair in the form of powerful hooked claws, by which the animal attaches itself to its host; these are 2-jointed, the basal joint being thick and powerful, while the shorter and more curved terminal joint bears a strong tooth on the middle of its inner surface, and behind it two or three rugosities.

First foot-jaws small and not very powerfully developed; the rather slender terminal joint ends in a feebly-chelate manner in two claws, the larger (and outer) of which is finely serrated along its outer margin. The second foot-jaws are strongly developed.

First pair of legs not seen. The second pair are very small, the minute outer branch being free and obliquely oblong, while the inner, which is in the form of a curved lobe, is anchylosed to the horny basal joint. The third pair are developed into large lamellar plates, the outer of which are broadly oblong, and rounded at their extremity, and have the narrower inner plates standing at right-angles against them. The fourth pair are produced in the form of two elongated and curved fleshy lobes, which are shorter than, and are completely hidden by, the lamellæ of the third pair.

Oviferous tubes rather longer than the dorsal shield, but lying slightly folded within its margin.

Length, 4–5mm.; colour, dark-brown.

*Hab.* A single (female) specimen was found by me on the gills of a blue cod (*Percis colias*).

This species is nearer to *L. scribæ*, Kroyer, in general form than to any other of the many oddly-shaped species of this genus, but differs entirely from it in most of the details of its structure. It is a very distinct form.

### Genus *Philichthys*, Steenstrup.

#### 1. *Philichthys xiphie*, Stp. Plate XXVIII., fig. 1.

I have several female specimens of this remarkable parasite, which were taken from the skull of a sword-fish (*Xiphias gladius*). Unfortunately, I do not know whether the specimen was taken near Dunedin, or from what part of the coast.

The male of this species, according to Bergsoe, is a long, narrow, *Cyclops*-like copepod, apparently free-swimming in its habits. The female, on the other hand, lives in the bones of the skull of the sword-fish, producing pit-like cavities in the bone-tissue. Not only is the body very numerously segmented, but the segments bear sac-like appendages whose analogies are not easily made out. The oral proboscis—so



distinctively produced in the forms previously referred to—is not found in this genus, nor, indeed, is there any appearance of a mouth-opening. The antennæ, foot-jaws, and three pairs of legs are all represented by sac-like appendages; the fourth pair of legs is quite absent.

Fam. LERNÆODEA.

Genus, **Penella**, Oken.

In the *females* of this genus the body is slender, cylindrical, and much elongated. The head is rounded and somewhat irregular in form, and behind it arise two arm-like lobes. The thorax or neck-part exhibits no segmentation, and is only indistinctly separated from the genital segment. This latter part is greatly elongated, and constitutes the largest part of the body. At its posterior extremity spring the narrow, straight oviferous tubes. The abdomen protrudes as a long, somewhat flattened portion, bearing on both sides a large number of styli-form, thread-like appendages. The antennæ and foot-jaws are difficult to distinguish in the head part, as they are more or less hidden by a mass of short slender tube-like processes. Behind the head all four pairs of feet are placed in close succession, and all in a very rudimentary condition.

The *male* is very small, almost spherical in form, and carries on the anterior portion a conical sucker furnished with several styli-form appendages, and on the inferior face two pairs of very large sub-cheliform limbs, by means of which he holds on to the female.

1. *Penella histiophori*, n. sp. Plate XXVIII., fig. 2.

In the absence of the full literature of this remarkable genus I advance this species provisionally, as it is very distinct in form from any figured or described in Bronn or Milne-Edwards.

The head is in the form of a rounded cup about 5mm. in diameter, and anteriorly presents a mass of botryoidal or grape-like processes, which are slightly arranged in about four parallel masses. Apparently the mouth-organs are placed among these. The arm-like processes behind the head extend horizontally to a length of 15mm. on each side. Between them and projecting a little posteriorly is a rounded protuberance. The four pairs of thoracic feet are very minute, and each consists of a small sub-acute lobe (somewhat similar to those in *P. sagitta*). The genital segment is separated by an imperfect constriction from the thorax, and is about 65mm. long, increasing in width posteriorly. It shows faint transverse marks throughout its length. The abdomen is



about 18mm. long and 5mm. broad, and is very thickly fringed on both sides with numerous setiform processes. The oviferous tubes barely reach to the extremity of the abdomen, and are very slender and thread-like.

No males were seen.

The average total length of the specimens was about 90mm. (nearly 4in.).

*Hab.* Found on a sword-fish—*Histiophorus herschelii*. (Otago Museum.)

### Genus *Lerneæ*, Linnæus.

M.-Edwards, and Baird after him, give the characters of the animals comprising this genus as follows:—

Body more or less twisted, and *outré* in appearance, destitute of rudimentary feet. Head furnished with horn-shaped appendages, which are irregularly branched. Ovarian tubes twisted together into rounded masses and placed under the posterior portion of the body. Abdomen large and distorted.

The description is incorrect as far as the appendages are concerned, as all four pairs of thoracic feet are present, although in a somewhat rudimentary condition.

#### 1. *Lerneæ lotellæ*, n. sp. Plate XXVIII., figs. 3 and 3a.

In general appearance this species somewhat resembles *L. branchialis*, but the three cephalic arms are quite simple, and not branched as in that species. The head is small and rounded, each of the three simple arms below it extending to a length of about 4mm. The neck is long and rather narrow, gradually widening below, the lower portion of this segment being greatly dilated and bent completely on itself. At the extremity of this segment the oviferous tubes arise. These are closely coiled up into two masses or rolls, each about 6mm. or 7mm. long. The posterior end of the body is separated distinctly into an oblong abdomen. There is considerable diversity of form in the posterior part of the body, both in the extent to which it is dilated and the amount of curvature exhibited. The whole of this hind portion is more or less covered with a filamentous growth, part of which appears to consist of natural hair-like processes, but which is mainly formed of masses of filamentous *Algæ* and of sertularians. The front part of the body is very hard and horny, but the hinder part is much softer and leathery in consistence. It is probable that as these parasites are attached by the hard head, and have the softer posterior portion projecting on the outside of the fish which they infest, the growth referred to is of the nature of a protective covering, resembling in this respect some of the rather soft-bodied crabs (*Paramithrax*) which are similarly protected.



The total length of my specimens, exclusive of the oviferous tubes, is from 16mm. to 20mm.

*Hab.* On the gills of the red cod (*Lotella bacchus*). (Otago Museum.)

Fam. CHONDRACANTHINA.

Genus *Lesteira*, Kroyer.

This genus is characterized as follows by Kroyer:—

Head enlarged at the sides as if into two rounded wings, by which the animal is attached; antennæ and rostrum (or buccal protuberance) not very clearly defined. Neck very long, cylindrical, thin in the front, and entirely destitute of all traces of limbs. Genital segment provided behind with two clusters of tubuliform appendages; oviferous tubes straight and somewhat thick. Abdomen rudimentary.

*Male* not known.

Young, at its earliest stage, furnished with four antennæ, maxillæ and palps, and six feet.

This is perhaps the same genus as is referred to by Cuvier under the name of *Sphyrion* ("Règne Animal," t. 3, p. 257), but of which he only gives the following imperfect character: "Head enlarged on both sides like a hammer; small hooks at the mouth; neck thin, succeeded by a depressed body in the form of a heart, which, besides the two long cords, carries on each side a large bunch of hairs."

1. *Lesteira kroyeri*, n. sp. Plate XXVIII., figs. 4 and 4a.

Front part of animal dilated into a thick, wide, float-like body, which is about 55mm. across, and 20mm. wide, inclusive of its protuberances. This tapers to the rounded ends, and seen from behind shows two long and obtusely-pointed projections on its upper margin, and two rounded shorter knobs below. When looked at from the front it is seen that the two long protuberances define the position of the mouth-organs. These are situated on a small protuberance—about 11mm. in width—the upper part of which is dilated into two hammer-like wings, and the lower into two rounded lobes. The former probably represent the antennæ, while above the latter may be seen the mouth-organs, consisting of a conical upper and an under lip, with a small rounded maxilla on each side. This part of the body is soft and fleshy in consistence. From near the middle of it arises the slender neck, which reaches back to a length of 12mm., and connects with the compressed and heart-shaped genital segment. This part of the body is about 20mm. long, 25mm. broad, and about 10mm. thick. Both it and the neck are of very hard and horny consistence, and are absolutely destitute of any traces of limbs. Its surface, though somewhat smooth, bears—in one specimen at



least—several small *Cirripedes* and *Serpulæ*. The bunches of coralline-like appendages at the posterior margin of the genital segment are irregular in form, and equal it in length. The oviferous tubes are thin and nearly straight, or at most only slightly curved, and are about 60mm. long.

The whole length of the animal (exclusive of the oviferous tubes) is about 70mm.

*Hab.* Taken from the abdomen of a ling (*Genypterus blacodes*), in the tissues of which the whole soft front part of the body was imbedded.

### Genus *Chondracanthus*, De la Roche.

The *males* of this genus are very minute, and are found attached under the posterior extremity of the thorax of the females. The body is more or less pyriform in shape, having a very large head and an articulated thorax. They are also provided with very large hooks (posterior antennæ) by which they remain attached to the females.

*Females* having the body of more or less bizarre form, and furnished with tubercles or lobed processes. Head generally indistinctly separated from the thorax and furnished with two pairs of antennæ. Of these, the first pair are usually short, and 1-(3)-jointed, while the second pair are in the form of hooked claws. The mouth is situated rather far back, and is furnished on each side with a small hooked maxilla. The foot-jaws are small, and end in hooked claws. Two pairs of thoracic feet are developed in the form of bifurcate lobes. The genital segment is usually produced backwards in the form of two lobe-like processes: between these arise the stout oviferous tubes. Between them projects a minute tubercle, representing the rudimentary thorax.

1. *Chondracanthus chilomycteri*, n. sp. Plate XXVIII., fig. 5, *a-d*.

Body rather stout, nearly three times as long as broad. Head small and not distinctly separated from thorax. Thorax divided into two rather distinct parts, of which the anterior is only half as wide as the posterior: the former is elongated and bears on each side two rounded protuberances which project laterally to a small extent: the posterior portion on the other hand is sub-quadrate in form, and bears two rounded protuberances, which project on its ventral face; the posterior extremity on each side is produced backwards to an obtuse lobe. The antennæ, which are broadly falcate in form, are rather closely approximated at their base, and do not reach to the margin of the head on each side. The first pair of thoracic legs are very small, and exhibit distinct segmentation; the second pair are very much larger, and consist only



of rounded two-branched lobes. The minute abdomen is very difficult to distinguish; I could only recognize one articulation, and its extremity appeared to be two-lobed. Oviferous tubes rather stout, hardly exceeding the length of the thick part of the thorax.

Length of body, 6–8mm.; including the oviferous tubes, 9–10mm.

*Hab.* Taken from the mouth of the porcupine-fish—*Chilomycterus jaculiferus*—by Mr. A. Hamilton, of Napier, to whom I am indebted for much assistance in working out the *Crustacea* of these seas.

2. *Chondracanthus genypteri*, n. sp. Plate XXVIII., figs. 6 and 6a.

Body long and narrow. Head laterally compressed, elongated, three times as long as broad when seen in front. Seen laterally it is rounded behind, and in the middle of the front margin protrudes a little at the point of attachment of the mouth-organs. The front part of the thorax is hardly broader than the neck, and is separated from it by a short constricted part or neck. The posterior division of the body is somewhat wider, and bears two pairs of elongated fleshy lobes which are considerably curved inwards towards the median line. Antennæ of first pair small and distinct, rather widely separated at the base and standing out backwards like minute horns. The second pair are produced a little forward in the form of two curved hooks. The mouth-organs are rather prominent. Both pairs of thoracic legs are elongated, and have the branches well defined and projecting somewhat widely to the sides. Abdomen not seen. Oviferous tubes short and stout, not half as long as the body.

*Hab.* Taken on the gills of the ling—*Genypterus blacodes*. (Otago Museum.)

3. *Chondracanthus lotellæ*, n. sp. Plate XXVIII., fig. 7, a and b.

Body very short and thick. Seen from the front it exhibits three pairs of fleshy obtuse lobes directed inwards and downwards; above these the head stands out somewhat distinctly. Looked at from the side the lateral lobes are seen to project prominently forward, while along the back are three large fleshy obtuse lobes directed posteriorly and corresponding to those of the sides. Behind the head also is a rounded protuberance. The antennæ are closely approximated, and broadly falcate in shape, lying close to the front of the head and not reaching past its lateral margins. They project forward to a considerable extent, so that the buccal portion is somewhat concave. The two pairs of thoracic limbs are



short, very thick and fleshy, and only imperfectly 2-lobed. Abdomen very small and completely hidden by the posterior lobes of the body. Oviferous tubes rather stout, about twice as long as the body.

Length of body, 5mm.; breadth, 3mm.; length of oviferous tubes, 9mm.

*Hab.* Found on the gills and abdominal wall of the red cod—*Lotella bacchus*—apparently not uncommon.

Fam. LERNÆOPODIDÆ.

Genus **Lernæopoda**, Kroyer.

Head short and thick, not very distinctly separated from the rest of the body. Thorax not showing any distinct segmentation; genital segment narrow, sac-like. Antennæ of first pair small, springing within the hook-like second pair. Mouth produced into a short but prominent proboscis, on each side of which the free palps of the maxillæ are seen. Foot-jaws of first pair in form of hooked claws. Those of second pair produced under the head in the form of two long arms, which are joined at the extremity into a disc, by means of which the animal anchors itself firmly in the tissues of the host on which it lives. Legs quite wanting. Oviferous sacs nearly or quite straight.

1. *Lernæopoda musteli*, n. sp. Plate XXVIII., figs. 9 and 9a.

Head rather small, about one-fourth as long as the body, ovoid in form, considerably longer than broad, and somewhat arched forward. The succeeding segments of the thorax form a very short and indistinct neck, below which is the large, sac-like, elongated, and smooth genital segment. The arms are rather stout at the base, but taper towards their extremity, which ends in a very small attachment-disc; they are considerably longer than the genital segment, and protrude from below the front of the head, so as to make a very acute angle with the rest of the body. Mouth-organs very indistinctly made out. External ovaries rather stout, as long as or longer than the genital segment. Abdominal lobes short, about one-sixth of the length of the segment preceding them.

Total length of the body alone, 5mm.; with the oviferous tubes, 9mm.

*Hab.* A single specimen taken from the cloaca of the smooth-hound—*Mustelus antarcticus*. (Otago Museum.)

Genus **Brachiella**, Cuvier.

This genus is distinguished from the preceding (and the whole group to which it belongs) in having the cephalo-



thoracic part of the body thin, elongated, and somewhat worm-like. The head therefore seems placed at the end of a long neck. The mouth is at the extremity of this neck, and is formed of a conical rostrum or proboscis, at the sides of which are the free maxillary palpi. The antennæ of the first pair are indistinctly recognizable; those of the second pair are produced as more or less hooked organs at the sides of the rostrum. Behind these are placed the hooked foot-jaws of the first pair. The arm-like second pair are free up to the point and rather long. The genital segment is thick and bag-like, and either oval or quadrate in form. It bears one or two pairs of tube-like posterior lobes or appendages. The oviferous tubes are considerably elongated.

1. *Brachiella parkeri*, n. sp. Plate XXVIII., fig. 8, *a* and *b*.

Head and thorax rather stout, about 2mm. in diameter and 8mm. long, forming a nearly-continuous line with the arm-like appendages, and bent at right angles to the genital segment. Rostrum long and conical, considerably exceeding the antennæ. The latter organs end in a rounded lobe, and have a small pointed joint protruding near their outer extremity. The maxillary palps are 2-jointed, and are directed backwards and outwards. About 3mm. from the extremity of the cephalothorax stand a pair of conical protuberances which show no distinct segmentation: these probably represent the foot-jaws of the first pair. The arms (modified foot-jaws of the second pair) are 17mm. long, and end in a large dark-coloured disc about 3mm. in diameter. The genital segment is pyriform and slightly compressed in shape, being about 11mm. long, 7mm. broad, and 5mm. deep from back to front. At its base and on each side of the anal papillæ two long, narrow, terete appendages about 10mm. long project downwards. The oviferous tubes are long and tolerably straight.

The total length of the animal from the bend of the thorax to the extremity of the oviferous tubes is 33mm.; that of the tubes alone is 21mm.

*Hab.* Found on the gills of the skate (*Raja nasuta*), and of a stingaree, *Trygon* sp. (Otago Museum.)

I have named the species after Professor T. J. Parker, to whom I am indebted for much of the material referred to in the paper.

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It is evident from the list of the fishes from which the foregoing species of parasites were taken that the kinds which are chiefly brought into the various markets by fishermen have hardly yet been examined with the object of ascertaining what



parasites are found on them. I have myself only gathered a few specimens, but a glance at the appended list shows that it is only those kinds of fish which, from their rarity, size, or peculiarity, are collected for museums which have furnished the material examined by me. A close examination of the food-fishes exposed for sale would certainly yield many other kinds of parasitic *Copepoda*, and the present paper may be considered as only an introduction to the subject, showing what is now known.

Host.	Parasite.
Sword-fish ( <i>Histiophorus herschelii</i> ) ..	{ <i>Lepeophtheirus huttoni</i> . <i>Penella histiophori</i> .
Sword-fish ( <i>Xiphius gladius</i> ) ..	{ <i>Philichthys xiphiæ</i> .
Blue cod ( <i>Percis colias</i> ) ..	{ <i>Lernanthropus percis</i> .
Red cod ( <i>Lotella bacchus</i> ) ..	{ <i>Lerneæ lotellæ</i> .
Ling ( <i>Genypterus blacodes</i> ) ..	{ <i>Chondracanthus lotellæ</i> .
Porcupine-fish ( <i>Chilomycterus jaculiferus</i> )	{ <i>Lestaira kroyeri</i> . <i>Chondracanthus genypteri</i> .
Sun-fish ( <i>Orthogoriscus molæ</i> ) ..	{ <i>Chondracanthus chilomycteri</i> . <i>Cecrops latreillii</i> .
Smooth-hound ( <i>Mustelus antarcticus</i> ) ..	{ <i>Lernæopoda musteli</i> .
Porbeagle shark ( <i>Lamna cornubica</i> ) ..	{ <i>Anthosoma crassum</i> .
White shark ( <i>Carcharodon rondeletii</i> ) ..	{ <i>Dinematura carcharodonti</i> . <i>Nogagus elongatus</i> .
Sharks, species not indicated ..	{ <i>Nogagus validus</i> . <i>Dinematura hamiltoni</i> .
Skate ( <i>Raja nasuta</i> ) }	{ <i>Echthrogaleus braccatus</i> . <i>Pandarus dentatus</i> .
Stingaree ( <i>Trygon</i> , sp.) }	{ <i>Pandarus brevicaudis</i> . <i>Specilligus curticaudis</i> .
{ Host not specified; probably species of sharks	{ <i>Brachiella parkeri</i> . <i>Dinematura affinis</i> .
	{ <i>Dinematura neo-zealanica</i> . <i>Pandarus armatus</i> .

## EXPLANATION OF PLATES.

## PLATE XXV.

- Fig. 1. *Dinematura hamiltoni*, male,  $\times 8$ : *a*, anterior antenna,  $\times 10$ ; *b*, posterior antenna,  $\times 23$ ; *c*, oral proboscis,  $\times 23$ ; *d*, mandible,  $\times 50$ , and extremity of same showing the saw-like teeth,  $\times 150$ ; *e*, first foot-jaw,  $\times 23$ ; *f*, foot of 1st pair,  $\times 23$ ; *g*, foot of 2nd pair,  $\times 23$ ; *h*, foot of 4th pair (male),  $\times 18$ ; *i*, foot of 4th pair (female),  $\times 8$ ; *j*, caudal lamellæ,  $\times 8$ .
- Fig. 2. *Dinematura neo-zealanica*, male,  $\times 8$ : *a*, female,  $\times 8$ ; *b*, anterior antenna,  $\times 20$ ; *c*, posterior antenna,  $\times 20$ ; *d*, 1st foot-jaw,  $\times 20$ ; *e*, foot of 4th pair (female),  $\times 20$ .



## PLATE XXVI.

- Fig. 1. *Dinematura neo-zealanica*, female: *a*, foot of 1st pair,  $\times 23$ ; *b*, foot of 2nd pair,  $\times 23$ ; *c*, foot of 4th pair (male),  $\times 23$ ; *d*, abdomen (fem.) from under-side,  $\times 8$ .
- Fig. 2. *Dinematura carcharodonti*, female, seen from above,  $\times 3$ : *a*, 1st foot-jaw,  $\times 8$ ; *b*, foot of 1st pair,  $\times 23$ ; *c*, foot of 2nd pair,  $\times 8$ ; *d*, foot of 4th pair,  $\times 8$ .
- Fig. 3. *Cecrops latreillii*, female,  $\times 2$ : *a*, dorsal aspect; *b*, ventral aspect; *c*, foot of 1st pair,  $\times 23$ ; *d*, foot of 2nd pair,  $\times 23$ ; *e*, foot of 3rd pair,  $\times 23$ ; *f*, foot of 4th pair,  $\times 8$ .

## PLATE XXVII.

- Fig. 1. *Pandarus armatus*: *a*, female, dorsal aspect,  $\times 4$ ; *b*, female, ventral aspect,  $\times 4$ ; *c*, male, dorsal aspect,  $\times 6$ ; *d*, foot of 1st pair,  $\times 40$ ; *e*, foot of 2nd pair,  $\times 40$ ; *f*, foot of 4th pair, male,  $\times 23$ .
- Fig. 2. *Lernanthropus lotellæ*, female: *a*, animal seen from above,  $\times 7$ ; *b*, ventral aspect,  $\times 7$ ; *c*, posterior antennæ from below,  $\times 26$ ; *d*, 1st foot-jaws,  $\times 26$ ; *e*, extremity,  $\times 80$ ; *f*, 2nd foot-jaws,  $\times 26$ ; *g*, leg of 2nd pair,  $\times 20$ ; *h*, leg of 3rd pair (from the inside),  $\times 13$ ; *i*, under-side of thoracic shield with lamellæ of the 3rd pair of legs removed, showing (*l*) 4th pair of legs, (*ab*) abdomen and (*ov*) oviferous tubes,  $\times 13$ ; *j*, abdomen,  $\times 20$ .
- Fig. 3. *Anthosoma crassum*: 1st foot-jaw,  $\times 20$ .

## PLATE XXVIII.

- Fig. 1. *Philichthys xiphiæ*, female, seen from above,  $\times 2$ .
- Fig. 2. *Penella histiophori*, female, nat. size.
- Fig. 3. *Lernæa lotellæ*, female,  $\times 2$ : *a*, the same species, but a somewhat different form.
- Fig. 4. *Lesteira kroyeri*, female, nat. size: *a*, head of same seen from the front.
- Fig. 5. *Chondracanthus chilomycteri*, female,  $\times 5$ : *a*, anterior antennæ,  $\times 26$ ; *b*, posterior antennæ,  $\times 26$ ; *c*, leg of 1st pair,  $\times 26$ ; *d*, leg of 2nd pair,  $\times 26$ .
- Fig. 6. *Chondracanthus genypteri*, female,  $\times 4$ : *a*, same in lateral aspect,  $\times 4$ .
- Fig. 7. *Chondracanthus lotellæ*, female,  $\times 3$ : *a*, same in lateral aspect,  $\times 3$ .
- Fig. 8. *Brachiella parkeri*, female, nat. size: *a*, mouth-organs,  $\times 26$  (*r*, rostrum; *an*, antennæ; *p*, maxillary palpi); *b*, conical protuberances representing first foot-jaws.
- Fig. 9. *Lernæopoda musteli*, female,  $\times 2$ : *a*, mouth-organs,  $\times 26$ .
- Fig. 10. *Lepeophtheirus huttoni*: *a*, leg of 1st pair,  $\times 26$ ; *b*, extremity of last joint of same,  $\times 56$ ; *c*, leg of 4th pair,  $\times 26$ .

## PLATE XXIX.

- Fig. 1. *Lepeophtheirus huttoni*: *a*, male, dorsal aspect,  $\times 7$ ; *b*, female, ventral aspect,  $\times 7$ ; *c*, antenna of 1st pair,  $\times 26$ ; *d*, antenna of 2nd pair,  $\times 26$ ; *e*, oral proboscis,  $\times 56$ ; *f*, extremity of mandibles,  $\times 26$ ; *g*, foot-jaw of 1st pair; *h*, foot-jaw of 2nd pair; *i*, sternal fork,  $\times 26$ ; *j*, foot of 2nd pair,  $\times 26$ ; *k*, foot of 3rd pair; *l*, lamella of last thoracic segment,  $\times 26$ ; *m*, abdomen,  $\times 26$ .





Thomson, George Malcolm. 1890. "Parasitic Copepoda of New Zealand, with descriptions of new species." *Transactions and proceedings of the New Zealand Institute* 22, 353–376.

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