

THE
TRANSACTIONS
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ON THE NEW ZEALAND PHYLLOBRANCHIATE
CRUSTACEA-MACRURA.

BY
GEORGE M. THOMSON, F.L.S.



INVERTEBRATE
ZOOLOGY
Crustacea

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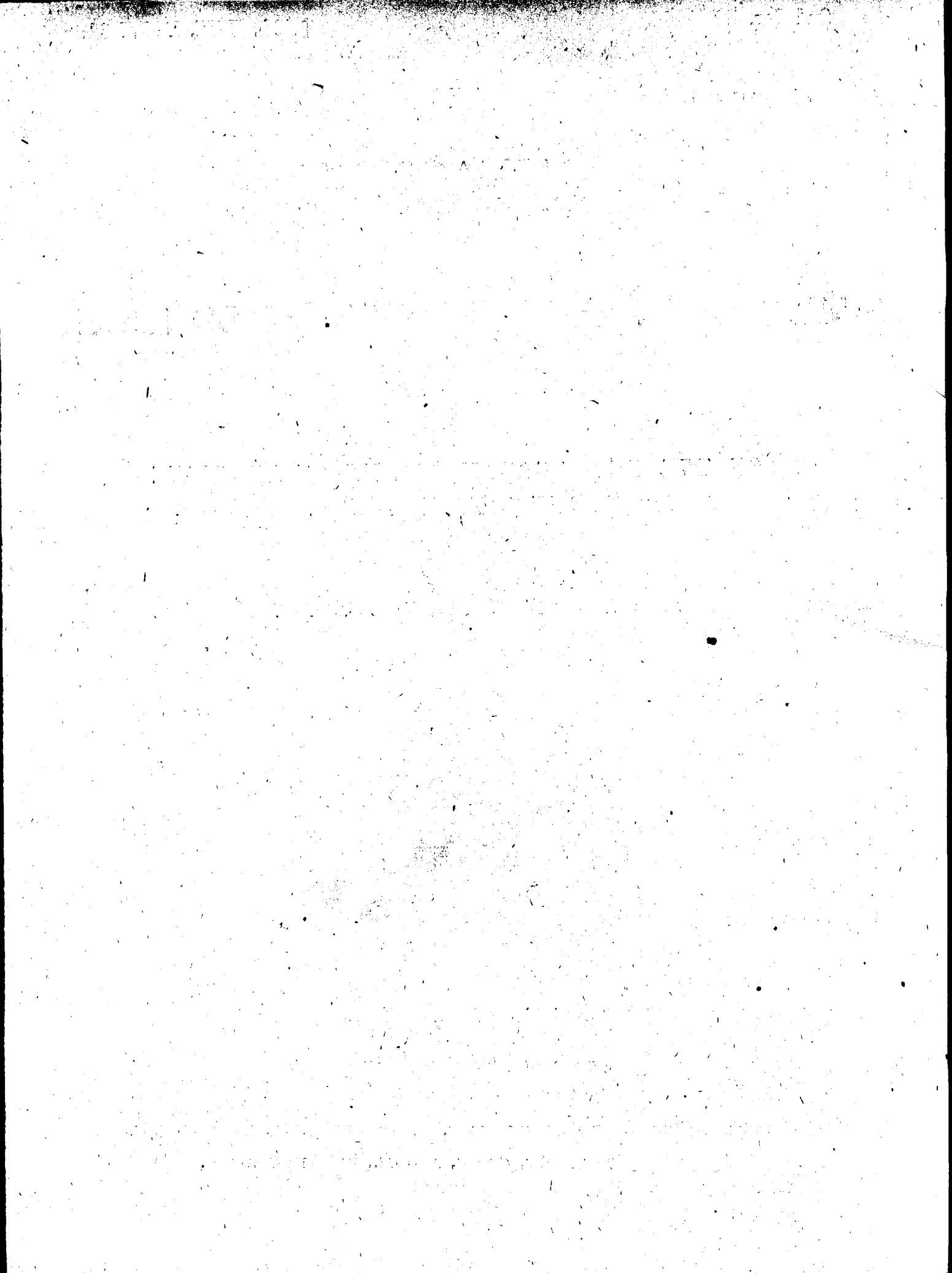
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[433]

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XI. *On the New Zealand Phyllobranchiate Crustacea-Macrura.*
By GEORGE M. THOMSON, F.L.S.

(Plates 27-29.)

Read 17th April, 1902.

THE proposed publication of a biographical census of the New Zealand Fauna makes it desirable to supervise many groups of animals, the members of which have been imperfectly described and in many cases incorrectly named. No groups have suffered more in this respect than the Crustacea, and, as a small contribution to our knowledge of this part of the fauna, I have lately been examining the Prawns and Shrimps of these islands, and find that very considerable revision is required in order to classify them correctly.

In Miers's 'Catalogue of the New Zealand Crustacea,' published in 1876, a summary of the then known species was given. Twelve species of Phyllobranchiate Macrura are there briefly described, but some of these are doubtful or incorrect. *Rhynchocinetes typus*, a species stated to be found also on the coasts of Australia and Chile, is introduced into the list of New Zealand species on the authority of British Museum specimens. Haswell also introduces it into the list of Australian Crustacea, apparently taking his description from Miers's Catalogue. No collector has, so far as I know, met with this species in this Colony, nor does it occur in any of the various local museums. I think, therefore, that its inclusion in our fauna is a mistake. I have recently received specimens of this very distinct and beautiful species from Mr. David G. Stead, of Sydney.

Again, Heller, in the Crustacea of the 'Novara' (p. 105), describes a Shrimp from Auckland, without any reference to its habitat, as *Caridina curvirostris*. This turns out to be the same as my *Leander fluviatilis*; but both names are equally incorrect. The species is found only in fresh water, and belongs to the genus *Xiphocaris*.

The inclusion of *Atya pilipes* in the New Zealand fauna is due to an error, as first suggested by Miers himself, since the species is found in the Mid-Pacific islands, but not in New Zealand. Spence Bate ('Challenger' Report, p. 693) also states that *Atya armata* and *Atya spinipes* occur in New Zealand, but this is probably also an error.

Of the remaining species in Miers's Catalogue, *Alpheus novæ-zealandiæ* was described by him from specimens in the British Museum. This species does not appear to have been met with since, but this only emphasizes the fact that so few examples of the Crustacea occur in our local museums.

The 'Challenger' collections added twelve species, belonging to seven genera, to
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the local fauna, but none of these are represented in our museums. They are all deep-sea species.

The following list includes the names of all the species known up to the present time.

Tribe CRANGONIDEA.

Family CRANGONIDÆ.

Genus 1. PONTOPHILUS, Leach, 1817.

1. PONTOPHILUS AUSTRALIS, G. M. Thomson. (Plate 27. figs. 1-5.)

1879. *Crangon australis*, Hutton, MS.; G. M. Thomson, Trans. N.Z. Inst. vol. xi. p. 231, pl. 10. fig. A 1.

Carapace (fig. 1) about one-third of the length of the animal, the whole surface somewhat rugose with very short hairs, and bearing five irregular longitudinal rows of spines. The rostrum is very short, blunt, and hollowed above, and does not extend beyond the eye-stalks. The eye-sockets are semicircular, their lower limit defined by a sharp spine. The margin then inclines a little forward, and at its lower edge ends in a rather long acute spine; the whole margin is rather setose. On the median line the carapace is slightly ridged and carries two short spines; on each side and behind the orbital spine is a second row of four spines; and on the lower lobe of the carapace are two acute spines, the posterior one at a little distance from the margin. The pleon is nearly smooth. Its second segment is shorter on the dorsal line than the first, but its lower margins are produced both backwards and forwards into rounded broad lobes. The third and fourth are subequal in length; the lateral margins of the fifth are produced posteriorly into a two-spined lobe. The sixth segment is two-ridged above, and ends on the sides in a three-spined process. The telson reaches to the extremity of the tail-fan; it is narrow and tapering, its margins are fringed with setæ, and it ends in three minute teeth and a number of plumose hairs.

The eye-stalks are short, stout, and blunt; the eyes are reniform.

The first antennæ (fig. 2) have the broad plate on the outside of their base reaching nearly to the extremity of the first joint; the latter is produced on its outer distal margin; the second and third joints diminish in length; the flagella are short.

The second antennæ have the scaphocerite about twice as long as broad, produced considerably beyond the peduncle, and ending in a strong tooth.

The third maxillipeds are much elongated, extending considerably beyond the plate of the first antennæ. According to Spence Bate ('Challenger' Macrura, p. 482), the dactylos and propodos are wanting in the members of this family; while Stebbing (South African Crust. p. 47) says: "in the third maxillipeds it is clear that the geniculation occurs between the fourth and fifth joints, and in all probability the sixth, which is much longer than the fifth, represents a coalescence of the sixth and seventh joints." In this

species (fig. 3) the basal joint bears a short appendage (basecphysis) not reaching to the extremity of the meros. The ischium is very short and almost completely merged into the next joint, the meros. The carpus is about half as long; while the terminal joint is again elongated, bearing a few spines on the lower margin among the numerous hairs, and ending in two very short spines.

The first pair of pereopoda have the meros (fig. 4) keeled on the upper margin and produced into an acute spine, the lower margin being flattened and winged to partially receive the hand when bent inwards. The hand is about three times as long as broad, and its inferior margin ends in a straight spine; the palm is very oblique.

The second pair of pereopoda are very short and feeble, only about half as long as the succeeding pair; both fingers of the slender chelæ are subequal and fringed with hairs.

The third pair are long, very slender, and stiliform, and extend beyond the extremity of the flagella of the first antennæ.

The fourth and fifth pairs are strong, with long and acute dactyla.

The posterior pair of pleopoda (fig. 5) are subequal with the telson; the outer branch has the outer margin terminating in a short subapical tooth; the inner is narrower and rather longer.

The colour is a uniform sandy grey; occasionally the fifth segment of the pleon is coloured dark brown or has patches of brown coloration on it.

The following are the dimensions of a large ovigerous female:—

	mm.
Extreme length	38
Breadth at second segment of carapace	7
Length of carapace	12
„ scaphocerite of first antennæ	6
„ last segment of pleon	5
„ telson	7

Habitat. This is a common species on the New Zealand coasts within the 20-fathom line, as the following list of localities shows:—Dusky Sound, Paterson Inlet (Stewart Island), Otago Harbour, Blueskin Bay, Akaroa, Lyttelton Harbour, and Cook Strait. Also at Napier (*Filhol*).

Distribution. Confined to New Zealand.

2. PONTOPHILUS GRACILIS, Bate.

1888. Bate, 'Challenger' Macrura, p. 487, pl. 87.

Habitat. Off the New Zealand coast, east of Cape Turnagain, in 1100 fathoms.

Distribution. Off Tristan da Cunha, near Torres Straits, and near the Philippine Islands.

Tribe POLYCARPIDEA.

Family PROCESSIDÆ.

Genus 1. GLYPHOCRANGON, A. Milne-Edwards, 1884.

1. GLYPHOCRANGON REGALIS, Bate.

1888. Bate, 'Challenger' Macrura, p. 517, pl. 93. figs. 3 & 4.

Habitat. North of the Kermadec Islands, 600 fathoms.

Distribution. Off Fiji and Banda Islands, at depths of 200 and 315 fathoms.

Family ALPHEIDÆ.

Genus 1. ALPHEUS, Fabricius, 1798.

1. ALPHEUS SOCIALIS (Heller). (Plate 27. figs. 6-12.)

1865. Heller, Voy. 'Novara,' Crust. p. 106, pl. 10. fig. 1.

1876. Miers, Cat. N.Z. Crust. p. 82.

The carapace is produced into a very short acute rostrum, the lower margin of which is straight; over each orbit it is produced into a rounded lobe which ends in a minute spine; the posterior margin is straight on the dorsal portion, but on the sides is slightly produced backwards; in length it is barely one-third as long as the body.

The first antennæ have the basal scale about as long as the first joint of the peduncle; it is broad and flat above, and the basal portion of its outer margin is finely serrated; the second joint of the peduncle is twice as long as the first. The outer flagellum is stouter than, but less than half the length of, the inner (which is about two-thirds as long as the animal), and tends to divide into two at the apex.

The second antennæ have the basal scale reaching to the extremity of the peduncle of the first pair; the basal spine is about half as long and very acute; the flagellum nearly as long as the body.

The first pereopoda are very unequal, the left being the largest in all my specimens. In the largest specimens the propodos of the left limb has the upper and lower margins nearly parallel, the upper having a narrow groove or channel, while the lower is transversely rugose; the dactylos is strongly curved and bent outwardly, while on the inner side it is furnished with a stout blunt tooth. In smaller ovigerous specimens the dactylos is rounded and less claw-like, as if it had lost its chelate function (fig. 9). At the hinge of the dactylos and propodos the opposing surfaces are flat and circular. In the right limb the dactylos is about half as long as the propodos, is well developed, and slightly curved; the inner faces of the claw are densely fringed with hairs.

The second pereopoda are considerably longer than the succeeding pair. The three

following pairs have the propoda (fig. 10) furnished with numerous spines on the lower margin, and the dactyla with a strong inner tooth.

The last pair of pleopoda have the inner branch evenly rounded; the outer (fig. 12) crossed near the extremity by a strong diæresis, the outer margin of which carries a strong spine.

The telson (fig. 11) bears two spines on its upper surface near each margin; its truncate and slightly rounded apex is about half as wide as the base, and ends in a fringe of setæ.

The following are the dimensions of a large male:—

	mm.
*Entire length	48
Length of carapace	15
Depth of carapace	10
Length of pleon	24
„ 1st pereopod (left)	37
„ propodos of same	22
„ dactylos of same	8
„ 1st pereopod (right)	34
„ propodos of same	18
„ dactylos	10
„ telson	9

Habitat. This species occurs fairly commonly in the North Island, and as far south as Cook Strait and Tasman Bay. I have specimens from the following localities:—Waiwera, Auckland, Hauraki Gulf (*L. F. Ayson*), Moko Hinau (*Sandager*), Portland Island (*Robson*), Wellington Harbour (*Farquhar*), and Tasman Bay, Nelson. I have never obtained any specimens from the east coast of the South Island, the waters of this part being more or less cooled by an Antarctic current, and *Alpheus* being apparently a genus which loves the warmer seas.

Distribution. Australia.

Mature specimens sent me from Port Phillip by Mr. S. W. Fulton, and which are not more than an inch (25 mm.) long, agree in nearly all details with the above, only the large left hand is like those of my smaller specimens in having the rounded dactylos, the supraorbital spines are much more produced (fig. 8), and the extremity of the telson is somewhat more rounded.

In the ‘Challenger’ *Macrura* (p. 540), Spence Bate gives a list of species of *Alpheus*, and refers *A. socialis* to Australia, and *A. chiragicus*, M.-Edw., and *A. novæ-zealandiæ*, Miers, to New Zealand. According to M.-Edwards (*Hist. Nat. Crust.* vol. ii. p. 354), *A. chiragicus* occurs in the seas of Asia, and I have seen no subsequent reference to its occurrence in New Zealand. From the brief description given by M.-Edwards it is a distinct enough species.

* In all the rostrum-bearing species, I have measured the length from the point of the rostrum to the apex of the telson.

2. *ALPHEUS NOVÆ-ZEALANDIÆ*, Miers.

1876. Miers, Ann. & Mag. Nat. Hist. ser. 4, xvii. p. 224; Cat. N.Z. Crust. p. 82, pl. 2. fig. 2.

I do not know this species. Miers says it "is distinguished by the absence of spinules on the upper orbital margin, the shorter basal spine of the external antennæ, &c.,"—characters almost too indeterminate to found a specific distinction upon.

Genus 2. *BETÆUS*, Dana, 1852.

It is difficult to find a definite character on which to base the generic distinction between *Betæus* and *Alpheus*. The two points emphasized by Dana are the absence of a rostrum and the inverted position of the propodos of the first pereopods. But Stimpson gives as the principal character of the Australian *B. trispinosus*, "front with a long needle-like rostrum, and armed with two acute orbital teeth, which are half the length of the rostrum." In our New Zealand species these orbital teeth are present, though small, and are not on the margin of the carapace, but on the front of the eyes. The twisting of the first pereopods, by which the dactylos is on the lower side of the propodos, appears to me to be due to a slight twisting of all three joints—the meros, carpos, and especially the propodos.

The ova, as pointed out by Spence Bate (Chall. Macr. p. 564), are much larger and more oval than the small spherical ova of *Alpheus*. The only New Zealand species appears to be very distinct. Spence Bate, considering a mutilated specimen of an Australian species, *B. microstylus*, was inclined to assign it to *B. æquimanus*, but his figures are conclusive against this identification.

1. *BETÆUS ÆQUIMANUS*, Dana. (Plate 28. figs. 1, 2.)

1852. Dana, U.S. Explor. Exped. xiii., Crust. part i. p. 560, pl. 35. fig. 11.

1876. Miers, Cat. N.Z. Crust. p. 83.

The front of the carapace is notched about as deep as the eye-sockets (fig. 1), above which it rises slightly, and is again slightly notched beneath them; its antero-inferior angle is rounded. The posterior margin is somewhat convex and acutely notched on each side of the dorsal surface, the postero-lateral portions being produced backwards into a rounded lobe which lies *under* the first segment of the pleon.

The second segment of the pleon has the sides greatly produced both forwards and backwards.

The telson (fig. 2) is wedge-shaped, its apex ending in a blunt tooth on each side, with a somewhat rounded portion between, bearing a row of plumose setæ.

The ophthalmopods are short, depressed, and slightly projecting from under the front of the carapace; the eyes are nearly circular, and occupy the greater portion of their upper surface. In front they are produced into a small spinule.

The first antennæ have the joints of the peduncle subequal in length and diameter, the first being slightly the longest. The basal scale reaches to the extremity of the second joint. The outer short flagellum shows the normal tendency to divide into two at the apex.

The second antennæ have the peduncle only slightly exceeding that of the first pair. The basal joint is produced into a short triangular lobe on the lower margin; the scaphocerite reaches nearly to the end of the peduncle, and its outer spine is short. The flagella are thick and tapering, and though I have not been able to observe the movement, I am inclined to think they help the animal to spring.

The third maxillipeds are slender, and do not reach to the extremity of the peduncle of the first antennæ.

The first pereopoda are not very strongly developed and are subequal in form; the triangular carpos is produced on its lower side into a rounded lobe; the propodos is about as long as the rest of the limb and slightly curved at its extremity; the dactylos is short and curved, and, as well as the opposed pollex, is somewhat hairy at the tip.

The second pereopoda are normally long and slender; the carpos is 5-jointed, the three middle joints being together equal to the first and last in length.

The succeeding pereopoda are very strong and stout, and are used for walking over the rocks and among the weed in which this species is found; the third pair are the strongest.

The pleopoda have short, broad, foliaceous branches, except the first pair, which have one of the branches long and slender, and the other rudimentary.

The last pair, forming the tail-fan, are nearly twice as long as the telson, and the plates are broad and spreading; the outer is divided by a distinct diæresis into two nearly equal parts, the upper margin ending in a strong spine; the inner is ovate in form, and ends in two strong spines.

The integument is somewhat rough with harsh points, especially on the limbs, and these are rather hard and brittle, as is so often the case with shore species.

The colour appears to be dependent on the surroundings. The specimens from Stewart Island, taken under stones, were of a uniform brownish-red colour; those from Moeraki, caught on the seaweed, were olive-green.

The normal mode of progression appears to be by walking, but when disturbed the animal escapes by vigorous leaps of a foot or more in length.

The following are the dimensions of a large male:—

	mm.
Entire length	30
Length of carapace	10
„ telson	3
Depth of carapace	5.5
Length of 1st pereopod	10
„ 1st antennæ to end of flagellum	11

Habitat. This species occurs most commonly under stones or among weed between tide-marks, less rarely in rock-pools. It is probably common on the coast. I have it from the Bay of Islands (where Dana's original specimens were collected), Waiwera, Cape Campbell, Moeraki, Dunedin Harbour, Stewart Island, and Chatham Islands (*H. B. Kirk*). Fillhol records it from Cook Strait.

Distribution. Confined to New Zealand.

Family HIPPOLYTIDÆ.

Genus 1. ALOPE, White, 1847.

1847. White, Proc. Zool. Soc. p. 123.

1848. White, Ann. & Mag. Nat. Hist. ser. 2, vol. i. p. 225.

1876. Miers, Cat. N.Z. Crust. p. 84.

Carapace smooth, with a supraorbital spine and a suborbital tooth on each side. Rostrum short, armed with teeth above, and springing from a deep groove.

Ophthalmopoda short, stout; ocellus well developed.

First antennæ short, with two flagella.

Second antennæ with a large scaphocerite and a very long flagellum.

Mandible with shortened cutting-tooth (psalistoma) and a three-jointed palp (synnhipod).

First maxillæ 2-branched; second pair 3-branched, with wide mastigobranchial plate.

First maxillipeds with a 2-lobed mastigobranchia.

Second maxillipeds with a short podobranchial plume.

Third maxillipeds very long and pediform, without any trace of branchiæ.

First pereopoda strong; chelæ well developed.

Second pereopoda very slender, long, and minutely chelate; carpos 7-articulate (or 9-articulate) *.

Third to fifth pereopoda slender, with bifid dactylos.

Telson long and narrow.

The branchial formula is as follows:—

	<i>h</i>	<i>i</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>
Pleurobranchiæ	—	—	1	1	1	1	1
Podobranchia	1	—	—	—	—	—	—
Mastigobranchiæ	—	r	r	r	r	r	r

The mastigobranchiæ are extremely rudimentary, consisting of a minute tubercle with a mere trace of a plume.

Miers placed this genus in the Alpheidæ, but its distinct rostrum, exposed ophthalmopods, mandibles with reduced psalistoma, the symmetrical first pereopods, and narrow tapering telson lead me to include it among the Hippolytidæ.

1. ALOPE PALPALIS, White. (Plate 28. figs. 3–12.)

1847. White, *l. c.*, &c.

1874. Miers, Zool. 'Erebus' & 'Terror,' Crust. p. 4, pl. 4. fig. 1.

The carapace is broad, widening posteriorly; in front it bears a 4-toothed slender rostrum, two teeth being near the point of origin, and two on the distal portion; the lower margin is entire. On each side of the rostrum, and about half its length, stands a

* See specific description, p. 441.

strong acute spine. Below the orbit the front margin is produced into a short tooth. The posterior margin of the carapace is rather deeply hollowed dorsally; the sides are deep.

The pleon is about twice as long as the carapace; its second segment is not very much produced on the sides.

The telson is long and tapering, with a deep groove along the centre; its extremity bears two long spines, with a short one at each side (fig. 4).

The first antennæ (fig. 5) have the basal joint broad and produced on the outer side into a spine which reaches to the middle of the second joint; the inner side bears a small tubercle near its base; the apex of the joint bears a transverse comb of small spinules both above and below. The second and third joints together barely equal the first in length, and the latter bears a very short joint on its outer side, from which springs the short thick flagellum, the inner flagellum being long and slender.

The second antennæ have the peduncle slightly exceeding in length the peduncle of the upper pair. The scaphocerite is long and rather narrow, and is produced into a spine on its outer margin, which is subequal with the peduncle in length. The flagellum is longer than the whole body of the animal.

The mandibles (fig. 6) have a cylindrical molar process, a short and much-reduced cutting-tooth (psalistoma), and a 3-jointed palp (synaphipod).

The first maxillæ (fig. 7) are two-branched, the larger (outer) branch consisting of an obovate plate fringed with setæ.

The second maxilla (fig. 8) is three-branched; the inner branch small, very short, and broad; the second long and plate-like, bifid, and fringed with setæ; the third slender and stiliform; mastigobranchial plate wide, produced both back and front.

The first maxilliped (fig. 9) bears a bilobed mastigobranchial plate, a flat broad basal plate fringed with setæ, a long cylindrical branch, and on the inner side of the latter a smaller more slender branch (ecphysis?).

The second maxillipeds (first gnathopoda of Spence Bate) (fig. 10) have a short broad plate on the inner face of the coxa, and on its outer a short branchial plume; the basos carries a long cylindrical branch fringed towards the extremity with setæ; the ischium and meros are short, broad, and curving round; the carpos is broader than long, and bears a very broad but short propodos fringed with hairs.

The third maxillipeds are long and pediform; the basal joint is furnished with a slender single-jointed branch, and there is no trace of branchiæ on the limb.

The first pereopoda are well developed, and are rough on their outer surface and edges with small spinules; the long triangular meros and the short carpos (which latter ends above, or rather on the outer side, in two or three strong teeth) have deep sockets at their extremities to receive the base of the succeeding joint.

The second pereopoda (fig. 11) are long and slender; the basos is very short, the ischium long and divided into two unequal joints, the meros still longer, and also divided into two joints, the carpos seven-jointed, and the propodos short, with a minute chelate dactylos.

The relative value of the joints of this limb is rather difficult to estimate. If we count

the first four joints as normal, and then regard all those between the fourth and the propodos as forming the carpos, then the latter is nine-jointed. But a glance at the limb itself seems to suggest that this is a forced and not very natural mode of treating it. The normal mode of folding the limb into three parts takes place at what I have assumed to be the distal ends of the ischium and meros respectively. On the other assumption I should describe the ischium and meros as straight, the latter about half as long as the former, the carpos as nine-jointed, first joint about as long as the two preceding, second half as long, remaining seven usually bent at a considerable angle and not quite so long as the first two.

The third to the fifth pereopoda are well developed and diminish in size posteriorly. The dactyla (fig. 12) are strongly toothed below so as to be two-clawed.

A small tubercle projects from the sternum between the bases of the third pereopoda, and a larger keeled protuberance between the bases of the fourth pair. This latter sternal segment is produced posteriorly into two small acute lobes (fig. 3).

The first pleopoda in the males have a stout basal joint longitudinally folded at right angles; the two foliaceous plates are slender and acute, and the outer projects outwardly nearly at right angles to the inner, so as to stick out from the sides of the animal like two minute fans.

The succeeding three pairs of pleopoda have the basal joints rather long and stout, and the foliaceous plates subequal with them in length. The fifth pair are shorter and thicker.

The sixth pair have the foliaceous plates subequal, narrow and rounded at the end, and somewhat exceeding the telson in length.

The dimensions of a male specimen were:—

	mm.
Entire length	77
Length of carapace to extremity of rostrum	25
Depth of carapace	14
Length of rostrum from first dorsal tooth	11
„ pleon	52
„ telson	12
„ first antennæ	28
„ second antennæ	85
„ peduncle of same	12
„ external maxillipeds	54
„ first pereopoda	33
„ second pereopoda	37

Habitat. I have only met with this species in rock-pools from the following localities.—Cape Campbell, Sumner, Moeraki, Otago Heads, and Stewart Island. Filhol also records it from Cook Straits.

Distribution. Australia.

Genus 2. HIPPOLYTE, Leach, 1815.

The generic character, as limited by Spence Bate, is given at length in the 'Challenger' *Macrura*, p. 587.

1. HIPPOLYTE BIFIDIROSTRIS, Miers. (Plate 28. figs. 13-16.)

1876. *Virbius bifidirostris*, Miers, Ann. & Mag. Nat. Hist. ser. 4, xvii. p. 224; Cat. N.Z. Crust. p. 81, pl. 11. fig. 1.

Carapace with a prominent acute spine over the eye-socket, a second subocular spinule on the front margin just between the bases of the two pairs of antennæ, and a third just close to the margin behind the base of the second antenna; infero-anterior angle subacute. Rostrum subequal with or slightly longer than the carapace; upper margin with two teeth placed just above the eyes, and a minute notch at the apex; lower margin with five to seven teeth.

The pleon is sharply bent (in all spirit-specimens) at the extremity of the third segment, the dorsal margin of which is slightly produced and hood-like. The fourth and fifth segments have their inferior margins produced considerably back into rounded and subacute lobes respectively.

The telson is long, narrow, and slender, ending at its slightly rounded apex in a row of small spinules.

The ophthalmopods (fig. 13) are rather elongated, and scarcely dilated towards the extremity; the eyes only occupy about a third of their length.

The first antennæ (fig. 14) have the first joint of the peduncle flattened, and broadened on the inside into a narrow wing which ends in a spine; the basal scale is acute and nearly as long as the first joint of the peduncle. The outer flagellum is short and imperfectly segmented, as seems to be usual in species of this genus.

The second antennæ have the peduncle very short, and the scaphocerite oval and reaching beyond the extremity of the rostrum; the flagellum is very slender and often as long as the entire animal.

The third maxillipeds (fig. 15) are long and stout; the third joint is subequal in length to the fourth and fifth together; the latter terminates in a number of minute spines.

The first pereopoda (fig. 16) are very short and stout; the carpos is produced on its upper margin into a blunt spine; the propodos is subquadrate in form.

The second pereopoda are nearly twice as long as the first pair; the ischium, meros, and carpos are about subequal in length, the latter being three-jointed and having the middle joint the shortest; the propodos is short and straight, with a stout straight dactylos.

The succeeding pairs of pereopoda are long and well developed; the propoda have a few long spinules on their lower margins, while the long straight dactyla are pectinately spined.

The pleopoda are well developed, and the inner branches of the females bear a well-developed process (stylamblys of Spence Bate).

The sixth pair are narrow and rather longer than the telson; the outer one with a two-spined outer margin and a well-developed diæresis.

The dimensions of a mature female were:—

	mm.
Entire length	41
Length of carapace	14
„ rostrum	7
„ sixth segment of pleon	4
„ telson	6
„ first antennæ	28
„ first pereopoda	5
„ second pereopoda	7

Colour. Specimens taken in the trawl outside Otago Harbour were bright green when alive.

Habitat. Kenepuru (*J. McMahon*), Otago Heads, 20 fathoms (trawled); Paterson Inlet, Stewart Island, 10 fathoms (dredged).

Distribution. Confined to New Zealand.

Genus 3. MERHIPPOLYTE, Bate, 1888.

‘Challenger’ Macrura, p. 618.

1. MERHIPPOLYTE SPINIFRONS, M.-Edwards.

1837. *Hippolyte spinifrons*, M.-Edw. Hist. Nat. Crust. ii. p. 377.

1843. *Hippolyte spinifrons*, White, Dieff. N. Z. ii. p. 268.

1876. *Hippolyte spinifrons*, Miers, Cat. N.Z. Crust. p. 80.

1885. *Hippolyte spinifrons*, Filhol, Miss. de l’Ile Campbell, p. 431, pl. 53.

The following is the description given by Filhol (*l. c.* p. 431):—“The smooth carapace bears on its anterior and median portion a very strong spine (rostrum), which reaches beyond the front of the eyes. This spine has on the anterior portion of the upper margin two acute teeth directed forwards. Two much smaller spines are produced on the median line immediately behind the first one. These are reduced and are directed upwards and forwards. Immediately outside of the frontal anterior spine are two other long spines without teeth, which project as far as the space between the two little teeth on the rostrum. The ocular peduncle is completely hidden. The first antennæ have the basal joint rather large, and they bear two flagella, the one long and slender, the other short and strong, and about half as long as the preceding one. The second antennæ have only one flagellum; the outer portion of the upper margin of the basal joint is two-toothed; the palp is moderately enlarged. The first two pairs of feet are slightly developed and of equal length; each of them ends in a small didactyle hand. The second pair is shorter than the third, and its carpos is multiarticulate; it ends in a very small didactyle hand. The third pair of feet is the strongest. The upper margin of the third joint of the last three pairs of feet ends in a small spine; the extremity of the fingers bears on its inferior

margin three or four little tufts of hairs. The third maxillipeds are long, pediform, and rather large; the terminal joint ends in an acute apex. The length from the apex of the frontal spine to the extremity of the telson is 37 mm. The telson is remarkable on account of the triangular form of its apex; it bears three pairs of small spines, of which one is very much reduced and scarcely visible.

"This species, which I collected at low water in the rock-pools, appears to me to be rather abundant. It occurs, without any indication of its habitat in New Zealand, in the collections of the Museum of Paris. The development of the suborbital spines enables it to be recognized at the first glance."

Habitat. Lyall's Bay, Wellington (*Filhol*).

Distribution. Confined to New Zealand.

I have not met with this species.

Spence Bate suggests that *M. orientalis*, one of the 'Challenger' species described by him, and which was taken off New Guinea in 600 fathoms, is the same species.

Genus 4. NAUTICARIS, Bate, 1888.

'Challenger' Macrura, p. 602.

1. NAUTICARIS STEWARTI, G. M. Thomson. (Plate 29. fig. 1.)

1888. *Hippolyte Stewarti*, G. M. Thomson, Trans. N.Z. Inst. xxi. p. 259, pl. 13. fig. 1.

Carapace relatively deep, depth nearly equal to half its length; surface smooth; subocular spine well developed; infero-anterior margin produced into a small spine. Rostrum very acute, about as long as the rest of the carapace; upper margin with six prominent teeth, lower produced deeply and with two acute teeth.

Pleon with the third to the fifth segments produced backwards on their lower margins into acute teeth; sixth segment also produced back into an acute tooth on either side above the lower margin, which bears the characteristic movable spine.

Telson narrow-oval; apex rounded, bearing two spines and a number of slender setæ.

Ophthalmopods short and thick; eyes occupying the slightly dilated upper half.

First antennæ have the basal joint longer than the next two together; stylocerite reaching to extremity of the second joint; inner flagellum not much longer than the peduncle, considerably stouter than the outer.

Second antennæ with a slender peduncle, equalling that of the first pair in length; flagellum ? (missing); scaphocerite twice as long as the peduncle, very narrow and tapering, the spine reaching beyond the foliaceous plate.

The mandibles, maxillæ, and maxillipeds closely resemble the same organs in *N. marionis* as figured by Spence Bate ('Challenger' Macrura, pl. 108).

The pereopoda are similar to those of *N. marionis*. In the second pair the carpos is 14-15-jointed. In the succeeding pairs the claws are all didactyle.

The following are the dimensions of the only specimen:—

	mm.
Length of entire animal	28
„ carapace	10
„ rostrum	5
„ pleon	15
„ third segment of pleon	2·5
„ sixth „ „	2
„ telson	3

Habitat. A solitary specimen was taken by the dredge in Paterson Inlet, Stewart Island, in 10 fathoms.

Distribution. Confined to New Zealand.

This species is so near *N. marionis*, Bate, that I retain it with some hesitation. It differs markedly in the dentition of the rostrum; and although this is a very conspicuous character, yet I am inclined to think that it is a variable feature, and consequently of little value as a specific distinction. Bate describes the telson as bearing three pairs of spinules, rather an unusual feature in the family. My specimen has only the usual two.

The 'Challenger' specimens of *N. marionis* were taken off Marion Island in 69 fathoms, and Prince Edward Island in 140 fathoms, both localities nearly due south of Africa, and off the Falkland Islands in South America in 12 fathoms.

Family PANDALIDÆ.

Genus 1. PLESIONIKA, Bate, 1888.

1. PLESIONIKA SEMILÆVIS, Bate.

1888. Bate, 'Challenger' Macrura, p. 644, pl. 113. fig. 3.

Habitat. Off the Kermadec Islands, 520 fathoms.

Distribution. Philippine Islands, Borneo, Fiji, and east coast of Australia, from 250 to 1200 fathoms.

Genus 2. PANDALUS, Leach, 1817.

1. PANDALUS MAGNOCULUS, Bate.

1888. Bate, 'Challenger' Macrura, p. 667, pl. 115. fig. 1.

Habitat. Stations 166 and 167 in Tasman Sea, west of New Zealand.

Distribution. Confined to New Zealand.

Tribe MONOCARPIDEA.

Family ATYIDÆ.

Genus 1. XIPHOCARIS, von Martens, 1872.

Xiphocaris, von Martens, Arch. f. Naturg. xxxviii. pt. 1, p. 139 (1872).

“Rostrum slender, compressed, dentate, usually long. All the pereopoda slender and with exopodites; carpal joints of first two pairs without a distal excavation, articulating in a normal way with the proximal end of the propodus. Abdomen with sixth segment elongate; telson slender, truncate at tip.” (*Mary J. Rathbun*, ‘The Brachyura and Macrura of Porto Rico,’ p. 118.)

1. XIPHOCARIS CURVIROSTRIS (Heller), G. M. Thomson. (Plate 29. figs. 2-13.)

1865. *Caridina curvirostris*, Heller, Voy. Novara, Crust. p. 105.

1876. *Caridina curvirostris*, Miers, Cat. N.Z. Crust. p. 78.

1879. *Leander fluviatilis*, G. M. Thomson, Trans. N.Z. Inst. vol. xi. p. 231, pl. 10. fig. A 2.

Carapace nearly twice as long as deep, the lower margin curved in towards the body; front furnished with a prominent spine above and another below the eye-socket. Rostrum slender and slightly curved upwards, 11-12-toothed above, beginning as a slight crest on the carapace, with two or three teeth behind the eyes, a central group of four or five in front of the eyes, and three or four small teeth close to the apex; 4-6-toothed below.

Pleon having the second segment greatly dilated in the females, extending forward over the posterior margin of the carapace; fourth and fifth segments with their infero-posterior margins produced back into angular projections, which are more or less fringed with setæ. Sixth segment nearly as long as the fourth and fifth together.

Telson (fig. 3) rather long, narrow, and slightly tapering; on each margin it bears two short spines on its distal half. The extremity is slightly rounded and ends in two very short marginal spines and about six slender short setæ.

The ophthalmopoda are nearly pyriform, the upper half being occupied by the large rounded eye; the peduncle has a minute rounded lobe just at its base on the inner side.

The first antennæ (fig. 4) have the peduncle reaching almost as far as the extremity of the rostrum. The first joint reaches beyond the ophthalmopod, and from the base of its outer margin there projects forward a stout stylocerite, which reaches halfway along the next joint; its outer margin is also somewhat produced. The second joint is shorter than the first, while the third is only about half as long as the second. The flagella are both rather slender, the outer being imperfectly divided into two.

The second antennæ (fig. 5) have a slender peduncle reaching only to the middle of the second joint of that of the first pair; the second joint is produced on its outer margin into a short spine. The scaphocerite is produced along its outer margin into a spine which reaches the extremity of the peduncle of the first antennæ, while the oval-pointed

foliaceous plate is produced considerably beyond it; the flagellum is slender and nearly as long as the body of the animal.

The mandibles (fig. 6) have a very distinct curved molar process and a well-developed four-toothed cutting-plate; there is no palp present.

The first maxillæ (fig. 7) are small, feeble, and three-branched; the outer branch is short, ovate, and bears two fine terminal setæ; the middle one is the largest and broadens distally, its edge being fringed with short spines; the inner is short and has a rounded finely setose edge.

The second maxillæ (fig. 8) consist of two distinct processes: an inner formed by two broad, straight-edged, overlapping plates with a thick fringe of setæ on their edges, and overlapped at their base by two smaller, rounded, fringed plates; the outer process extends forward into a slender, rounded, fringed plate, and backward into a long slender portion ending in long setæ, which lie in the branchial cavity of the body. Between the two main portions of the limb there is produced a very small, slender, and rudimentary one-jointed process, only visible under the microscope.

The first maxillipeds (fig. 9) are two-lobed, the inner lobe being semicircular and fringed on the straight inner edge with numerous setæ, the outer shorter and thinner; between them, and apparently projecting from the basal joint, is a long, slender, slightly flattened process.

The second maxillipeds (fig. 10) have a short podobranchia on the coxal joint, and a long plumose branch (ecphysis) on the basos; the ischium is short, the meros still shorter, while the carpos is dilated into a short fringed plate; the propodos is bent against the preceding joints in the form of a large fringed plate. I can find no trace of a dactylos.

The third maxillipeds (fig. 11) are long and pediform, four-jointed; the short basal joint carries a long exopodite; the next three are long and subequal, the terminal one bearing numerous spines.

The first pereopoda (fig. 12) are comparatively short and stout; the exopodite reaches nearly to the propodos; the carpos is short, broadened at its deeply excavated apex; the stout propodos articulates with it at its lower angle; the dactylos and pollex are thick, spoon-excavate on their inner faces, and furnished with a thick tuft of hairs at their extremities.

The second pereopoda (fig. 13) are considerably longer and more slender than the first pair; the exopodite reaches only to the extremity of the meros; the carpos is long, excavate at the tip, and the propodos, which resembles that of the first pair but is more slender, is also attached to it by its lower angle.

The three posterior pairs are long and nearly unarmed, except for a few spinules on the meros and propodos; the dactyla are simple; each limb bears a well-developed exopodite.

The pleopoda have strongly developed foliaceous plates, and each bears a stylamblys. The sixth pair have the basal joint short, and produced on the outer margin into a tooth; the foliaceous plates are subequal in length, and the outer is crossed by a well-defined diæresis.

The following are the dimensions of a mature female:—

	mm.
Length of entire animal	39
„ carapace	9
„ rostrum	8
„ pleon	22
„ second segment of pleon	5
„ sixth „ „	5
„ telson	6

Habitat. Freshwater streams apparently throughout the Colony. I have it from the neighbourhood of Dunedin, Christchurch, Nelson, and Greymouth, also from the Buller River in the South Island; and from the Waikato and the neighbourhood of Auckland in the North Island.

Distribution. Confined to New Zealand.

This species is distinct from the Australian *X. compressa*, the most conspicuous difference being in the number of spines on the rostrum. While *X. curvirostris* shows only slight variation in this respect, the Australian form is rather variable. Ortmann (Proc. Acad. Philadelphia, 1894, p. 400) states that it has from 20 to 24 teeth on the upper, and from 2 to 4 on the lower margin. But the following figures give the dentition of a number of specimens from different localities, the first figure representing the number of teeth on the upper, and the second the number on the lower margin:—

From Victoria.—(1) 26—2; (2) 14—5, this one had the end broken.

From N. S. Wales.—(1) 31—9; (2) 23—7; (3) 24—6; (4) 24—5; (5) 26—4.

From Norfolk Island.—(1) 31—5; (2) 27—9; (3) 34—7; (4) 25—6; (5) 22—7.

From Norfolk Island.—(1) 22—3; (2) 21—2; (3) 17—3.

The last three belonged to a form smaller than those previously received from Norfolk Island, and having a shorter rostrum. From the above it appears that the dentition of *X. compressa* may be expressed as follows:—Upper margin with 17–34 teeth; lower with 2–9.

It is interesting to notice that while one slightly variable species, *X. compressa*, should range from Australia (including Norfolk Island) to Japan, a quite distinct one, which is also distinct from the American *X. elongata*, occurs in New Zealand.

Family PALÆMONIDÆ.

Genus 1. ACANTHEPHYRA, A. Milne-Edwards, 1881.

1. ACANTHEPHYRA SICA, Bate.

1888. Bate, 'Challenger' Macrura, p. 739, pl. 125. fig. 1.

Habitat. Off Cape Turnagain, 1100 fathoms; off East Cape, 700 fathoms; and off the Kermadec Islands at 520 and 630 fathoms.

Distribution. This species occurs both in the Atlantic and Pacific Oceans, and from Japan in the north to New Zealand in the south, at depths varying from 200 to 2675 fathoms.

2. ACANTHEPHYRA BRACHYTELSONIS, Bate.

1888. Bate, 'Challenger' Macrura, p. 753, pl. 126. fig. 7.

Habitat. Off the Kermadec Islands at depths varying from 200 to 630 fathoms.

Distribution. Seas of Japan, Philippines, Banda, and the Falkland Islands at depths of 200-2040 fathoms.

Genus 2. PALÆMON, Fabricius, 1798.

1. PALÆMON AFFINIS, M.-Edwards.

1837. *Palæmon affinis*, M.-Edw. Hist. Nat. Crust. ii. p. 391.

1852. *Palæmon affinis*, Dana, U.S. Explor. Exped., Crust. p. 584, pl. 38. fig. 5.

1888. *Palæmon affinis*, Bate, 'Challenger' Macrura, p. 782, pl. 128. fig. 5.

1837. *Palæmon Quoianus*, M.-Edw. Hist. Nat. Crust. ii. p. 393.

1843. *Palæmon Quoianus*, White, Dieffenb. Voy. N. Z. ii. p. 268.

1876. *Leander affinis*, Miers, Cat. N.Z. Crust. p. 85.

Bate states (*l. c.* p. 782) that this species is only distinguished from *P. squilla*, Fabr., of Europe, by having the apex of the rostrum bifid, and four teeth instead of three on the under margin. But, as Miers points out, "the number of teeth varies in a large series of specimens, while the bifid appearance is caused by the greater or less approximation of the anterior tooth of the upper series to the apex of the rostrum—also a variable character." And on this ground he unites *P. Quoianus*, M.-Edw., with *P. affinis*, an opinion I quite agree with. I have never, however, found a specimen with only six teeth on the upper margin of the rostrum, and I have examined an immense number from various parts of the Colony. The number varies from seven on the upper and three on the lower to nine and six respectively.

This is the commonest Shrimp in New Zealand, and is the only one I have seen offered for sale in the fish-shops in Dunedin, Christchurch, and Wellington.

Habitat. Stewart Island, dredged, 10 fathoms; east coast of Otago in rock-pools, &c., commonly between tide-marks; Akaroa, Lyttelton, Wellington, Bay of Islands, and Chatham Islands. Filhol (Miss. de l'Ile Campbell, p. 434) records it from Campbell Island.

Distribution. A widespread southern species, found at the Cape of Good Hope, coasts of Australia, Tasmania, and in the Falkland Islands.

2. PALÆMON NATATOR, M.-Edwards.

1837. *Palæmon natator*, M.-Edw. Hist. Nat. Crust. ii. p. 393.

1888. *Palæmon natator*, Bate, 'Challenger' Macrura, p. 784, pl. 128. figs. 6 & 7.

1849. *Leander erratica*, Desmarest, Ann. Soc. Entom. France, ser. 2, vii. p. 87.

1860. *Leander natator*, Stimpson, Proc. Acad. Nat. Sc. Philad. p. 109.

1876. *Leander natator*, Miers, Cat. N.Z. Crust. p. 86.

This species is included by Miers among the New Zealand Crustacea on the authority

of specimens so labelled in the British Museum. I have not met with it, nor does it occur, so far as I am aware, in any of the local museums in the Colony, but, being a pelagic species of very wide distribution, it is probably quite a correct reference. At the same time, Filhol (Miss. de l'Ile Campbell, p. 434) states that Hutton has collected it in the South Island.

Genus 3. BITHYNIS, Philippi, 1860.

1. BITHYNIS ORNATUS, Olivier.

1812. *Palæmon ornatus*, Olivier, Encycl. viii. p. 660.

1837. *Palæmon ornatus*, M.-Edw. Hist. Nat. Crust. ii. p. 396.

1876. *Palæmon ornatus*, Miers, Cat. N.Z. Crust. p. 87.

This is another species of wide distribution in the seas of the southern tropical regions, and is introduced into the list of New Zealand Crustacea on the authority of Heller, who obtained it at Auckland. All Heller's identifications of New Zealand Crustacea are, however, doubtful, as the 'Novara' collections appear to have got mixed up.

I have not heard of its being found at any other part of the Colony, nor does it seem to occur in the museum collections as a local species.

Genus 4. BRACHYCARPUS, Bate, 1888.

1. BRACHYCARPUS AUDOUINI, Bate.

1888. Bate, 'Challenger' Macrura, p. 798, pl. 129. fig. 5.

This species is fully described by Bate from a single female specimen, but it is apparently common in shallow waters round the coasts. The number of teeth in the rostrum varies from eight to nine in the upper, and from four to six in the lower margin. When alive, the body of the animal is nearly transparent, the hepatic region being green. On placing the specimens in alcohol the green turns to a bright red, and numerous red star-like spots also appear on the bases of the limbs, the colours dying out after a day or two.

Habitat. Cook Strait, 10 fathoms ('Challenger' Exped.); Tasman and Blueskin Bays, 10 fathoms, trawled.

Distribution. Confined to New Zealand.

Family NEMATOCARCINIDÆ.

Genus 1. NEMATOCARCINUS, A. Milne-Edwards, 1884.

1. NEMATOCARCINUS UNDULATIPES, Bate.

1888. Bate, 'Challenger' Macrura, p. 801, pl. 130.

Habitat. North of the Kermadec Islands, 600 fathoms.

Distribution. Philippines and Banda Islands.

2. NEMATOCARCINUS GRACILIS, Bate.

1888. Bate, 'Challenger' *Macrura*, p. 815, pl. 132. fig. 8.

Habitat. North of the Kermadec Islands, 600 fathoms.

Distribution. Fiji Islands, 610 fathoms.

3. NEMATOCARCINUS SERRATUS, Bate.

1888. Bate, 'Challenger' *Macrura*, p. 819, pl. 132. fig. 11.

Habitat. Off East Cape, 700 fathoms.

This species is described from a solitary specimen. Bate says (*l. c.* p. 820), "associated with *Acantheephyra purpurea*"; but this is evidently a slip instead of *A. sica*, as the former species is found only in the Atlantic Ocean, whereas *A. sica* was trawled at the above locality.

4. NEMATOCARCINUS HIATUS, Bate.

1888. Bate, 'Challenger' *Macrura*, p. 821, pl. 132. fig. 12.

This species was constituted on a fragmentary specimen.

Habitat. Off East Cape, 700 fathoms.

Family STYLODACTYLIDÆ.

Genus 1. STYLODACTYLUS, A. Milne-Edwards, 1883.

1. STYLODACTYLUS DISCISSIPES, Bate.

1888. Bate, 'Challenger' *Macrura*, p. 851, pl. 138. fig. 1.

Habitat. North of the Kermadec Islands, 600 fathoms. Described from two specimens.

2. STYLODACTYLUS ORIENTALIS, Bate.

1888. Bate, 'Challenger' *Macrura*, p. 854, pl. 138. fig. 2.

Habitat. North of the Kermadec Islands, 600 fathoms. Described from a solitary specimen.

It is worth recording in this paper that, in 1894, the Otago Acclimatisation Society liberated specimens of *Penæus canaliculatus*, Oliv. (obtained from Sydney), in Dunedin Harbour. I made a protest at the time, using as my strongest argument to a utilitarian and unscientific body the waste of money involved in attempting to introduce a tropical species into our cold waters, for the south-east coast of the South Island of New Zealand, as far north as Banks Peninsula, is washed by a cold southerly current. But some fifty specimens were brought over and set free.

Nothing more has been seen of these Prawns, and it is very improbable that any of them have survived. But should this species hereafter be found in New Zealand waters, the fact of their having been introduced will have to be taken into account.

EXPLANATION OF THE PLATES.

PLATE 27.

Figs. 1-5. *Pontophilus australis*.

- | | |
|--|-------------------------|
| Fig. 1. Front of carapace, from above. | Fig. 4. First pereopod. |
| 2. Base of first antenna. | 5. Telson and tail-fan. |
| 3. Third maxilliped. | |

Figs. 6-12. *Alpheus socialis*.

- | | |
|---|--|
| Fig. 6. Part of large male specimen. | Fig. 9. Extremity of first pereopod of small male (from inside). |
| 7. Front of carapace of same. | 10. Extremity of third pereopod. |
| 8. Front of carapace of a specimen from Port Phillip (Australia). | 11. Telson and tail-fan. |
| | 12. Outer plate of last pleopod. |

PLATE 28.

Figs. 1-2. *Betaeus equimanus*.

- | | |
|--------------------------------------|-----------------|
| Fig. 1. Carapace, viewed from above. | Fig. 2. Telson. |
|--------------------------------------|-----------------|

Figs. 3-12. *Alope palpatis*.

- | | |
|---------------------------------------|---------------------------------|
| Fig. 3. Portion of sternum. | Fig. 8. Second maxilla. |
| 4. Telson and sixth pair of pleopods. | 9. First maxilliped. |
| 5. First antenna. | 10. Second maxilliped. |
| 6. Mandible. | 11. Second pereopod. |
| 7. First maxilla. | 12. Dactylos of third pereopod. |

Figs. 13-16. *Hippolyte bifidirostris*.

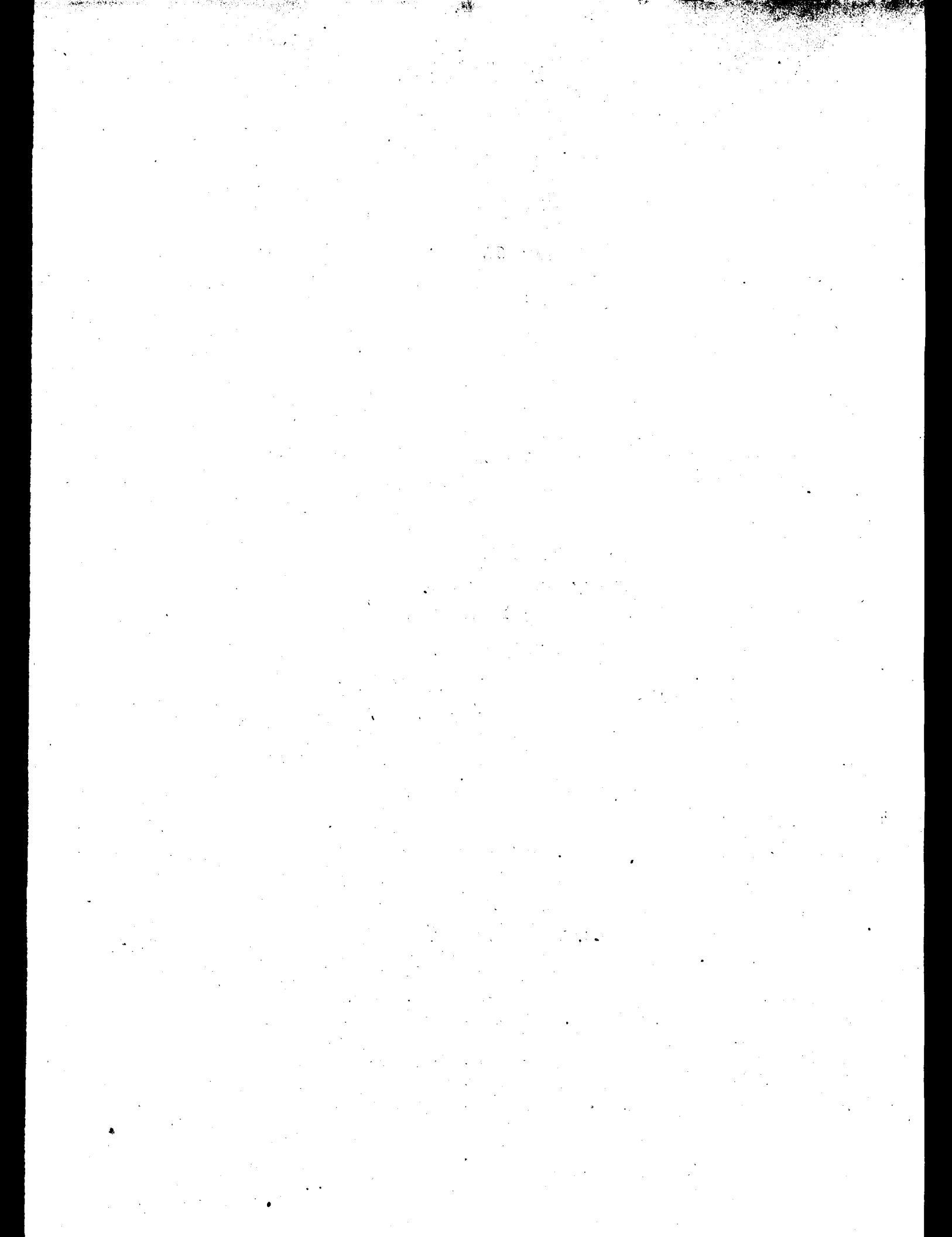
- | | |
|------------------------|----------------------------|
| Fig. 13. Ophthalmopod. | Fig. 15. Third maxilliped. |
| 14. First antenna. | 16. First pereopod. |

PLATE 29.

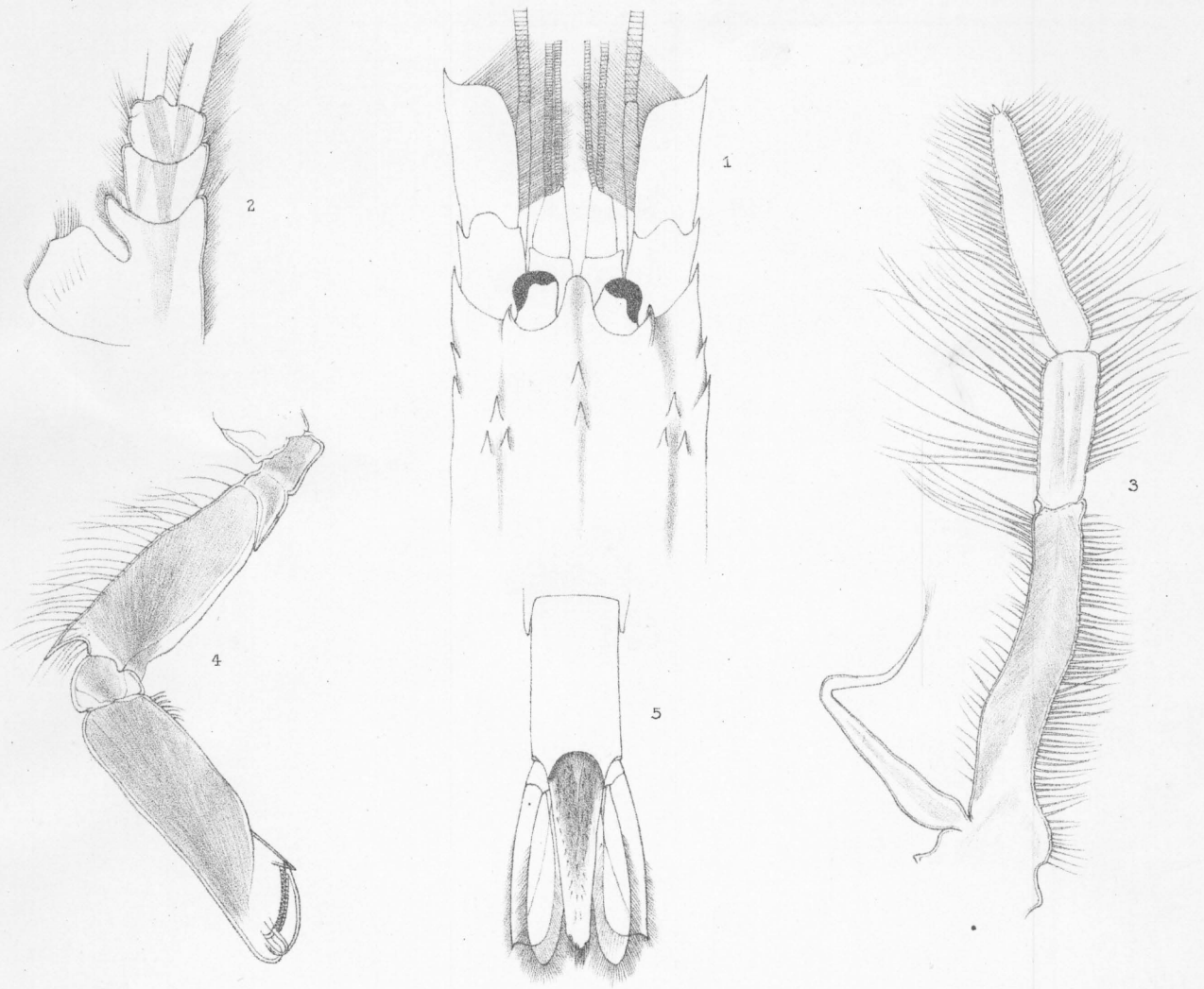
Fig. 1. *Nauticaris Stewarti*.

Figs. 2-13. *Xiphocaris curvirostris*.

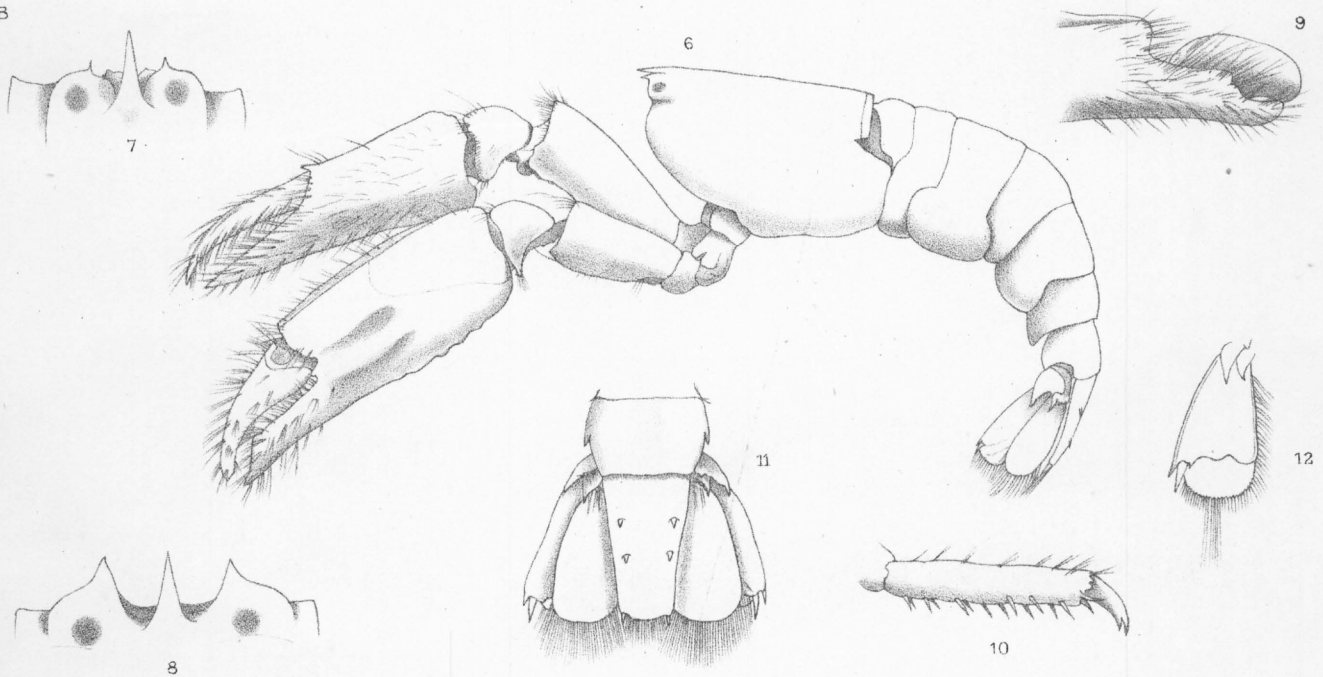
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|--------------------|-------------------------|
| Fig. 2. Side view. | Fig. 8. Second maxilla. |
| 3. Telson. | 9. First maxilliped. |
| 4. First antenna. | 10. Second maxilliped. |
| 5. Second antenna. | 11. Third maxilliped. |
| 6. Mandible. | 12. First pereopod. |
| 7. First maxilla. | 13. Second pereopod. |



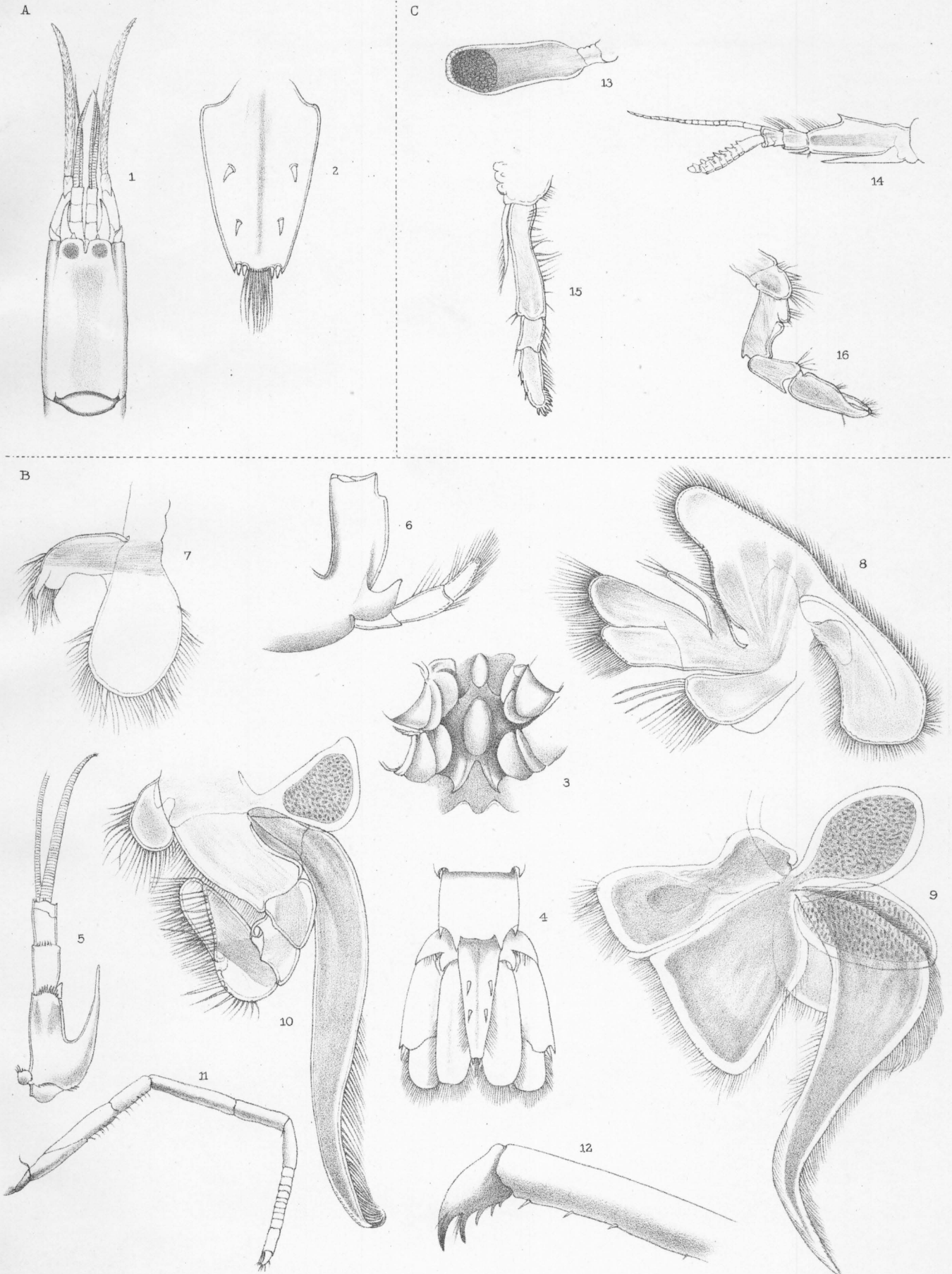
A



B







Del. G.M. Thomson.

A. *BETAEUS AEQUIMANUS*, Dana.
 B. *ALOPE PALPALIS*, White.
 C. *HIPPOLYTE BIFIDIROSTRIS* (Miers).

J.T. RENNIE REID, LITH. EDIN⁹

