

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 152

**The Marine Fauna of New Zealand:
Crustaceans of the Order
Cumacea**

by
N. S. JONES

**New Zealand Oceanographic Institute
Memoir No. 23**

1963



Photo: H. O'Kane

Cone dredge coming aboard during New Zealand Oceanographic Institute investigations in Cook Strait aboard m.v. *Viti*, September 1959. Cumaceans collected during these operations are included in the material described in the present report. Also shown in the photograph are the sieves, release tray, and 2 cu. ft. orange-peel grab, the latter equipped with NZOI pattern trip gear and metal cover plates.

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FOREWORD

SINCE the early nineteenth century there has been continuity of activity in marine biological research in New Zealand. Up to 1900, over 850 papers on the marine zoology of New Zealand had been published. Most of this and later work has appeared as discrete papers, there being relatively few monographic or serial comprehensive treatments of particular taxonomic groups. Despite some substantial contributions in this form, the lack of detailed accounts enabling the ready recognition of species in many other groups has hampered the development of ecological work dependent on such identification.

Since 1955 the N.Z. Oceanographic Institute has been developing a programme of research in benthic ecology in the New Zealand region. The effects of this scarcity of systematic monographs of the marine fauna has been particularly evident. The opportunities that have arisen in the course of sampling programmes have provided additional material for systematic consideration and a number of specialists in systematic groups have interested themselves in working on the New Zealand fauna.

The present work arises from the availability to the author of Cumacean material from a number of New Zealand collections: apart from N.Z. Oceanographic Institute collections, those by Dr Pilgrim and Dr Miller have yielded a considerable number of species. The present work by Dr N. S. Jones stands as a contribution to a series of monographs on the Marine Fauna of New Zealand. As such, it follows that by Dr E. W. Bennett on the "Crustacea Brachyura of New Zealand" recently published in this series of memoirs.

The preliminary technical editing of this manuscript has been carried out by Dr D. E. Hurley. Final editing has been carried out under the supervision of Mr F. E. Studt, Information Bureau, Department of Scientific and Industrial Research.

J. W. BRODIE, Director,
New Zealand Oceanographic Institute,
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The Marine Fauna of New Zealand: Crustaceans of the Order Cumacea

By N. S. JONES,
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Abstract

THE characteristics of the Crustacean order Cumacea are described in a general account which includes a detailed description of their general morphology. The nervous system, eyes, digestive apparatus, circulatory and excretory systems, and genital organs are also described. The development, ecology, parasites, distribution of New Zealand species, phylogenetic affinities and classification of the order are discussed, and collecting methods are suggested.

The systematic section includes keys to the families of Cumacea, and the genera and species at present known from New Zealand. An account of recent material collected in New Zealand waters and of previously described New Zealand species is given, providing a comprehensive account of the New Zealand Cumacean fauna, as at present known.

Five new species belonging to the genera *Leucon* (?), *Eudorella*, *Nannastacus*, *Colurostylis* and *Gynodiastylis* are described and figured.

INTRODUCTION

The first Cumacean from New Zealand waters was described by Thomson (1892). Subsequently important contributions were made by Zimmer (1902) and especially by Calman (1907, 1908, 1911, 1917). Finally, one further species has been described by Jones (1960b).

Nearly all the Cumacea known at present from New Zealand have been collected in very shallow water, and most of them merely as chance occurrences in the course of general faunistic collections or benthos investigations. Thirteen species out of a total of 33 have each been found on only one occasion and seven are known through single specimens. Very few have been collected on the west coast. It is therefore improbable that the number of species known approaches the total actually present. Specialised collecting would no doubt rapidly increase the number of species identified and it is hoped that the publication of a comprehensive account of the known species will encourage the study of the order in New Zealand itself.

Besides the original descriptions in the works mentioned above the volume by Stebbing (1913) in *Das Tierreich* will be found most useful for identification of the species known at the time at which it was written, though his classification has not been generally accepted. Much the best general account of the order is that by Zimmer (1941) in *Bronns Klassen und Ordnungen des Tierreichs* and the general part of the present work is largely drawn from it. Shorter general accounts may be found in Fage (1951a), Lomakina (1958), and in English in Sars (1900) and Calman (1909). The excellent series of papers on the Australian Cumacea by Hale (1928-51) includes descriptions of some species which will probably be found to occur off New Zealand.

The new material has considerably supplemented the work of previous authors whose descriptions and figures have been freely drawn upon in compiling the present systematic account.

ACKNOWLEDGMENTS

I wish to express my thanks to the following institutions and the individuals concerned for supplying me with recently collected material: The Zoology Departments of the Universities of Auckland (Dr M. C. Miller) and Canterbury (Dr R. L. C. Pilgrim); the Dominion Museum, Wellington (Dr J. C. Yaldwyn), and the New Zealand Oceanographic Institute (Dr D. E. Hurley).

Thanks are also due to Mr Cedric Webb, Chief Cartographer, New Zealand Department of

Scientific and Industrial Research, for the lettering and numbering of illustrations.

Collections from Hawke Bay were made during the New Zealand Oceanographic Institute cruises on the Marine Department Fisheries Research Vessel *Ikatere* and on RNZFA *Tui*, and the co-operation of the Marine Department and the Royal New Zealand Navy is gratefully acknowledged. The assistance given by the masters and crews of these two vessels, and of m.v. *Viti*, is greatly appreciated.

GENERAL ACCOUNT

1. Characteristics of the Order

The Cumacea are an order of the sub-class Peracarida of the class Malacostraca. They have a well developed carapace fused dorsally with the first three, or sometimes four, thoracic somites or very rarely with the first six. At the sides the carapace is developed into overhanging folds which usually come together as lappets, known as "pseudorostral lobes", at the front, the whole enclosing with the trunk a branchial cavity. A free telson is often present but it may be fused with the last abdominal somite and apparently absent. The eyes are sessile and, except in a few genera, are coalesced into an unpaired median organ or wholly wanting. The second antennae of the females are rudimentary. The mandible is without a palp. Exopodites are present on varying numbers of the thoracic appendages, usually more in the male than in the female. The first two and the last thoracic appendages always lack exopodites. The first three thoracic appendages are modified as maxillipeds, the first carrying an epipodite modified as a branchial organ. The female has oostegites on thoracic somites 3 to 6. Pleopods are absent in the females, the males having 0, 1, 2, 3, or 5 pairs.

2. External Morphology

The Body

All known species of Cumacea have a characteristic shape as seen from the side owing to the inflated carapace and thoracic somites and the long slender abdomen (fig. 1, 2). The carapace may be compressed laterally, when a mid-dorsal keel is usually present, or occasionally flattened dorso-ventrally. The uropods are characteristically in the shape of a forked tail.

The length of the majority of species is between 1 and 12 mm. A few reach larger sizes, the maximum being about 35 mm. There is usually little difference between the size of the sexes but sometimes one or the other may be a little larger. On the whole the larger species occur in colder waters.

Most species are more or less transparent even when coloured but many are opaque. The colour in life varies from white to red, brown, green or golden, often irregularly distributed in patches of chromatophores. The body is covered with a chitinous epidermis, sometimes strongly calcified and brittle. Its surface is frequently sculptured with grooves, ridges, spines, tubercles or teeth, or carries hairs, and has a fine reticulated, pitted, or scaled appearance. The ornamentation is usually confined to or most conspicuous upon the carapace.

THE CARAPACE is always coalesced with the first three thoracic somites and sometimes with the fourth, and rarely with the fifth and sixth also. At the sides it encloses the branchial cavity. In front each side is produced in the form of a lappet, known as the *pseudorostral lobe*, which usually projects forwards in contact with its fellow to form the *pseudorostrum*, from which emerges the *syphon*, the membranous terminal part of the branchial epipodites of the first maxillipeds. In some genera, including *Schizotrema*, the pseudorostral lobes are separated, as are the branchial syphons, and occupy a lateral position. In others, *Eudorella* and *Eudorellopsis*, they are reflexed and no pseudorostrum is apparent. Below the pseudorostrum the anterior border of the carapace is normally excavated to form the *antennal notch* or *sinus* and this is defined below by the *antero-lateral angle* or *corner*, which may be rounded or obsolete. Behind

the pseudorostral lobes on the dorsum is the bell-shaped *frontal lobe* from which the small *ocular lobe* projects forwards, usually carrying the unpaired eyes. The eyelobe normally persists even when eyeless except where the eyes are separated into two groups as in *Nannastacus*. Behind and to the sides of the frontal lobe are the *branchial regions* with a narrow *cardiac region* between them.

THE FREE THORACIC SOMITES usually have feebly developed epimera but the limit between their tergites and sternites is marked by a longitudinal furrow or ridge. Some of the sternites in some genera carry a mid-ventral projection or *hyposphenum*. The free thoracic somites and carapace together comprise the *cephalothorax*.

THE ABDOMEN OR PLEON consists of six cylindrical somites without a distinct separation between the tergite and sternite. (The Bodotriidae have pleural folds or epimera in the male.) The somites are sometimes articulated by a peg on each side which fits into a corresponding socket on the preceding somite. The abdomen is prolonged by a *telson* which is coalesced with the last somite in three of the families but is free in the remainder. The *anus*, protected by a pair of valves, opens on its lower face.

Between the bases of the antennae on the underside of the front end of the body are two small chitinous plates, the *epistome* (fig. 3), to the front edge of which the first antennae are attached, and behind it the *upper lip* or *labrum*, with the second antennae attached to its sides, sometimes produced forwards as a triangular projection. Epistome and labrum are sometimes not distinctly separated. Behind the labrum is the mouth opening and behind that the *lower lip* (*labium* or *paragnathes* fig. 4). This consists of a chitinous fold attached at its broadened hind end. It is divided into two lobes which project at the front between the distal ends of the mandibles and first maxillae. The inner edge of the front part of each lobe carries a row of hairs or small setae which may extend a little way round the front end. In some genera longer setae in the form of flattened platelets may be present on the point of each lobe (fig. 5).

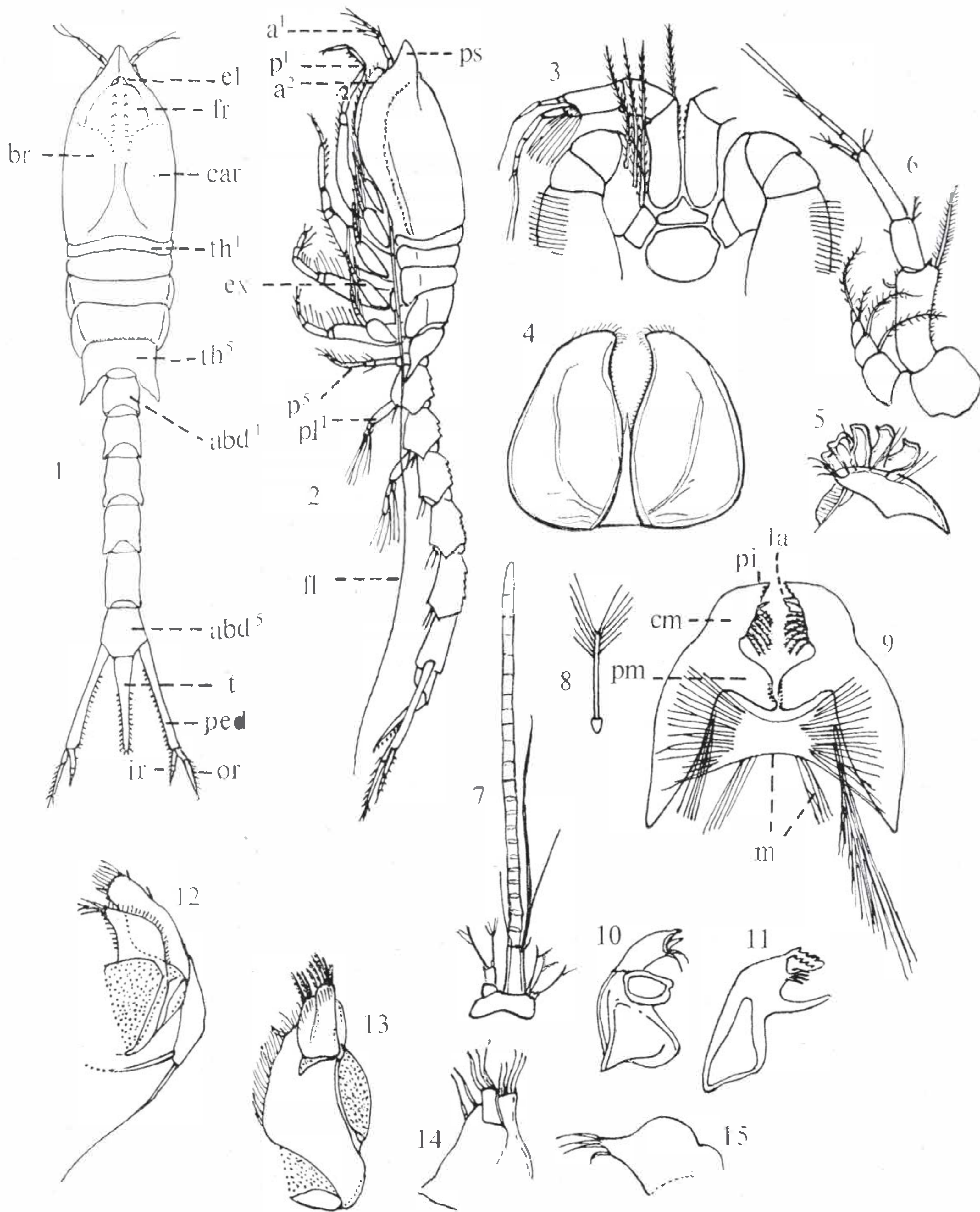
The Appendages

THE FIRST ANTENNAE (ANTENNULAE) (fig. 6) have a three-segmented peduncle and two flagella of which one, the main (outer) flagellum, is usually longer than the other, the accessory (inner)

flagellum. The main flagellum has at the most six segments. The accessory flagellum has up to four segments but frequently only one and it may be wanting. The first antennae bear numerous sensory hairs. The main flagellum carries on its penultimate or two distal most segments one or two specially modified setae of a segmented appearance, known as *aesthetascs* (fig. 7), which are possibly organs of taste or smell. The accessory flagellum carries short unsegmented setae beset distally with fine filaments (fig. 8) which may be organs of hearing. These may also be present on the peduncle and occasionally on the main flagellum. In the males of some species a brush of sensory filaments, similar to the aesthetascs but more slender and unjointed, is present on the first segment, which in this instance is usually swollen, of the main flagellum. Very rarely these filaments are also present on the first segment of the accessory flagellum.

THE SECOND ANTENNAE (ANTENNAE) are rudimentary in the female (fig. 6) but, with one exception known at present, more or less well developed in the male. In the female there are from one to five segments, usually carrying a few plumose setae. In the male there is nearly always a peduncle of five segments and a many-segmented flagellum. The number of segments in the peduncle is occasionally reduced. The distal segment is always the longest. The flagellum normally reaches to the end of the body or beyond it but in a number of genera it is much shortened and in some may be used as an organ for clasping the female. The segments of the flagellum vary in length in different families. The outer sides of the fourth and fifth segments of the peduncle are normally thickly beset with hairs or setae, the first three segments carrying a few plumose setae. At rest, the second antennae are bent backwards between the third and fourth segments of the peduncle and the flagellum is closely applied to the body at the side. Where epimera are well developed on the free thoracic and abdominal somites the flagellum lies below these and in the Nannastacidae it ends in a channel excavated on the lateral surfaces of the abdomen.

THE MANDIBLES are always without a palp. Each is normally boat-shaped, pointed at each end, with a *molar process* or *pars molaris* jutting inwards from it (fig. 9), and is attached to the body by strong muscles inserted into its hinder part. The front end, the *pars incisiva*, is more or less toothed on the inner edge. A *lacinia mobilis* is present on the left mandible only or also as a rudiment on



Figs. 1, 2. *Diastylis rathkei* (Kröyer). Female from above and male from the side. a¹ – first antenna; a² – second antenna; abd¹, abd⁶ – first and sixth abdominal somites; br – branchial region; car – carapace; el – eyelobe; ex – exopodite; fl – flagellum; fr – frontal lobe; ir – inner ramus; or – outer ramus; p¹, p⁵ – first and fifth pereopods; ped – peduncle; pl¹ – first pleopod; ps – pseudorostrum; t – telson; th¹, th⁵ – first and fifth thoracic somites. Fig. 3. *Diastylis glabra* (Zimmer). Male epistome, labrum, first antennae and bases of second antennae. Fig. 4. *Cyclops longicaudata* G.O. Sars. Female labium. Fig. 5. *Iphinoe tenella* G.O. Sars. Female front inner edge of the labium. Fig. 6. *Diastylis rathkei*. Female labrum, first and second antennae. Fig. 7. *Iphinoe tenella*. End of first antenna of female. Fig. 8. *Bodotria arenosa* (Goodsir). Auditory (?) seta. Fig. 9. *Diastylis rathkei*. Mandible. cm – corpus mandibulae; la – lacinia mobilis; m – muscles; pi – pars incisiva; pm – pars molaris. Fig. 10. *Leucon nasica* (Kröyer). Mandible. Fig. 11. *Campylaspis rubicunda* (Lilljeborg). Mandible. Figs. 12, 13. *Diastylis rathkei*. First and second maxillae. Fig. 14. *Campylaspides grandis* Fage. Second maxilla. Fig. 15. *Campylaspis rubicunda*. Second maxilla. (After Fage, 1935, Sars, 1879, 1900, and Zimmer, 1942.)

the right. Between the pars incisiva and the molar process there is normally a row of spines which are feathered on their front edges. The molar process is usually robust and cylindrical with a flattened masticating surface but exceptionally may be styliform and pointed (fig. 11). The posterior end of the mandible in the Leuconidae and some Nannastacidae and Diastylidae is broadened and not drawn out to a point (fig. 10, 11).

THE FIRST MAXILLAE (MAXILLULAE) (fig. 12) lie ventral to the labium. They are flattened with a three-segmented protopodite, the first segment of which is rudimentary but has a well developed endite, the proximal lobe. The second is also rudimentary, and without an endite. The third is narrow where it articulates with the second but broadens without segmentation into an endite, the distal lobe. On its outer side it bears a backwardly directed endopodite, the palp. The two lobes carry at their distal ends a small number of partly feathered, partly toothed spines. The palp is one-segmented and bears usually two but in some species a single seta or filament. Very rarely the palp is rudimentary. It projects into the branchial cavity where it assists in the circulation of water.

THE SECOND MAXILLAE (MAXILLAE) (fig. 13) lie ventral to the first pair. They also consist of a three-segmented protopodite. From the short first segment springs the three- or four-sided lamelliform second segment, with a long row of plumose setae on its inner and front edges. The third segment appears as a strip along the outer edge of the second, with a two-lobed endite at its distal end. On the ends of the two lobes are some stout spines feathered on their inner sides. An exopodite is present as a thin half oval plate on the outer side of the third segment. The second maxillae are very uniform throughout the order with the exception of some genera in the Nannastacidae in which the endite is reduced to one lobe or absent (fig. 14, 15).

THE EIGHT PAIRS OF THORACIC APPENDAGES are all normally seven-segmented. The first three pairs are modified as maxillipeds and the last five as peraeopods. According to Hansen (1925) the segments should be: coxa, basis, preischium, ischium, merus, carpopropodus, and dactylus, but they are usually referred to as coxa, basis, ischium, merus, carpus, propodus, and dactylus. The coxa is very short and fused with the sternite. The ischium is frequently lacking in the first two pairs of maxillipeds and in the second peraeopods. The basis is usually the longest segment and may carry an exopodite on its proximal part, normally of a

peduncle and a flagellum of several segments bearing long plumose setae but this may be reduced to one or two segments. The number of appendages bearing exopodites varies with the species but they are never present on the first and second maxillipeds or the fifth peraeopods. In the female, oostegites are borne on the coxae of the third maxillipeds and the first three pairs of peraeopods. They are lamellar in form and interlock to contain the brood chamber. Rudimentary oostegites are present on the second maxillipeds.

THE FIRST MAXILLIPEDS are short and robust (fig. 16). The short coxa carries a greatly developed epipodite, the *branchial apparatus*. The basis is usually the longest segment. At its inner end it is drawn out into an endite which reaches the end of the merus. The ischium is very short or absent. The merus is of medium length. The carpus is the second longest segment. The propodus is narrower or much narrower than the carpus and is placed on the outer side of the end of the carpus, against which it can be bent back. The inner end may be somewhat drawn out. The dactylus is claw-shaped, short, and nearly always narrower than the propodus. In some Nannastacidae it is in the form of a rounded plate. In *Campylaspis*, the whole appendage is much modified (fig. 18).

The basis carries a row of plumose setae on its distal inner border. The endite has some plumose setae at its end and may also be somewhat serrated; on the outer part of its ventral side there are usually two *retinacula* (fig. 17), flattened hook-shaped setae, which according to Hansen engage behind a chitinous ridge on the endite of the opposite side, holding the distal parts of the bases of the first maxillipeds together. The carpus has on its ventral side near the edge a row of peculiarly shaped setae, which are usually finely or coarsely serrated on their hind edge or lamelliform. The propodus and dactylus usually carry some plumose setae.

The epipodite is made up of a lamellar siphonal part directed forwards and a more or less canoe-shaped branchial part extending backwards. The siphonal part is spear-shaped, stiffened by a ridge. It ends in a lancet which carries a membrane on the inner or on both sides. Together with the pseudorostral lobes the extremities form usually a single but sometimes a pair of tubes, the *siphon*, through which the water leaves the branchial chamber. The branchial part normally carries specially modified lobules or gills, which are finger-shaped or lamelliform. Usually an

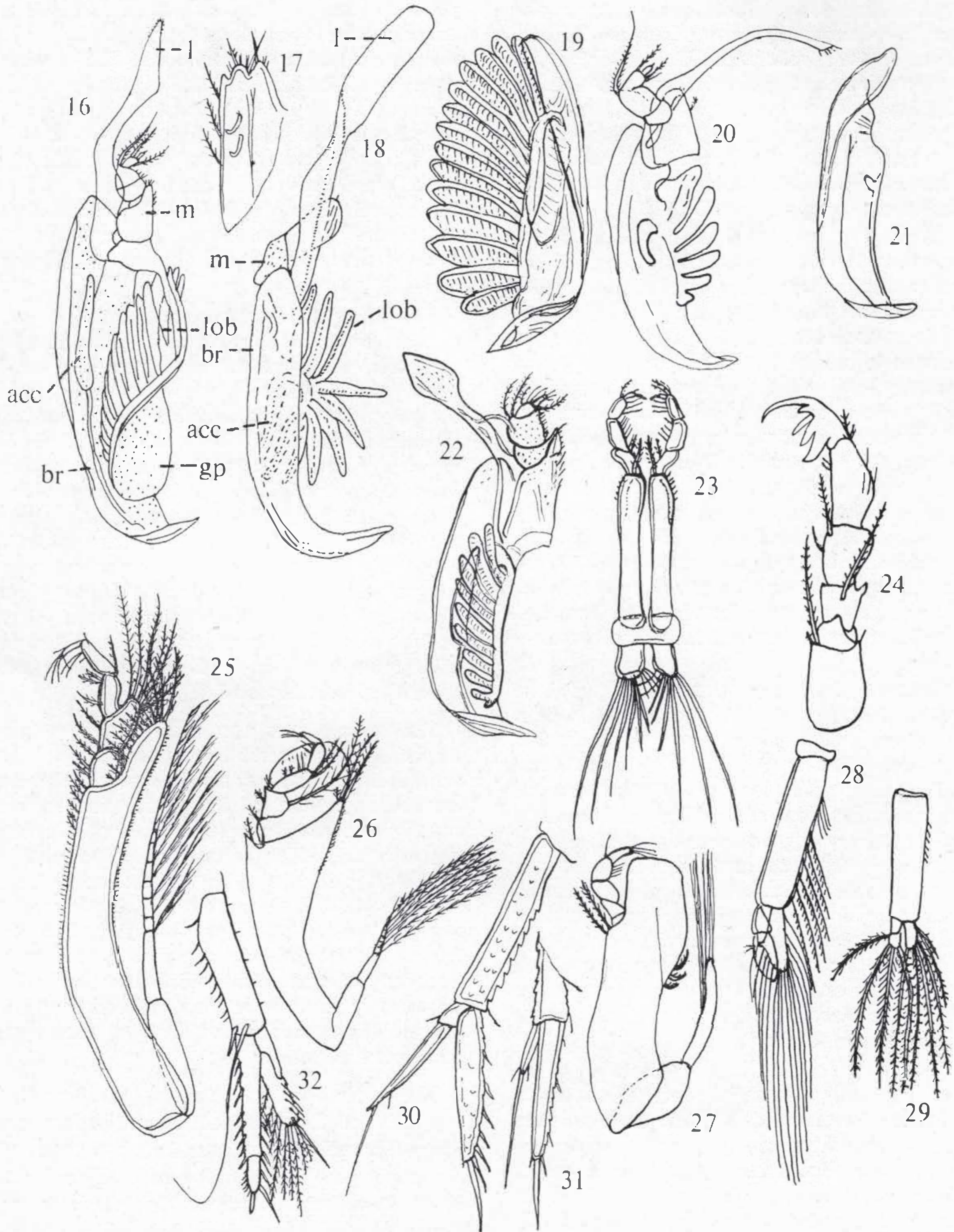


Fig. 16. *Diastylis rathkei*. female first maxilliped. acc – accessory lobule; br – branchial part; g.p. – gill-plate; lob – lobules; m – maxilliped. Fig. 17. *Eudorellopsis deformis* (Kröyer). Endite of the first maxilliped. Fig. 18. *Campylaspis rubicunda*. First maxilliped. Fig. 19. *Bodotria arenosa*. Branchial part of female first maxilliped. Fig. 20. *Eudorella truncatula* (Bate). Female first maxilliped. Fig. 21. *Pseudocuma similis* G.O. Sars. Branchial part of female first maxilliped. Fig. 22. *Lamprops fasciata* G.O. Sars. Female first maxilliped. Fig. 23. *Iphinoe trispinosa* (Goodsir). Female second maxilliped. Fig. 24. *Procampylaspis armata* Bonnier. Second maxilliped. Fig. 25. *Iphinoe trispinosa*. Female third maxilliped. Fig. 26. *Diastylopsis thileni* (Zimmer). Female third maxilliped. Fig. 27. *Gephyrocuma pala* Hale. Female third maxilliped. Fig. 28. *Bodotria scorpioides* (Montagu). Pleopod. Fig. 29. *Diastylis rugosa* G.O. Sars. Second pleopod. Fig. 30. *Cumella pygmaea* G.O. Sars. Female left uropod. Fig. 31. *Nannastacus unguiculatus* (Bate). Female left uropod. Fig. 32. *Eudorella gracilior* Zimmer. Female right uropod. (After Bonnier, 1896, Hale, 1936, Sars, 1879, 1900, Zimmer, 1942.)

accessory lobule is present, situated on the inner side at the bottom of the canoe-shaped branchial portion. The remaining branchial lobes are arranged in a row on its inner side. They may be situated on the upper edge of the side (fig. 19, 20) or on a lobe, the *gill-plate* (fig. 16, 22), formed by an expansion of the side which is reflexed towards the inner surface, showing a spiral arrangement through half a turn. Alternatively the lobules may be borne on a backwardly directed lamella, the *gill support* (fig. 18), separated from the edge of the inner side immediately behind its point of attachment. The number of the branchial lobules is usually between four and 12 but there may be only from one to three (fig. 21), while in some genera there may be from 15 to as many as 40. Occasionally there are none. The lobules are usually larger when present in greater numbers and they are often more numerous in males than in females.

THE SECOND MAXILLIPEDS (fig. 23) have the basis long, often longer than the distal segments together. The ischium is short or frequently wanting. The more distal segments, except the dactylus, are seldom much narrower than the basis. The dactylus is a slender, often claw-shaped segment. Usually the carpus and propodus bear plumose setae on their inner edges and there are slender end spines on the dactylus. The bases are usually set close together and the more distal parts of the appendages are bent inwards towards each other. In the *Campylaspis* group the structure of the second maxillipeds is considerably modified (fig. 24). In the females of all groups there is a semicircular or half oval plate—the *rudimentary oostegite*—situated at the hind end of the coxa. In ripe females it has a fringe of long slender setae directed backwards into the brood chamber.

THE THIRD MAXILLIPEDS have always seven distinct segments. Except in some of the Diastylidae an exopodite is present. The basis is nearly always the longest segment and is often longer than the distal segments together (fig. 25). In some species these appendages are similar in structure to the first peraeopods but they usually differ considerably. They partly cover the first and second maxillipeds and the mouthparts. The basis may be broadened and its distal end may be produced outwards into a lobe often reaching to the end of the merus. Occasionally the distal end of the basis is produced inwards into a broad lobe (fig. 27). The ischium may be broadened and produced, sometimes greatly so

(fig. 26). In other species the merus may be widened. There are nearly always long plumose setae at the distal end of the basis or on its prolongation and frequently also on the merus.

THE FIRST PERAEOPODS normally reach forwards beyond the tip of the pseudorostrum, sometimes much beyond it. The basis is long and generally the longest segment, often longer than the distal segments together. The ischium and merus are short or of medium length. The last three segments are usually progressively narrower. The basis often carries many robust plumose setae. The propodus is sometimes poorly armed but may have a group of very long setae. The dactylus normally carries an end spine and some accessory setae but may be armed simply with a group of setae. The basis may be widened or expanded into lobes, and the ischium and merus, and even the carpus and propodus, may be expanded.

THE SECOND PERAEOPODS are normally directed forwards and more or less diagonally towards the ventral side. Their length is usually less than that of the first pair but they are sometimes shorter than the third pair. In a few species they are almost rudimentary. The basis is fairly long but seldom longer than the distal segments together. The ischium, when present, is short. The merus is short or of medium length. The last three segments are usually more or less elongated. The basis is the broadest segment, the others becoming successively narrower. In the male, the basis may be specially broadened. The dactylus has usually one or several end spines but it may carry a row of robust spines and, in the male, it sometimes has modified flattened setae. The merus may have a very strong spine at its outer end.

THE LAST THREE PAIRS OF PERAEOPODS are similar in shape. They are normally directed backwards. The last pair is absent from the young stages immediately after release from the brood pouch and, in abnormal cases, later. The long basis is followed by a short ischium. The next two segments are sometimes short but usually long or of medium length. The propodus is narrower than the carpus and the dactylus still narrower. When an exopodite is present the basis is robust and sometimes much broader than the following segments, particularly in the males of some genera. The dactylus frequently ends in a claw. The number of spines and setae on the other joints varies considerably throughout the

order but there may be a row of strong spines on the propodus and carpus. In the male sex, there may be long flattened setae on the ischium. The basis may be serrated or it may carry a row of expanded platelets.

The first pair of peraeopods is normally used for seizing and holding food particles, the second and succeeding pairs for burrowing in the substratum. The second pair may sometimes be used for holding the female during copulation.

PLEOPODS (fig. 28, 29) are never present in the female and are frequently absent in the male. When present there is a maximum of five pairs but there may be three, two or, exceptionally, one pair. They are placed at the hind end of the abdominal sternite. Where the abdominal somites lack pleopods they may have a row of spines in their place. The peduncle consists of a short coxa and a longer smooth basis from which normally extend two short rami, the outer usually two-segmented and the inner with a single segment. In several families the outer edge of the inner ramus bears a finger-shaped or angular process (fig. 28). Each ramus usually carries a row of long plumose setae. The fifth pair of pleopods is usually smaller than the others. Where the number is reduced, the pleopods may be modified. The outer ramus is sometimes one-segmented, or there may be only a single ramus, or the rami may be entirely missing.

THE UROPODS (fig. 30, 31, 32) have a one-segmented peduncle with a two-segmented outer ramus or exopod and an inner ramus or endopod of one to three segments. The relative lengths of the uropod compared with the body length and of its parts are very variable. When the peduncle is short it is usually flattened but, in most species, neither it nor the rami show any considerable flattening. Spines and setae, sometimes modified in form, may be present on the edges of the peduncle and the rami and the latter frequently have strong end spines which sometimes appear fused with the ends of the rami. The edges may be serrated, chiefly on the inner side.

Sexual Differences

In adults there is always some sexual dimorphism which may include the following: differences in shape and sculpturing of the body and of the number of spines and setae on the appendages; the development of epimera on the thoracic and sometimes the abdominal somites; the presence of

oostegites in the female; specially modified setae on the third peraeopods of the males in some species; differences in shape of the telson and uropods; better development of sense organs, including larger eyes when present, and well developed second antennae in the male; better organs of locomotion, including the presence of pleopods, and better developed or more numerous thoracic exopodites in the male.

The immature male resembles the female until its later stages when the greater development of the second antennae and the early stages of the pleopods and exopodites becomes apparent.

3. Internal Anatomy

Nervous System

The nervous system consists, according to Oelze (1931), of a supra-oesophageal mass and a ventral ganglionic chain of 17 pairs of ganglia joined together by a double nerve trunk. The protocerebrum occupies the dorsal part of the mass and gives rise to the optic vesicles. The deutocerebrum, situated below, gives rise to the first antennal nerves while the second antennal nerves spring from the front part of the tritocerebrum. The supra-oesophageal mass is connected to the ventral chain by a broad commissure from which springs the visceral system. From the ventral ganglia there arise nerves to each somite and its appendages.

Eyes

The eyes, situated on a median ocular lobe, are nearly always unpaired. In a few genera, however, they retain the primitive position and remain in two separate groups. They are better developed in the males but are sometimes lacking, especially in species inhabiting greater depths. According to Fricke (1931) they should be considered as a compound eye composed of a small number of ommatidia each with a lens-like transparent body beneath the epithelium. They remain separated into two groups until the last moult before release from the brood pouch.

There is a body near the ocular ganglia which Staahl (1938) considers to be an endocrine gland analogous to the eye-stalk gland of Decapoda.

Digestive Apparatus

The mouth opens into a short oesophagus rising obliquely backwards to the stomach. In the anterior part of the oesophagus the walls are thickened and

the lumen is X-shaped; in its posterior part the thickenings form valves. The stomachal pouch contains an anterior masticatory part which belongs to the stomodeum and is the stomach proper, provided with chitinous walls, irregularly thickened, and numerous stiff setae which constitute a filtering mechanism. There are from one to four pairs of finger-shaped hepatic caeca which open into the stomach at its point of junction with the mid-gut, which is about the same length as the stomach proper and continues as the hinder part of the stomachal pouch, its walls containing secretory cells. The hind-gut, continuing from the mid-gut to the anus on the last abdominal somite or the telson, is normally straight but may exceptionally be coiled in its thoracic part.

Circulatory System

The heart is a spindle-shaped organ lying dorsally, with its front end level with the bases of the third maxillipeds and its hind end at the level of the fourth peraeopods. It is encircled by muscle bands and has a pair of osteoles in its hind part. From the front end a cephalic aorta extends forwards; on each side there are four lateral arteries, and a pair of abdominal aortae extend backwards from the hind end. The cephalic aorta is dilated at the level of the cerebrum into a cerebral heart from which blood passes to the brain, eyes, antennae, and mouthparts. The lateral arteries supply the thoracic somites and their appendages, and the abdomen and its appendages are supplied from the abdominal aorta. The venous system consists of a series of lacunae, particularly in the branchiae and between the epithelial layers of the carapace where the blood is oxygenated.

From here it returns to the pericardium and thence through the osteoles to the heart.

The blood is unpigmented and contains a moeboid corpuscles.

Excretory System

The principal organs of excretion are a pair of maxillary glands situated, as in the Tanaidacea, on each side above the second maxillae, with excretory tubules opening at their bases. There are also a pair of mammillated tubes between the heart and the genital glands containing concretions which may be excretory or serve as a reserve of calcium to be used during moults.

Genital Organs

The sexes are separate. The ovaries are two spindle-shaped sacs lying in the cephalothorax at the sides of the gut and ventral to the pericardial septum. Each is continued backwards into an oviduct opening, at maturity, on the inner side of the coxa of the third peraeopod.

The testes are a pair of tubes in a similar position to the ovaries, prolonged on each side by a vas deferens which opens on the last thoracic sternite. At the front end, each testis has four short blind sacs on its outer edge. The spermatozoa consist each of an elongated head with numerous cilia at its base and a long tail set at an acute angle to it.

4. Development

The number of eggs produced varies but may reach 100 in the largest species. They are laid immediately after the moult of maturity and are held in the incubatory pouch by the long setae on the rudimentary oostegites of the second maxillae.

There are four marsupial stages after hatching—a nauplius stage, two post-nauplius stages, and a manca-stage which resembles the adult in most respects but lacks the last pair of peraeopods. After leaving the brood pouch there are several further moults before the subadult stage (“Vorbereitungstadium” of Zimmer) is reached, when the gonads ripen and the secondary sexual characters become more apparent, leading after a further moult to the adult (“Brutkleid” for the female and “Hochzeitkleid” for the male) when the sexual characters are fully developed and reproduction takes place. In large species the female may moult again after the young stages leave the brood pouch, when the oostegites become reduced (“Zwischenstadium”), after which a further moult leads to a second reproductive period. This may be repeated up to four times. Normally in such cases there is only one reproductive stage each year so that the female may live for four years. It is not known whether the male behaves in a similar fashion but the great disparity in the sizes of mature males in certain species indicates that they may do so. The majority of species are probably annual, and reproduction may occur only once, or perhaps several times in one year, without intervening moults.

5. Ecology

Very little is known about the ecology of the New Zealand species but in general the Cumacea are benthic in habit. They spend most of their lives

on the bottom where they burrow into the surface of the sediment with their four posterior pairs of peraeopods, leaving only the front of the body and the caudal extremity uncovered. Most are confined to the softer deposits but some species occur in sands of various grades and a few even in fine gravels. They feed on detritus and small organisms present in the sediments which are carried to the mouth by the maxillipeds and maxillae, the setae of which form a filtering mechanism. The genus *Campylaspis*, however, which has its mouthparts modified for piercing, may feed on larger animals such as Foraminifera or small Crustacea. Cumacea are themselves eaten by various fishes.

Coastal species, and especially the more active adult males, frequently swim up from the bottom, usually at night, and may rise nearly to the surface. At certain times the males may be joined by females and copulation has been observed to take place during the pelagic phase, the males holding the females with their second antennae and first peraeopods.

6. Parasites

The carapace of some species which have a covering of hairs is often found encrusted with sand grains but otherwise their cleaning mechanisms are efficient and they do not provide a suitable base for ectoparasites. The branchial cavity and brood pouch, however, are less accessible for cleaning by the setae and spines on the appendages, and in them may be found various species of the copepod family Choniostomatidae, studied particularly by Hansen (1897). When one of these parasites is present in the brood pouch the latter is always without eggs or young stages of the host.

7. Distribution

Cumacea occur in all seas, and in some estuaries and areas of brackish water. There are probably no true freshwater species but some species may penetrate for some distance up rivers. The majority inhabit waters less than 200 m in depth and some may be found above low-water mark but many live in greater depths. The deep-water fauna is only just becoming known. Cumacea have been found in all latitudes where suitable habitats exist. Probably the greatest numbers of species occur in tropical coastal waters. At the time of writing about 680 species are known, placed in 80 genera, but as many parts of the ocean have been poorly investigated, the total number may be found to exceed 1,000.

In New Zealand waters a high proportion, 25 out of 31 of the coastal species, seems to be endemic but this cannot be stated with certainty as the cumacean fauna off the islands of the south Pacific is almost entirely unknown. Of the remainder, *Pomacuma australiae* (Zimmer) has been found off Queensland, New South Wales, and north-western Australia (Hale, 1944b); *Cyclaspis levis* Thomson and *C. similis* Calman, off Queensland (Foxon, 1932)—but these two records need to be confirmed as Foxon states that the specimens were poorly preserved and at that time little was known of the Australian species of *Cyclaspis*. *Cyclaspis calmani* Hale, here regarded as a synonym of *C. levis*, and *C. coelebs* Calman have been reported from the Andaman Islands by Kurian (1956)—his identifications, particularly of the latter, are, however, not convincing: *Eudorella truncatula* (Bate) occurs off north-west Europe and in the Mediterranean but it seems likely that the New Zealand specimens somewhat doubtfully allocated to this species by Calman (1907) belong to a closely related but distinct species; *Leptostylis recalvastra* Hale is recorded from New South Wales (Hale, 1945c) and the New Zealand specimens probably belong to the same species, but because of their immaturity, this is uncertain. Two species obtained from the Chatham Rise (Jones, 1960b) may be characteristic of deeper water; they are *Hemilamprops pellucida* Zimmer, also found off South Africa (Zimmer, 1908; Stebbing, 1912), and *Diastylis acuminata* N. S. Jones, which has not been found elsewhere.

Such evidence as exists, then, points to an affinity of the New Zealand cumacean fauna with that of eastern Australia and this is supported by the presence of species of *Hemileucon*, of which the only other species is known from New South Wales, and of *Cyclaspis* and *Gynodiastylis*, both of which have many Australian species. That such affinity is not very strong, however, is shown by the number of species which have not been found outside New Zealand waters. Ekman (1953) concludes that the New Zealand marine fauna is largely endemic but shows its closest affinity with that of South Australia.

The New Zealand Cumacea are peculiar in that several genera have not been found elsewhere, including *Heteroleucon*, *Paraleucon*, and *Colurostylis* if *Colurostylis* (?) *occidentalis* Calman (1912) from California, which seems to be generically separate, is excepted. This distribution points to a long period of separation from any other land mass. The relative abundance of members of different families contrasts with that in Australia and the

tropical regions to the north. The Leuconidae are well represented with nine species now identified compared with three from Australia. In the Diastylidae, *Diastylis* is represented by three species and *Diastylopsis* by three, whereas no member of either genus has been recorded from Australia. This distribution accords with Zimmer's (1941) summary of the distribution of the two families which he regards as characteristic of high latitudes. The families Bodotriidae (except for the genus *Cyclaspis*) and Nannastacidae, more characteristic of low latitudes, do not seem to be well represented off New Zealand but form a more important part of the Australian fauna.

8. Affinities

Fossil Cumacea are unknown. The Cumacea comprise a sharply defined order of the Peracarida with which they share an incomplete carapace leaving free several thoracic somites; the first thoracic somite is fused with the head; the first antennal peduncle has three segments; the mandible has a lacinia mobilis; the thoracic appendages are flexed between the carpus and the propodus; and they have an incubatory chamber formed by oostegites.

They resemble the Mysidacea in having the carapace well developed and exopodites on the thoracic appendages. On the other hand they resemble the Tanaidacea in having the carapace in the form of a fold projecting on each side of the cephalothorax, enclosing a chamber in which lies the respiratory organ formed from the epipodites of the first maxillipeds. As in the Isopoda, they leave the egg with the eighth thoracic appendage absent and the females lose their oostegites between broods. Cumaceans, tanaids, and isopods have maxillary nephridia, while amphipods and mysids, except the lophogastrids, have antennal nephridia. The Cumacea should, therefore, probably be placed on the branch of the peracaridan family tree from which also spring the Tanaidacea and Isopoda but as an evolutionary divergent line, above the branch giving rise to the Mysidacea and Amphipoda.

9. Classification

Seven families are usually recognised—the Bodotriidae, Leuconidae, Nannastacidae, Ceratocumidae, Lampropidae, Pseudocumidae, and Diastylidae. Stebbing (1913) proposed 26 families but most of them were based on characters which in some cases are of doubtfully generic value and

they did not receive general acceptance. It is perhaps impossible to produce a truly natural scheme of classification. Many species and even genera are separated for convenience on trivial characters, and none of the characters on which the families are separated is both confined to a single family and found in every member of it.

The family Ceratocumidae (with only a single species, not represented in the New Zealand fauna) appears to stand apart from the remainder but is little known. The Pseudocumidae (unknown off New Zealand) and Diastylidae approach each other very closely through the genus *Colurostylis* and should probably be combined, as suggested by Zimmer (1941). The Lampropidae are also near to the Diastylidae but can be separated from them by several characters. Finally the Bodotriidae, Leuconidae, and Nannastacidae, all without a free telson, form a group apart from the families in which a telson is present.

Primitive characters are found in each of these groups but none combines them all. Possibly the Lampropidae, with well developed pleopods (but not more than three pairs), a long second antenna in the female, and third maxillipeds resembling the first pereopods, possess a greater number of primitive characters than the remainder, but the Bodotriidae usually have five pairs of pleopods in the male and may have a greater number of well developed thoracic exopodites in the female.

10. Collecting Methods

The relatively few species which occur between tide marks, usually on sandy beaches, may be collected with a hand net which has a fine-meshed bag. The surface layer of sand should be skimmed off and, after as much sand as possible has been shaken through, what remains should be emptied out into a white dish. The cumaceans may then be picked out. Alternatively, the sand may be dug out and passed through a fine sieve.

On soft bottoms the most satisfactory collecting gear is a runner-dredge, which will not sink deeply into the deposit and become too rapidly filled; the bag should be made of stramin or coarse bolting silk or nylon and the contents passed through a fine sieve or, if not too bulky, they may be taken back to the laboratory as they are. On coarser deposits a small dredge with a bowed frame or a conical dredge with a bag of stramin or other fairly fine-meshed material, protected by an open sleeve of fine canvas, will be found most useful.

In the laboratory the contents of the dredge may be shaken up a little at a time in sea water in a dish. Cumaceans do not float in the surface film as do some other kinds of crustaceans, but they may be seen to swim out of the bottom material when the dish is agitated. They may also be floated out of the deposit in a saturated solution of such substances as magnesium sulphate or sugar.

A simple method of collecting cumaceans and many other animals is by means of a light trap, as described by Sheard (1941) and Hale (1953a).

This consists essentially of a coarse silk townet (or a N.50 plankton net) with a light suspended in its mouth. The light should be of low intensity—a naked hand-torch wired to a battery or a small cheap torch in a kilner or quart Agee jar will be found satisfactory. The net should remain suspended just clear of the sea bed for 10 to 15 minutes and should then be hauled straight up. This method is selective in that only species with well developed eyes are attracted to the light and a large preponderance of adult males is usually obtained; however, many species may be captured in shallow water.

STATION DETAILS

(1) New Zealand Oceanographic Institute Stations

Sta. A322, 28 Jan 1957, 44° 40' 12" S, 167° 55' 20" E, Upper Stirling Basin, Milford Sound, on delta slope, 1400 h 10 fm, cone dredge, bottom sandy mud with many twigs and green leaves, numerous small heart urchins (*Echinocardium cordatum*).

Diastylis insularum Calman 3♀♀.

Sta. A647, 25 March 1961, Main Wharf, Nelson, 2215–2230 h, N.50 plankton net with light, coll. D. E. Hurley.

Cyclaspis similis Calman 2♂♂, 14♀♀, 12 juv.
Colurostylis lemorum Calman 15♂♂, 60+♀♀.

Sta. A648, 10 May 1961, Seatoun Wharf, Wellington Harbour, 2110–2115 h, N.50 plankton net with light, coll. D. E. Hurley.

Diastylis insularum Calman 1♂.

Sta. A649, 11 May 1961, Petone Wharf, Wellington Harbour, 2000–2045 h, N.50 plankton net with light, coll. D. E. Hurley.

Diastylis insularum Calman 1♂.
Colurostylis lemorum Calman 10♂♂, 2♀♀.

Sta. B1, 25 Aug 1956, 39° 08' S, 177° 12' E, (Hawke Bay), 0847–0921 h, 10.5 fm, *Tui*, cone dredge, fine grey sand.

Diastylopsis crassior Calman 1♂.

Sta. B2, 25 Aug 1956, 39° 08' S, 177° 13' 30" E, (Hawke Bay), 1048–1057 h, 10 fm, *Tui*, cone dredge, fine grey sand.

Diastylopsis elongata Calman 5♀♀.

Sta. B3, 25 Aug 1956, 39° 12' S, 177° 18' 30" E, (Hawke Bay), 1130–1142 h, 24 fm, *Tui*, cone dredge, fine grey sand, bottom temp. 13.0°C.

Diastylopsis elongata Calman 8♀♀.
Diastylopsis crassior Calman 1♂, 1♀.

Sta. B4, 25 Aug 1956, 39° 16' S, 177° 22' E, (Hawke Bay), 1207–1222 h, 35 fm, *Tui*, cone dredge, fine grey sand, bottom temp. 13.1°C.

Diastylopsis elongata Calman 1♀.

Sta. B5, 25 Aug 1956, 39° 13' 30" S, 177° 26' 30" E, (Hawke Bay), 1314–1326 h, 30.5 fm, *Tui*, cone dredge, fine grey sand, bottom temp. 13.0°C.

Diastylopsis elongata Calman 1♀.

Sta. B7, 25 Aug 1956, 39° 06' S, 177° 19' E (Hawke Bay), 1623–1634 h, 9.5 fm, *Tui*, cone dredge, fine grey sandy sloshy mud, bottom temp. 12.4°C.

Diastylopsis crassior Calman 3♀♀.

Sta. B8, 26 Aug 1956, 39° 06' S, 177° 23' E, 1210–1220 h, 15.5 fm, *Tui*, cone dredge, fine grey sand, bottom temp. 13.1°C.

Diastylopsis crassior Calman 2♂♂, 7♀♀.

Sta. B10, 26 Aug 1956, 39° 13' 30" S, 177° 35' 30" E, 1328–1345 h, 30 fm, *Tui*, cone dredge, fine grey sandy mud, bottom temp. 12.9°C.

Diastylopsis elongata Calman 2♀♀.

Sta. B14, 27 Aug 1956, 39° 04' S, 177° 42' E, 1020–1033 h, 13.5 fm, *Tui*, cone dredge, very sloshy sand, bottom temp. 12.5°C.

Diastylopsis crassior Calman 1♂.

Sta. B15, 27 Aug 1956, 39° 09' 30" S, 177° 46' 30" E, 1118–1148 h, 19.5 fm, *Tui*, cone dredge, fine grey sand, bottom temp. 12.6°C.

Diastylopsis crassior Calman 1♀.

Sta. B16, 27 Aug 1956, 39° 11' S, 177° 41' E, 1235–1245 h, 22 fm, *Tui*, cone dredge, slushy blackish-grey mud and fine sandy mud, bottom temp. 13.2°C.

Diastylis insularum Calman 1♀.

Sta. B18, 27 Aug 1956, 39° 18' 30" S, 177° 48' E, 1418–1436 h, 24 fm, *Tui*, cone dredge, sand, bottom temp. 13.4°C.

Diastylopsis elongata Calman 1♀.

Sta. B37, 2 Sep 1957, 39° 25' S, 176° 57' E, 1115–1120 h, 10.5 fm, *Ikatere*, cone dredge, sand.

Cyclaspis triplicata Calman 2♀♀.
Diastylopsis crassior Calman 16♂♂, 26♀♀, 2 juv.
Diastylopsis thileniysi (Zimmer) 5♂♂, 10♀♀.

Sta. B38, 2 Sep 1957, 39° 21' 45" S, 177° 02' 30" E, 1235–1240 h, 16.5 fm, *Ikatere*, cone dredge, fine sandy mud.

Cyclaspis argus Zimmer 3♂♂, 1♀.
Cyclaspis triplicata Calman 1♂.
Diastylis insularum Calman 1♂, 8♀♀, 5 juv.
Diastylopsis thileniusi (Zimmer) 10♂♂, 35♀♀.

Sta. B39, 2 Sep 1957, 39° 18' 45" S, 177° 07' E, 1315–1320 h, 27.5 fm, *Ikatere*, cone dredge, glutinous mud.

Diastylopsis elongata Calman 1♀.

Sta. B42, 2 Sep 1957, 39° 15' S, 177° 03' 30" E, 1600–1605 h, 13 fm, *Ikatere*, cone dredge, fine sandy mud.

Cyclaspis argus Zimmer 4♂♂, 5♀♀.
Cyclaspis elegans Calman 2♂♂, 1♀, 1 juv.
Cyclaspis triplicata Calman 2♂♂.
Diastylopsis crassior Calman 2♀♀.
Diastylopsis thileniusi (Zimmer) 28♂♂, 84♀♀, 9 juv.
Colurostylis longicauda sp. n. 1♂, 4♀♀.

Sta. B43, 3 Sep 1957, 39° 31' 45" S, 176° 56' 30" E (Hawke Bay), 0830–0835 h, 11 fm, *Ikatere*, cone dredge, fine sandy mud.

Cyclaspis levis Thomson 1♂.
Cyclaspis argus Zimmer 1♂.
Cyclaspis triplicata Calman 1♂.
Diastylopsis crassior Calman 14♂♂, 78♀♀, 1 juv.
Diastylopsis thileniusi (Zimmer) 4♂♂, 4♀♀.
Colurostylis longicauda sp. n. 1♀.

Sta. B44, 3 Sep 1957, 39° 28' 45" S, 177° 01' 15" E (Hawke Bay), 0915–1920 h, 14 fm, *Ikatere*, cone dredge, fine sandy mud.

Diastylopsis crassior Calman 1♀.
Diastylopsis thileniusi (Zimmer) 6♀♀.

Sta. B45, 3 Sep 1957, 39° 29' 45" S, 177° 06' 30" E (Hawke Bay), 1000–1005 h, 22 fm, *Ikatere*, cone dredge, fine sandy mud and mud, two layers showing.

Eudorella hurleyi sp. n. 1♀.
Diastylopsis elongata Calman 1♂, 1♀.
Diastylopsis thileniusi (Zimmer) 1♂.

Sta. B50, 3 Sep 1957, 39° 26' 30" S, 177° 15' E (Hawke Bay), 1430–1435 h, 37 fm, *Ikatere*, cone dredge, fine grey-green sandy mud.

Diastylis insularum Calman 1♂.

Sta. B51, 3 Sep 1957, 39° 29' 15" S, 177° 10' 15" E (Hawke Bay), 1510–1515 h, 26 fm, *Ikatere*, cone dredge, grey-green semi-glutinous mud.

Cyclaspis levis Thomson 1♂.
Diastylopsis elongata Calman 4♂♂, 1♀.

Sta. B52, 3 Sep 1957, 39° 32' 30" S, 177° 05' 15" E (Hawke Bay), 1550–1555 h, 14 fm, *Ikatere*, cone dredge, grey-green glutinous sandy mud.

Diastylopsis elongata Calman 1♂, 1♀.
Diastylopsis crassior Calman 2♀♀.

Sta. B56, 4 Sep 1957, 39° 30' 15" S, 177° 19' E (Hawke Bay), 0930–0935 h, 46 fm,* *Ikatere*, cone dredge, grey-green sandy mud, slight rusty tint.

Leucon (?) *latispina* sp. n. 1♀.

Sta. B59, 4 Sep 1957, 39° 28' S, 177° 32' 45" E (Hawke Bay), 1140–1145 h, 65 fm,* *Ikatere*, cone dredge, grey-green glutinous mud.

Leucon (?) *latispina* sp. n. 1♀.

Sta. B60, 4 Sep 1957, 39° 31' 15" S, 177° 28' E (Hawke Bay), 1240–1245 h, 66 fm,* *Ikatere*, cone, dredge, grey-green glutinous mud.

Leucon (?) *latispina* sp. n. 1♀.

Sta. B61, 4 Sep 1957, 39° 34' 15" S, 177° 23' E (Hawke Bay), 1325–1330 h, 65 fm,* *Ikatere*, cone dredge, grey-green glutinous mud.

Leucon (?) *latispina* sp. n. 1♀.

Sta. B62, 4 Sep 1957, 39° 37' S, 177° 18' 15" E (Hawke Bay), 1415–1420 h, 64 fm,* *Ikatere*, cone dredge, grey-green mud.

Leucon (?) *latispina* sp. n. 2♀♀, 1 juv.

Sta. B232, 23 May 1960, 46° 54.8' S, 168° 09.5' E (Akers Bay, Stewart Island), 0850 h, 5 fm, *Viti*, large orange-peel grab, fine shelly sand, Many polychaete tubes, dead lamellibranch shells, many small gasteropods (*Zethalia*).

Diastylopsis thileniusi (Zimmer) 1♂, 6♀♀.

Sta. C280, 23 Oct 1959, 38° 00' S, 174° 46.8' E (off Kawhia), 0725–0735 h, 17.5 fm, *Viti*, Petersen Grab, muddy ironsand. Polychaetes, live molluscs, amphipods, cumaceans.

Diastylopsis crassior Calman 3♀♀.

*Echo sounding not available; depth estimated from chart positions.

Sta. C281, 23 Oct 1959, 38°00' S, 174° 45.4' E (off Kawhia), 0835–0900 h, 19 fm, *Viti*, Petersen Grab, predominantly ironsand but more mud than C280. Few shells but polychaetes, amphipods, cumaceans, shrimps.

Diastylopsis crassior Calman 7♀♀.

Sta. C351, 27 Oct 1959, 38° 40' S, 174° 23.3' E (North Taranaki Bight, off Mokau), 0935–0959 h, 30 fm, *Viti*, Petersen Grab, golden sand, iron-sand, and shell.

Cyclaspis levis Thomson 1♂.

Sta. C388, 1 May 1960, 41° 43' S, 174° 16' E (anchorage near Cape Campbell), 1900–2030 h, 10 fm, *Viti*, N. 70 net with light, four hauls each 10–15 min.

Cyclaspis levis Thomson, 7♂♂, 5♀♀, 6 juv.

Cyclaspis argus Zimmer, 12♂♂, 6♀♀.

Cyclaspis similis Calman 1♂.

Diastylis neozealanica Thomson 4♂♂, 7♀♀.

Diastylopsis thileniusi (Zimmer) 1♂.

Colurostylis lemorum Calman 2♂♂, 1♀.

Sta. C395, 2 May 1960, 41° 43' S, 174° 16' E (anchorage near Cape Campbell), 2130–2300 h, 8 fm, *Viti*, N.70 net with light, two successive half-hour hauls.

Cyclaspis levis Thomson 100♂♂, 6♀♀, 7 juv.

Cyclaspis argus Zimmer 21♂♂, 1♀, 1 juv.

Cyclaspis similis Calman 3♂♂, 2♀♀.

Diastylis neozealanica Thomson 1♂, 3♀♀.

Sta. C486, 11 May 1960, 41° 27' S, 175° 6' E (Palliser Bay, Cook Strait), 1121–1132 h, 15 fm, *Viti*, cone dredge, fine grey-blue sand, polychaete tubes.

Cyclaspis argus Zimmer 2♂♂, 7♀♀.

Cyclaspis elegans Calman 1♂, 4♀♀.

Diastylis neozealanica Thomson 1♂, 3♀♀.

Diastylopsis thileniusi (Zimmer) 3♀♀.

Gynodiastylis laevis Calman 1♀.

(2) Dominion Museum Station

Sta. BS143, 20 May 1952, 39° 30' 30" S, 177° 05' 30" E (Hawke Bay, off Napier), 16 fm, *Kotuku*, standard rectangular dredge, bottom sand. Coll. J. A. F. Garrick. (Victoria University of Wellington Zoology Department "Kotuku" Expedition, Sta. No. 1).

Cyclaspis argus Zimmer 1♀.

Cyclaspis elegans Calman 1♂, 1♀.

Diastylis insularum Calman 8♂♂, 18♀♀.

Diastylopsis elongata Calman 1♂, 3♀♀.

(3) HMNZS Lachlan Station

Sta. 337/51B, 22 March 1951, 44° 23' S, 172° 42' E (Canterbury Bight), conical net 75 m to surface.

Cyclaspis similis Calman 1♀.

Leptostylis recalvastra Hale 1 imm. ♂, 1 imm. ♀.

CHECK LIST OF NEW ZEALAND CUMACEA

Species new to New Zealand are shown in bold face.

Family BODOTRIIDAE

Pomacuma australiae (Zimmer)

Cyclaspis levis Thomson

Cyclaspis argus Zimmer

Cyclaspis thomsoni Calman

Cyclaspis elegans Calman

Cyclaspis similis Calman

Cyclaspis triplicata Calman

Cyclaspis coelebs Calman

Family LEUCONIDAE

Leucon (?) *heterostylis* Calman

Leucon (?) *latispina* sp. n.

Heteroleucon akaroensis Calman

Paraleucon suteri Calman

Hemileucon uniplicatus Calman

Hemileucon comes Calman

Eudorella truncatula (Bate)

Eudorella hurleyi sp. n.

Eudorellopsis resima Calman

Family NANNASTACIDAE

Nannastacus pilgrimi sp. n.

Campylaspis sp.

Family LAMPROPIDAE

Hemilamprops pellucida Zimmer

Family DIASTYLIDAE

Diastylis neozealanica Thomson

Diastylis insularum Calman

Diastylis acuminata N. S. Jones

Diastylopsis elongata Calman

Diastylopsis crassior Calman

Diastylopsis thileniusi (Zimmer)

Leptostylis recalvastra Hale

Colurostylis pseudocuma Calman

Colurostylis lemorum Calman

Colurostylis longicauda sp. n.

Gynodiastylis carinata Calman

Gynodiastylis laevis Calman

Gynodiastylis milleri sp. n.

SYSTEMATICS

KEY TO THE FAMILIES OF CUMACEA

- 1 No independent telson (figs. 40, 55, 122, 191) 2
Telson present (figs. 200, 209, 278, 301) 4
- 2 Mandibles of normal shape (fig. 9) or with the molar process styliform (fig. 11) 3

Mandibles broadly truncated at the base with the molar process normal (fig. 10) (p. 38)
LEUCONIDAE
- 3 Male usually has 5 pairs of pleopods (fig. 43, 57), exceptionally 2 or 3 pairs (p. 25)
BODOTRIIDAE
Male without pleopods (fig. 184) (p. 50)
NANNASTACIDAE
- 4 Male has 5 pairs of pleopods [CERATOCUMIDAE]
Male has at most 3 pairs of pleopods or 0 (figs. 281, 316) 5
- 5 Telson well developed with at least 3 end spines (fig. 200) (p. 52)
LAMPROPIDAE
Telson well developed or small, with 2 end spines or 0 (figs. 209, 311) 6
- 6 Inner ramus of the uropods has only 1 segment [PSEUDOCUMIDAE]
Inner ramus of the uropods has 2 or 3 segments (figs. 209, 311) or, if one-segmented, the male is without pleopods or the telson is large and has end spines (p. 53)
DIASTYLIDAE

[CERATOCUMIDAE]: Telson present, small. Pleopods with external process on inner ramus - 5 pairs. Thoracic exopodites - ♂, 3 pairs, ♀, unknown. Inner ramus of uropods one-segmented. ♂ second antenna with segments short.

LAMPROPIDAE: Telson present, of medium or large size, with 3 or more end spines, rarely with only 1. Pleopods with external process on inner ramus - 3 pairs or 0. Thoracic exopodites - ♂, 5 pairs; ♀, 3 + 2 rudimentary pairs, rarely 2 or 2 + 1 rudimentary. Inner ramus of uropods three-segmented. ♂ second antenna with segments short. Branchial apparatus with narrow gill plates.

[PSEUDOCUMIDAE]: Telson present, small. Pleopods without external process on inner ramus - 2 pairs, somewhat rudimentary. Thoracic exopodites - ♂, 5 pairs; ♀, 3 + 2 rudimentary pairs. Inner ramus of uropods one-segmented. ♂ second antenna varying in length of segments. Branchial apparatus with narrow gill plates.

DIASTYLIDAE: Telson present, usually of medium or large size, less frequently small, usually with 2 end spines, sometimes with 0. Pleopods without external process of inner ramus - 2, sometimes rather reduced pairs, less often 0. Thoracic exopodites - ♂, 5 pairs, more rarely 3; ♀, 3 or 3 + 2 rudimentary pairs, rarely 0 or exopodites present only on the first two pairs of pereopods. Mandibles usually normal, seldom widened. Inner ramus of uropods with 2 or 3 segments, rarely 1. ♂ second antenna with the segments long. Branchial apparatus with narrow or broad gill plates.

DISTINGUISHING CHARACTERS OF THE FAMILIES

BODOTRIIDAE: No free telson. Pleopods with a process on the outer edge of the inner ramus - 5 pairs, occasionally 3 or 2 pairs. Exopodites on thoracic appendages (2nd maxillipeds and pereopods 1 - 4) - ♂, 5 or 2 pairs, occasionally 3 or 4, 2 + 2 rudimentary, 3 + 2 rudimentary or 4 + 1 rudimentary; ♀, 4 or 2 pairs, occasionally 3, 4 + 1 rudimentary, 3 + 2 rudimentary, 3 + 1 rudimentary or 2 + 2 rudimentary. Mandibles not broadened at base. Inner ramus of uropods one- or two-segmented. Branchial apparatus without gill plates or supports. ♂ second antenna usually with the segments short. The number of free thoracic segments is frequently reduced. Pleural folds nearly always present on the abdomen of the ♂.

LEUCONIDAE: No free telson. Pleopods without external process on inner ramus - 2 pairs, rarely 1 or 0. Thoracic exopodites - ♂, 5 pairs, rarely 3; ♀, 4 pairs, rarely 3. Mandible broadened at base. Inner ramus of uropod two-segmented, rarely one-segmented. ♂ second antenna with segments short or of medium length. Branchial apparatus without gill plates or supports.

NANNASTACIDAE: No free telson. No pleopods. Thoracic exopodites - ♂, 5 pairs, rarely 4 or 3; ♀, 3 pairs, rarely 4 or 0, or present only on the first two pereopods and absent from the third maxillipeds. Mandible normal or widened. Inner ramus of the uropods one-segmented. ♂ second antenna with long segments. Branchial apparatus without gill plates, with or without gill supports.

Family **BODOTRIIDAE** T. Scott, 1901; Kurian, 1951, emend.

Twenty-two genera and 197 species have been described in the family. In the New Zealand fauna there are two genera and eight species known at present.

KEY TO THE GENERA OF BODOTRIIDAE

- Exopodites, sometimes rudimentary, present on at least the first two pairs of pereopods in either sex (figs. 33, 39) (sub-family Vaunthompsoniinae Hale, 1944) (p. 25)
Pomacuma
- Exopodites present on the first pereopods only (figs. 42, 50) (subfamily Bodotriinae Hale, 1944) (p. 28)
Cyclaspis

Genus **Pomacuma** Hale, 1944

Integument little calcified. Carapace with pseudo-rostral lobes extending in front of moderately large ocular lobe and meeting in mid-line; antennal



notch a closed slit. Five pedigerous somites exposed. Telsonic somite well produced posteriorly. First antenna normal with accessory flagellum one-segmented. Second antenna of female three-segmented, that of male reaching end of pleon, its flagellum with the three longest segments only $1\frac{1}{2}$ as long as wide. Third maxilliped with well developed exopodite; basis with a short external distal lobe bearing a fan of plumose setae; the segment is widened interiorly and is truncate distally but is not produced forwards; there is a long series of plumose setae on the whole length of the inner margin; the remaining segments forming a geniculate palp, with the ischium short, the carpus expanded in the proximal half and the propodus widened distally. First three pairs of peraeopods with well developed exopods; the fourth pair with rudimentary single-jointed exopods. The basis of the first peraeopod widened distally where a large forwardly directed lobe is produced interiorly reaching the level of the anterior end of the oblique articulation of the ischium and merus. The carpus of the second peraeopod much shorter than the merus. Five pairs of pleopods in the male. The inner ramus of the uropod two-segmented, the distal segment very short; the inner margin of the outer ramus with plumose setae.

Pomacuma australiae (Zimmer, 1921) (figs. 33–41).

Zimmer, 1921a, as *Vaunthompsonia ? australiae*; Hale, 1936b, as *Leptocuma australiae*; Hale, 1944b.

Female: Integument glossy with a fine reticulate pattern.

Carapace almost evenly arched dorsally; median carina distinct with a shallow excavation on either side in the front half; it is as wide as deep, less than $1\frac{1}{2}$ as long as deep and not quite as long as the pedigerous somites together. Pseudorostral lobes subtruncate in front, meeting in front of the eyelobe. Eyelobe as long as wide, rounded anteriorly, with lenses obscured by pigment.

Pedigerous and pleon somites smooth, rounded. Telsonic somite less than $1\frac{1}{2}$ as long as wide and less than $\frac{2}{3}$ as long as the fifth pleon somite; produced distal portion more than $\frac{1}{4}$ the length of the whole somite.

Basal segment of the first antenna nearly twice as long as the second which is more than $1\frac{1}{2}$ as long as the third segment; flagellum two-segmented; accessory flagellum short, one-segmented.

Basis of third maxilliped more than $1\frac{1}{2}$ as long as remaining segments together; carpus barely more than twice as long as merus, not quite $1\frac{1}{2}$ as long as propodus, and about twice as long as dactylus.

Basis of first peraeopod as long as rest of appendage, with plumose setae on the outer edge and with spines and plumose setae on the inner edge, the distal end unarmed; ischium, including the lobe, about as long as the merus; propodus about $1\frac{1}{2}$ as long as carpus and about twice as long as the dactylus. Dactylus of second peraeopod more than twice as long as propodus, less than twice as long as carpus, and about as long as the merus; its inner margin bears a row of 5–7 spines and there is a long distal spine and a short one. Third and succeeding peraeopods robust, with four distal carpal setae which with the propodial seta reach well beyond the tip of the dactylus.

Uropod with the peduncle shorter than the first joint of the endopod and with a few spines on the inner margin; the endopod equal in length to the exopod, its first segment at least three times as long as the second, with short spines on the inner margin interspersed with long spines; second segment with a row of inner spines increasing successively in length, but with the long terminal spine of the rounded distal end shorter than the segment; apex of the exopod with three or four blunt, stout, unequal spines, and with only one or up to seven stout spines on the outer margin.

Colour translucent, with brown chromatophores which are often massed to form an irregular pattern, often at the posterior ends of the dorsal excavations of the carapace. Sometimes the second and third pedigerous somites have the back brown and a brown patch on each pleural part, while the posterior half of the first pleon somite is darkened. The eye is always bluish-black.

Length, 8.5–9.5 mm.

Adult Male: First antenna with second segment twice as long as third, with flagella more robust and bearing sensory setae. Uropods with a greater number of marginal spines than in the female.

Length, 9 mm.

Localities

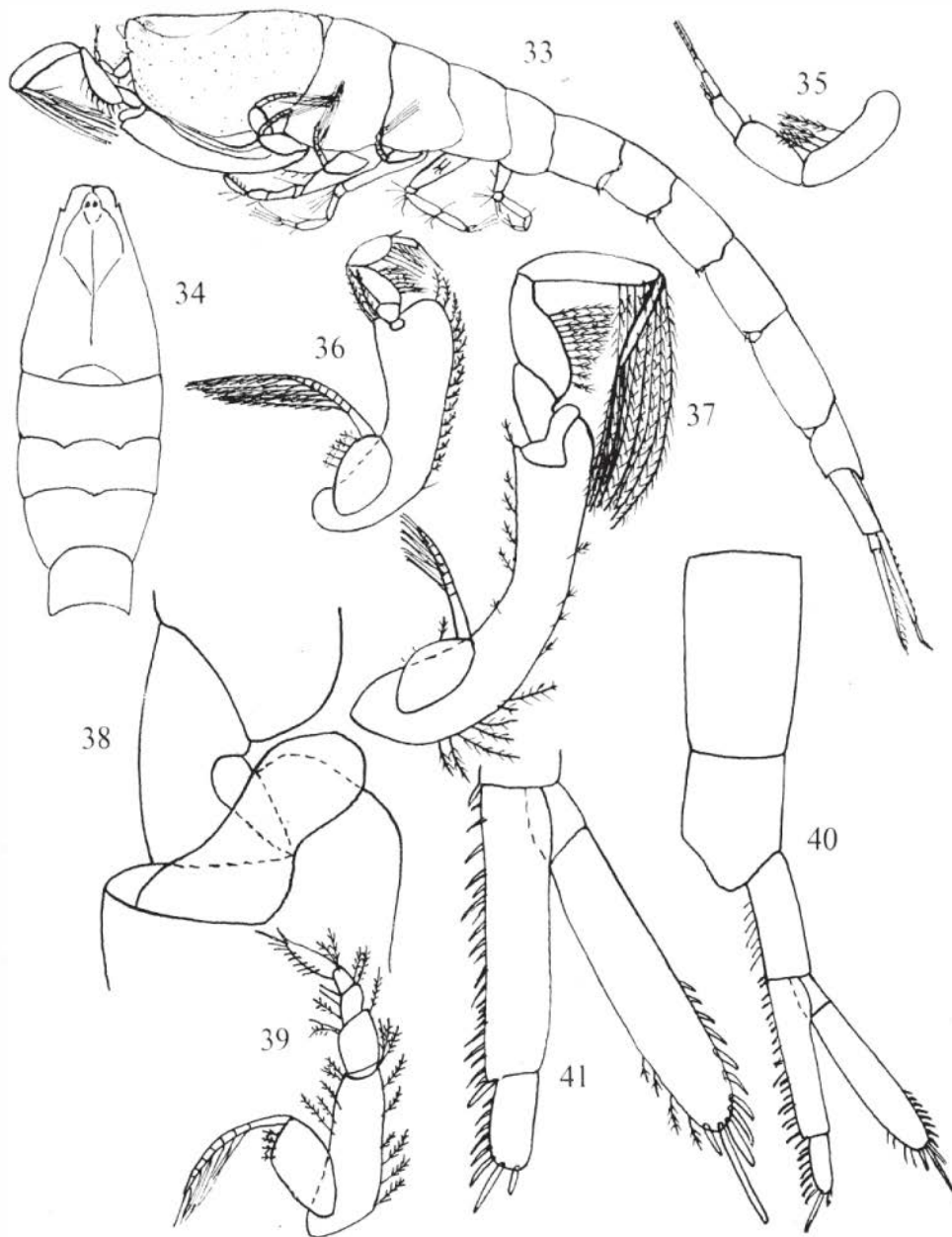
PREVIOUSLY RECORDED: North-western and eastern Australia (Zimmer, 1921a; Hale, 1944b).

WELLINGTON HARBOUR, NEW ZEALAND: 7 Feb 1955, 1 female.

Remarks

The single ovigerous female obtained from New Zealand differs from the description given by Hale (1944b) in having a row of spines on the distal





Pomacuma australiae (Zimmer). Fig. 33. Female from side. Fig. 34. Carapace from side. Fig. 35. First antenna. Fig. 36. Third maxilliped. Fig. 37. First peracopod. Fig. 38. Merus, ischium and distal end of basis of first peraeopod. Fig. 39. Second peraeopod. Fig. 40. End of plcon and right uropod. Fig. 41. Rami of uropod.

third of the outer margin of the exopod of the uropod, resembling in this respect *P. cognata* Hale. Hale points out that Zimmer figured three small subapical spines in this position. The New Zealand specimen has only four plumose setae on the inner margin of the exopod of the uropod where there are many in both *P. australiae* and *P. cognata* as illustrated by Hale, but these may have been lost. In other respects the specimen shows no important differences from Hale's description of the female.

Genus *Cyclaspis* G.O. Sars, 1865

Integument strongly calcified and brittle. First pedigerous somite seldom visible from above, the second rarely much longer than those following. Articular pegs nearly always present on the sides of the pleon somites. Only the first peraeopods bearing an exopodite. The second peraeopods with the ischium separated from the basis. Five pairs of pleopods in the male. The peduncle of the uropods never much shorter than the rami; the inner ramus of a single segment.

KEY TO THE SPECIES OF CYCLASPIS

- 1 No ridges or tubercles on the sides of the carapace (figs. 42, 43) *C. levis*
Sides of the carapace with ridges or tubercles or both (figs. 56, 68, 72, 90, 113) 2
- 2 Sides of carapace almost smooth with no projection below the pseudorostral suture (figs. 56, 59, 68, 69) 3
Sides of carapace not smooth with at least one projection below the pseudorostral suture (figs. 72, 74, 90, 92, 103) 4
- 3 Two ridges on each side of the carapace (figs. 56, 59) *C. argus*
Only one short faint ridge on each side of the carapace in the posterior half (figs. 68, 69) *C. thomsoni*
- 4 A depressed quadrilateral area on each side of the carapace, the edges defined by ridges or the corners marked by projections (figs. 72, 73, 90, 91) 5
No depressed quadrilateral areas on sides of carapace (figs. 94, 97, 103) 6
- 5 Quadrangular area on side of carapace with 4 tubercles (fig. 72) *C. elegans*
Quadrangular area on side of carapace with less than 4 tubercles (fig. 90) *C. similis*
- 6 Side of carapace with 3 obliquely transverse ridges (figs. 94, 97) *C. triplicata*
Side of carapace with 1 transverse curved ridge and in front a strong tubercle (fig. 103) *C. coelebs*

Cyclaspis levis Thomson, 1892 (figs. 42–55).

Thomson, 1892; Calman, 1907; Stebbing, 1913; Calman, 1917; Foxon, 1932; Zimmer, 1943b; Hale, 1944a, as *C. levis* and *C. calmani*.

Female: Integument smooth and highly calcified, with numerous shallow and inconspicuous pits.

Carapace about 2/7 of the total length, hardly compressed, its vertical height little more than half its length. The dorsal edge is distinctly keeled, the keel becoming flattened or faintly doubled posteriorly. The pseudorostrum is very short, the eyelobe reaching to its tip. The antennal notch is not widely open and the antennal tooth is not acute. The ocular lobe is slightly prominent on the dorsal surface and the eye shows a number of corneal lenses. There is a faintly marked ridge running backwards for a short distance from the antennal tooth.

The first pedigerous somite is visible from the sides only. The second somite has a distinct dorsal keel.

The abdomen is a little longer than the cephalothorax; its somites are subcylindrical, with lateral articular pegs and with a median dorsal and faint lateral keels.

The first antennae are short; the last two segments of the peduncle are about equal in length. The second antennae are composed of two segments, the first being bent almost at a right angle and bearing two large plumose setae, the second small and ending in three small setae.

The mouthparts are normal.

The third maxillipeds have the basis more than twice as long as the distal segments together; the basis is prolonged into a lobe which reaches half way along the merus; the merus is expanded and prolonged into a broad lobe; the carpus and propodus are broad and flattened; the dactylus is short and about half the length of the propodus.

The first peraeopods are of moderate length, extending beyond the tip of the pseudorostrum by less than 1/3 of the length of the carapace; the basis is hardly shorter than the distal segments together and is not produced into a tooth, but bears two densely plumose setae at the distal end; the dactylus is about 1/3 as long as the propodus and about equal in length to the carpus.

The peduncle of the uropods is equal to or about 1/5 longer than the last somite; the endopod is a little longer than the peduncle, acutely pointed at the tip, without an apical spine, with four spinules on its inner edge; exopod a little longer than the endopod, with a small apical spine and plumose setae on the inner edge.

Length, 6.0–7.5 mm.



Cyclops levis Thomson. Fig. 42. Ovigerous female from side. Figs. 43, 44. Male from side and from above. Fig. 45. Male first antenna. Fig. 46. Male third maxilliped. Fig. 47. Female first pereopod (after Calman, 1907). Figs. 48, 49. Male first pereopods. Figs. 50, 51, 52, 53. Male second, third, fourth, and fifth pereopods. Fig. 54. Female last somite and right uropod (after Calman, 1907). Fig. 55. Male last somite and left uropod.

Adult Male: Generally similar to female except for secondary sexual characters. Lenses of cyclope larger, antennal notch shallower and antennal tooth less prominent. Abdominal somites deeper owing to presence of pleural folds. Second antenna reaches to end of uropod peduncles. The first peraeopods have a number of small spines on the inner margin. The uropods have the peduncle and rami fringed with long plumose setae on their inner edges; the exopod is serrated on the inner edge and ends in a fairly long slender spine; the rami are subequal excluding the terminal spine.

Length, 7.0–8.0 mm.

Localities

PREVIOUSLY RECORDED: Bay of Islands, Lyttelton Harbour, Akaroa Harbour, Otago Harbour, Spirits Bay, Portobello (Thomson, 1892; Calman, 1907, 1917; Zimmer, 1943b). Possibly Queensland, Australia (Foxon, 1932).

KAPITI ISLAND: trevally stomach, 5 males. MENZIES BAY: coll. R. Pilgrim, 1953, 5 males; Aug. 1954, 7 males, 1 female. LYTTELTON HARBOUR, coll. R. Pilgrim, Oct 4 1954, 21 males, 1 juv. HAWKE BAY: NZOI Sta. B43, 1 male; B51, 1 male. COOK STRAIT: NZOI Sta. C388, 7 males, 5 females, 6 juv.; Sta. C395, 100+ males, 6 females, 7 juv. NORTH TARANAKI BIGHT: NZOI Sta. C351, 1 male.

Remarks

There can be little doubt, as pointed out by Calman (1907) and Hale (1944a), that Thomson's description and figures were incorrect for a number of characters. Calman assumed that Thomson's figure showing a long spiniform process at the distal end of the basis of the first peraeopod was a mistaken representation of two long plumose setae matted together with silt. Hale agreed with this interpretation and stated that Thomson's description of the ocular lobe and lenses was improbable but supposed that the remainder of Thomson's figures were reasonably accurate, erecting a new species, *C. calmani*, for Calman's specimens. There seems, however, to be no good reason for this course. Thomson's description is sufficiently clear for recognition of the species as it does not apply to any other species found up to the present in New Zealand waters, but in view of his other errors it can not be assumed that his figures of the uropods are accurate and that terminal spines are absent from both rami; the spines at the end of the exopods are frequently

broken off. In most, but not all, of the adult males the propodus of the first peraeopod is much longer than the carpus. It therefore seems unnecessary to separate Calman's specimens from those described by Thomson.

Zimmer (1943b) discussed the differences between some males examined by him and the females described by Calman (1907 and 1917) and concluded that his specimens were nearer to Thomson's original description. He doubted that Calman's form belonged to the same species mainly, apparently, because in his males the basis of the first peraeopod was much longer in proportion to the remaining segments than in Calman's females. In later collections, however, the proportions of the bases of the first peraeopods of the males (figs. 48, 49) show considerable variation with the size of the individual, from $1\frac{1}{2}$ to little more than the length of the other segments together. It seems probable that, while there is some individual variation in such characters as the relative proportions of the segments of the first peraeopods, the chief causes of confusion in the descriptions of *C. levis* are differences between the sexes and growth stages in either sex.

Cyclaspis argus Zimmer, 1902 (figs. 56–67).

Zimmer, 1902, as *C. argus* and *C. bistrinata*; Calman, 1907, as *C. biplicata*; Zimmer, 1913; Stebbing, 1913, as *C. bistrinata* (♂ as *C. argus*); Calman, 1917.

Female: Integument moderately calcified and finely pitted.

Carapace about $\frac{2}{7}$ of the total length, somewhat compressed, its height about $\frac{2}{3}$ of its length; the dorsal edge is moderately arched; a dorsal keel is present which is sharply defined and rises at the hind end into a more or less well marked broad tooth; on either side of the carapace are two parallel ridges, running obliquely forward and downward but not reaching the lower edge; they are not prominent and are better defined in some specimens than in others and may converge or remain separated at their upper ends; the eyelobe is broad and reaches nearly to the tip of the pseudo-rostrum; the eye contains about nine corneal lenses.

The first pedigerous somite is visible only at the sides. The second has the dorsal crest produced upwards into an acute tooth curving slightly forwards and as high as the hind end of the carapace. The posterior pedigerous and the anterior abdominal somites have a median dorsal keel sometimes becoming fainter posteriorly,

which may be elevated at the hinder end of each somite to give a serrated appearance to the dorsal outline of the abdomen.

The first antennae have the third segment of the peduncle longer than the second and the accessory flagellum is marked by a minute vestige. The second antennae are two-segmented. The mouthparts are normal.

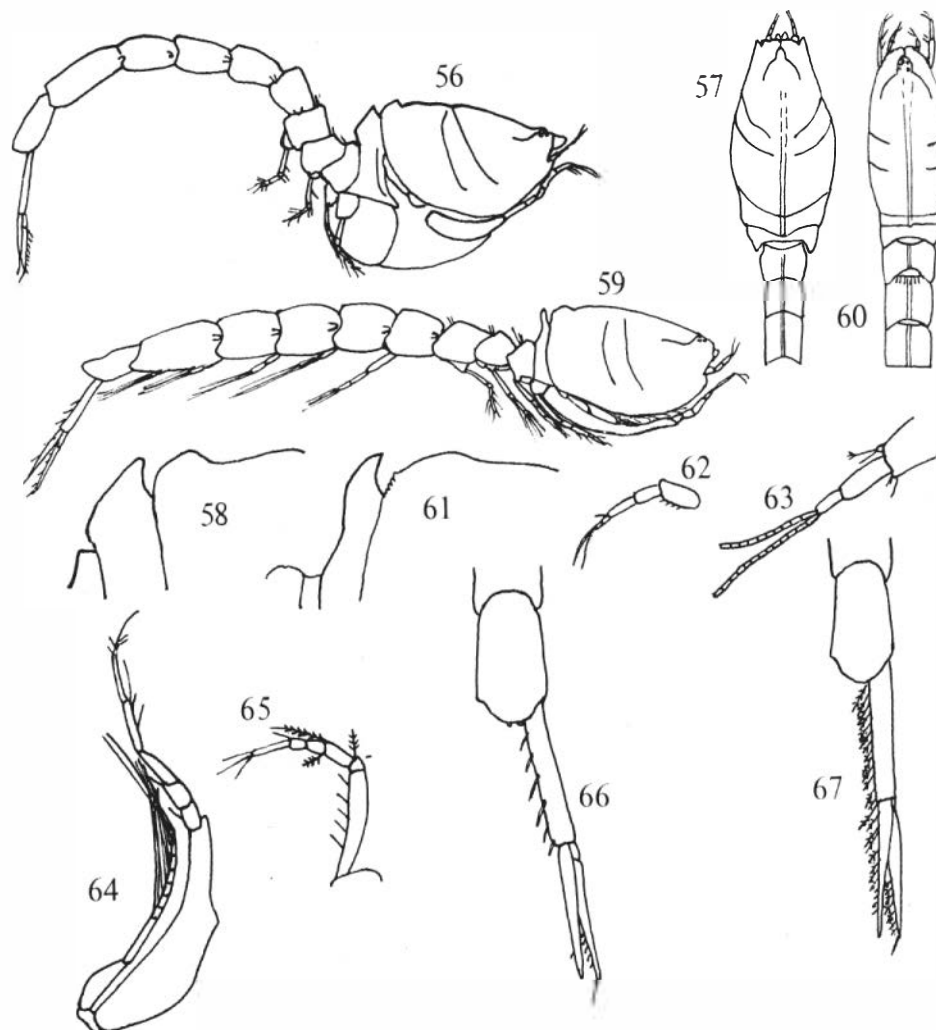
The basis of the first peraeopods is a little longer than the distal segments together; the dactylus is equal in length to the propodus.

The peduncle of the uropods is a little longer than the telsonic somite and has a few plumose setae on its inner edge; the rami are subequal or

the exopod a little longer than the endopod and are equal to or a little longer than the peduncle; the endopod has the inner edge serrated with a single seta near its tip; the exopod is slightly serrated, ending in a slender spine and it has several plumose setae on its inner edge.

Length, 3.6–5.1 mm.

Adult Male: Carapace less deep than in the female and dorsal outline less arched; eyelobe more prominent with lenses better developed; oblique ridges at sides of carapace less well defined and may be very faint; antennal notch more widely open and antennal tooth more obtuse.



Cyclops argus Zimmer. Figs. 56, 57. Female from side and front end from above. Fig. 58. Female dorsal outline of first free somite. Figs. 59, 60. Male from side and front end from above. Fig. 61. Male dorsal outline of first free somite. Figs. 62, 63. Female first antenna and distal end further enlarged. Figs. 64, 65. Female first and second peraeopods. Fig. 66. Female last somite and right uropod. Fig. 67. Male last somite and right uropod. (All after Calman, 1907.)

First pedigerous somite completely hidden; dorsal tooth on second somite more slender than in female.

First pereopods with basis about $1\frac{1}{2}$ as long as the distal segments together.

Uropods with more numerous plumose setae which are present also on the inner edge of the endopod.

Length, 4.0–6.0 mm.

Localities

PREVIOUSLY RECORDED: Bay of Plenty, Lyttelton Harbour, Spirits Bay (Zimmer, 1902; Calman, 1907, 1917).

MENZIES BAY: coll. R. Pilgrim, 1953, 21 males, 3 females; Aug. 1954, 272 males, 39 females, 20 juv. HAWKE BAY: Dom. Mus. BS143, 1 female; NZOI Sta. B38, 3 males, 1 female; B42, 4 males, 5 females; B43, 1 male. COOK STRAIT: NZOI Sta. C388, 12 males, 6 females; C395, 21 males, 1 female, 1 juv.

Cyclaspis thomsoni Calman, 1907 (figs. 68–71).

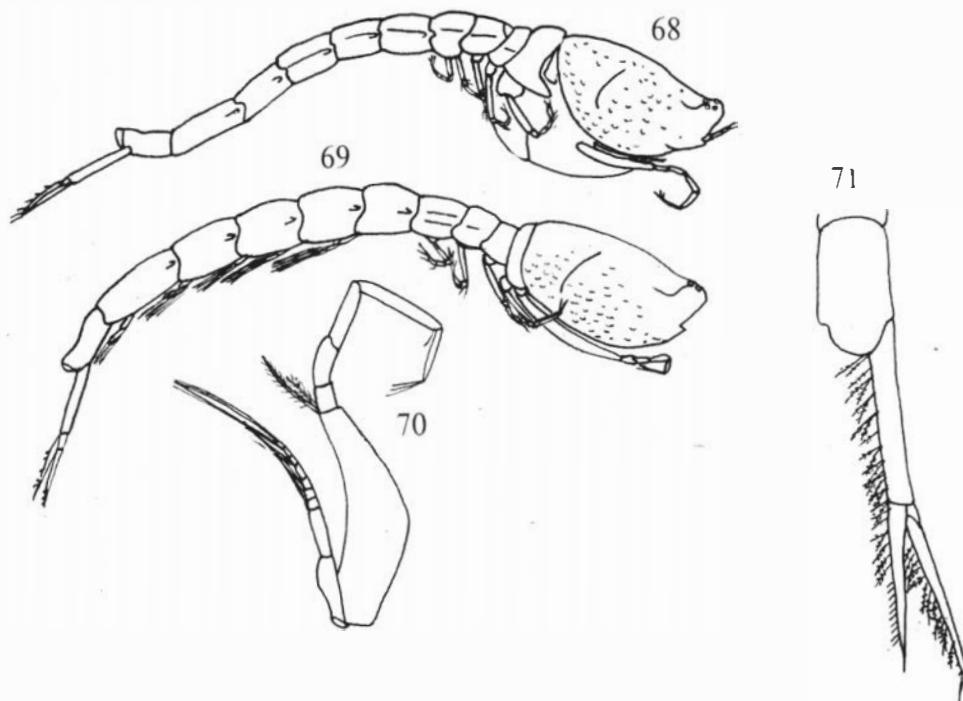
Calman, 1907; Stebbing, 1913; Calman, 1917.

Female: Integument of carapace with many fairly large shallow pits forming a reticulate network and giving it a rugose appearance.

Carapace a little more than $\frac{1}{4}$ of the total length, slightly compressed, its height a little more than half its length; the dorsal edge with a distinct keel which is flattened or faintly doubled posteriorly, slightly arched with a distinct concavity at the base of the pseudorostrum; pseudorostrum short, the eyelobe reaching to the tip of the lateral lobes; antennal notch rather widely open; antennal tooth triangular; on each side of the carapace, a little behind the middle of its length, is a short groove, limited behind by a faintly marked ridge, which is sometimes barely distinguishable, running obliquely downwards and backwards; a slight ridge runs backwards for a short distance from the antennal tooth; eyelobe with lenses distinct.

The first pedigerous somite exposed at the sides only; the second with a distinct dorsal keel, third and fourth with lateral ridges, fifth with a double lateral ridge.

The abdomen a little longer than the cephalothorax; the somites subcylindrical with a distinct median dorsal and lateral keels and the usual lateral articular pegs.



Cyclaspis thomsoni Calman. Fig. 68. Ovigerous female from side. Fig. 69. Male from side. Fig. 70. Female first pereopod. Fig. 71. Male last somite and right uropod. (All after Calman, 1907.)

First pereopods of moderate length, the basis a little shorter than the distal segments together, with two plumose setae at the distal end; the dactylus is between $\frac{2}{3}$ and $\frac{3}{4}$ as long as the propodus and about $\frac{3}{4}$ as long as the carpus.

The peduncle of the uropod is nearly $\frac{1}{4}$ longer than the last somite; the endopod is a little shorter than the peduncle, acutely pointed at the tip, without an apical spine, with four spinules on its inner edge; the exopod is a little longer than the endopod, with a slender apical spine and a series of plumose setae on its inner edge.

Length, 6 mm.

Adult Male: Similar to female but pseudorostrum rather less prominent and ocular lobe distinctly projecting beyond lateral lobes; surface of carapace smoother than in the female, the oblique groove only faintly marked.

First pedigerous somite quite concealed.

Abdominal somites with median dorsal but no lateral keels.

Uropods with rami less unequal than in female; peduncle nearly $\frac{1}{3}$ longer than the last somite and beset with long plumose setae; endopod with about nine spinules and a series of plumose setae on its inner edge.

Length, 6.8 mm.

Localities

PREVIOUSLY RECORDED: Bay of Islands, 8 fm; Spirits Bay, surface (Calman, 1907, 1917).

DEVONPORT WHARF, AUCKLAND: coll. M. C. Miller, 7 Aug 1960, 3 fm, townet after dark, 5 males, 7 females, 26 juv.; coll. 18 Sep 1960, 6 females, 1 juv.

Remarks

C. thomsoni is very closely related to *C. levis* and the differences described between the two species are slight.

Cyclaspis elegans Calman, 1907 (figs. 72–89).

Calman, 1907; Stebbing, 1913; Calman, 1917.

Female: Integument well calcified and brittle, sometimes coarsely granulated.

Carapace about $\frac{1}{3}$ of the total length and its height about $\frac{2}{3}$ of its length; on each side is a quadrilateral area bounded by ridges, which rise at the corners into four prominent tubercles,

occupying the greater part of the lateral surface; its upper margin is sinuous and its posterior margin parallel to the posterior border of the carapace; the lower horizontal ridge is produced in front and behind to the edge of the carapace, and the upper is continued forward on to the side of the pseudorostrum; there is a well marked, obscurely granulated, median dorsal keel which rises at its posterior end into a blunt tooth; eyelobe a little longer than broad, reaching nearly to the tip of the pseudorostrum, and with about nine corneal lenses.

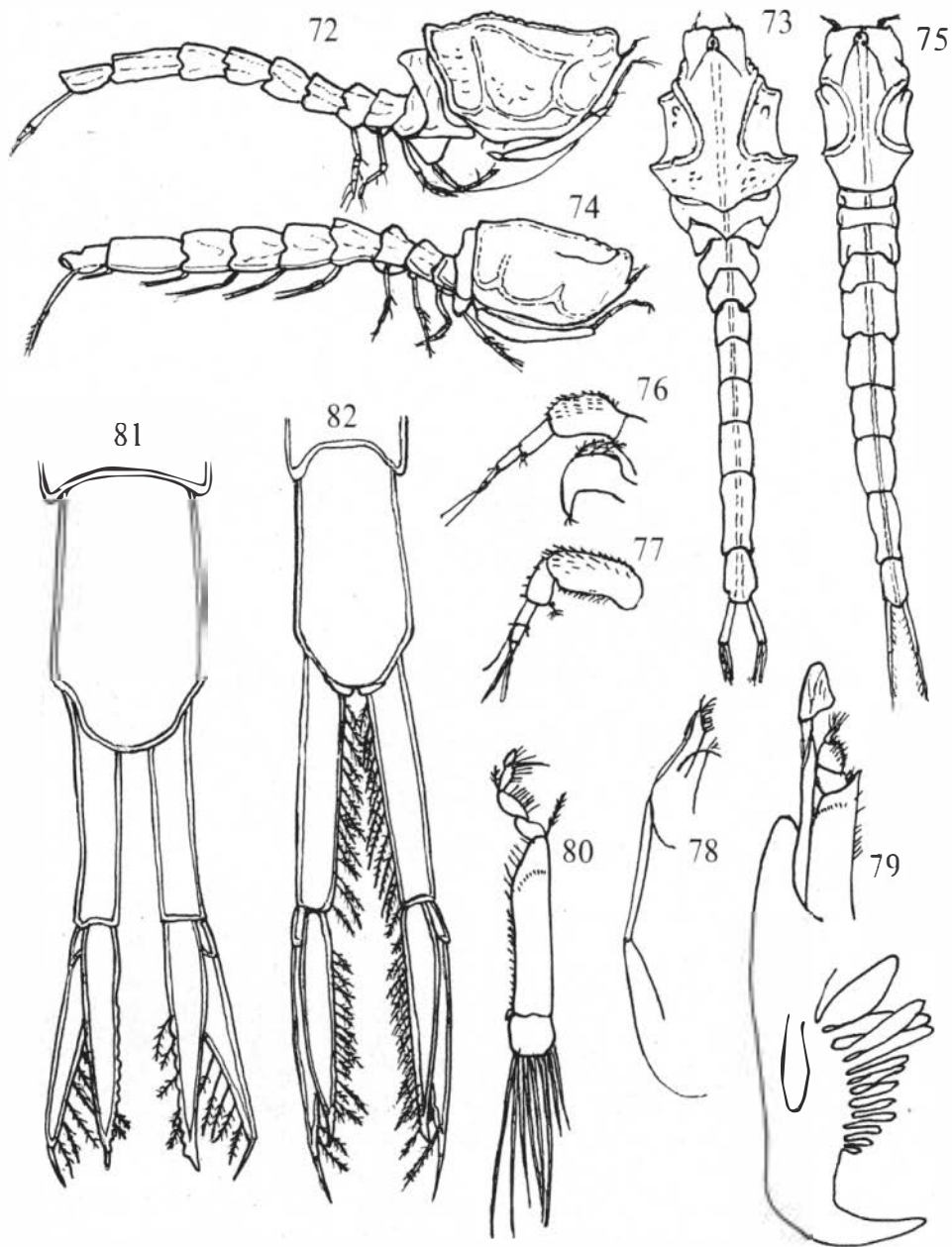
First pedigerous somite almost entirely concealed; the second large, nearly equal in height to the carapace, with a dorsal crest produced backwards into a sharp tooth and with the lateral plates expanded; the posterior thoracic somites have a median dorsal keel, which is continued on all the abdominal somites except the last; there are less distinct dorso-lateral ridges on the last two thoracic somites and the first two abdominal somites; the first five abdominal somites have lateral articular pegs anteriorly.

First antenna with the first segment the longest and stoutest; the flagellum two-segmented, about as long as the last peduncular segment and tipped by two aesthetascs; accessory flagellum quite vestigial. Second antenna with a long and slender external process which is not segmented off from the basal part.

Mandibles with about 18 spines on the inner edge. The labium has the tip of each lobe sharply bent inwards and armed with a group of peculiar spatulate spines. First maxilla about $1\frac{1}{2}$ as long as the distance between its base and the tip of the distal lobe, with two long setae.

First maxilliped with the basis long, about $1\frac{1}{2}$ as long as the distal segments together; the terminal segment is very small; the branchial apparatus is well developed; the epipod is produced forwards nearly as far as the end of the basis and bears about 13 branchial lobes. Second maxilliped slender, its basis about $1\frac{1}{2}$ the length of the remaining segments together; there are about 12 long setae on the basal lamina. The third maxilliped has the basis sharply bent outwards about the middle of its length, and about twice as long as the distal segments together, with its expanded distal prolongation reaching to about half the length of the merus; the merus has a broad lobe and the carpus and propodus are widened.





Cyclops elegans Calman. Figs. 72, 73. Female from side and from above. Figs. 74, 75. Male from side and from above. Fig. 76. Female first and second antennae. Fig. 77. Male first antenna. Fig. 78. Female first maxilla. Figs. 79, 80. Female first and second maxillipeds. Fig. 81. Female last somite and uropods. Fig. 82. Male last somites and uropods. (All after Calman, 1907.)

The first pereopods have the basis longer than the rest of the appendage, its distal end not produced; the propodus is rather longer than the dactylus or carpus. Dactylus of second pereopods with three terminal but no lateral spines.

Uropods with peduncle slightly shorter than the last somite, the rami subequal and about equal in length to the peduncle; the endopod slightly curved upwards and outwards at the tip, the distal half of its inner edge strongly serrated and bearing a small pectinate spine; the exopod with a short apical spine and a series of plumose setae on its inner edge.

Length, 6.0–6.5 mm.

Adult Male: Carapace about $\frac{2}{3}$ of total length, its height little more than half its length; dorsal outline less strongly arched than in the female; the ridges defining the depressed areas on the lateral surfaces are less prominent and only the anterior upper tubercle is prominent; the upper horizontal ridge does not meet the posterior vertical ridge; the eyelobe and lenses are larger than in the female; the antennal notch is shallower.

The first pedigerous somite is entirely concealed; the second is as high as the posterior end of the carapace, with its dorsal crest rounded, not produced, and the lateral plates not expanded. The dorso-lateral keels of the last two thoracic and first two abdominal somites are more strongly

developed than in the female. The abdominal somites are much stouter than in the female and have their pleural plates expanded.

The second antenna reaches to the end of the body, the segments of its flagellum short. The branchial apparatus of the first maxilliped has about 17 branchial lobules.

The uropods are longer than in the female; the peduncle about twice as long as the last somite and fringed along the inner edge with plumose setae; the rami about equal in length to the peduncle, the endopod slightly the shorter, with plumose setae on its inner edge.

Length, 6.2–6.5 mm.

Localities

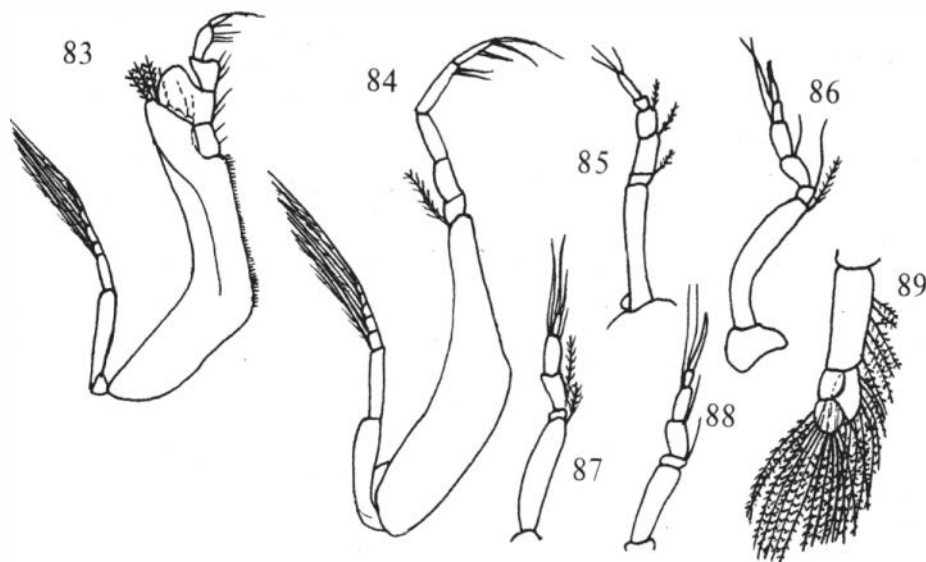
PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm; Spirits Bay, 3 m depth (Calman, 1907, 1917).

HAWKE BAY: Dom. Mus. BS143, 1 male, 1 female; NZOI Sta. B42, 2 males, 1 female, 1 juv. COOK STRAIT: NZOI Sta. C486, 1 male, 4 females.

Cyclaspis similis Calman, 1907 (figs. 90–93).

Calman, 1907; Stebbing, 1913; Calman, 1917.

Female: Integument well calcified and brittle; carapace sparsely tuberculated.



Cyclaspis elegans. Fig. 83. Female third maxilliped. Figs. 84, 85, 86, 87, 88. Female first, second, third, fourth, and fifth pereopods. Fig. 89. Pleopod. (All after Calman, 1907.)



Resembling *C. elegans* in shape and proportions of body, but lateral depressed areas usually less excavated, only the anterior upper tubercle being prominent though low tubercles may be present at the anterior lower and posterior upper corners of the areas; the lower horizontal ridge is continued forwards to the edge of the carapace, but posteriorly it is continued with an even curve into the posterior vertical ridge and does not extend to the posterior edge; the posterior vertical ridge forks into two divergent branches at its upper end; the upper margin of the depressed area may or may not be completely closed.

The first pedigerous somite is exposed only at the sides except in ovigerous specimens, when it may be visible as a narrow band dorsally; the dorsal crest of the second is produced backwards into a large rounded lobe. The remaining somites are similar to those of *C. elegans* but the dorso-lateral crests are stronger and are continued as far as the fifth abdominal somite.

The appendages are similar to those of *C. elegans* but their distal segments are relatively longer. In the third maxilliped the distal lobe of the basis is more acute and much longer relative to the basis itself. In the first pereopod the distal segments together are longer than the basis.

The peduncle of the uropods is shorter than the last somite and is finely serrated internally; the rami are shorter than the peduncle; the endopod is not curved at the tip as in *C. elegans* and is less strongly serrated internally; the exopod has an apical spine and some plumose setae on its inner edge.

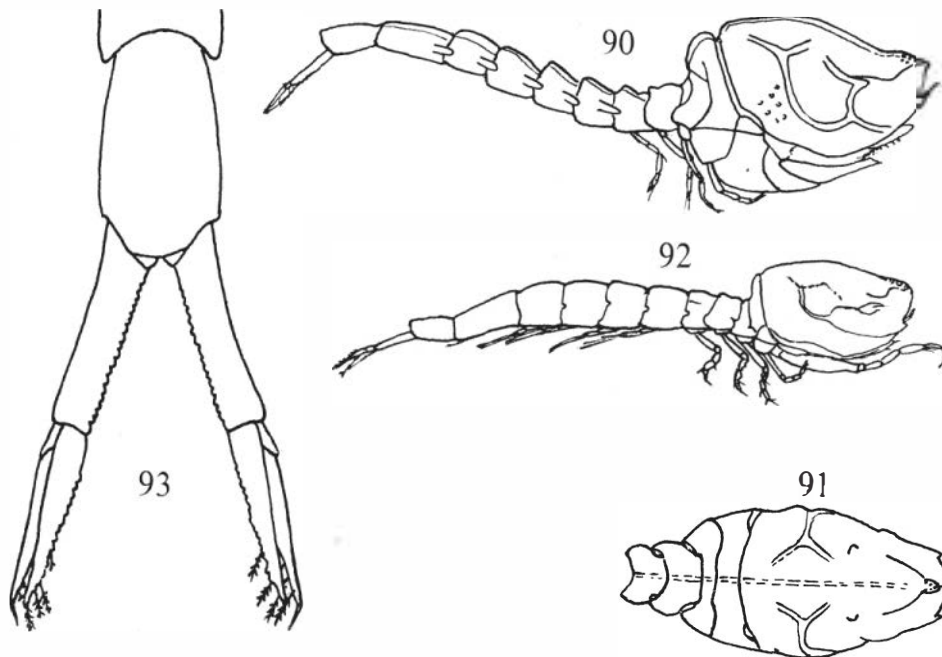
Length, 4.7–5.8 mm.

Adult Male: General form agrees with that of the male of *C. elegans* but the disposition of the ridges of the carapace resembles that of its own female. The lateral enclosed area is relatively smaller than in the female. The carapace differs from that of the male of *C. elegans* in having no tubercle at the posterior lower corner of the enclosed area (though this tubercle may be inconspicuous in *C. elegans*) and no ridge running from it to the hinder margin, while the posterior vertical ridge forks at its upper end.

Length, 5.6 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm; Spirits Bay, 20 m to surface (Calman, 1907, 1917). Possibly Queensland, Australia (Foxon, 1932).



Cyclops similis Calman. Figs. 90, 91. Female from side and front end from above. Fig. 92. Male from side. Fig. 93. Female last somite and uropods. (All after Calman, 1907, 1917.)

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CANTERBURY BIGHT: *Lachlan* Sta. 337/51B, 1 female. DEVONPORT WHARF, AUCKLAND: coll. M. C. Miller, 18 Aug 1960, 3 fm, tow net after dark, 2 males. LYTTTELTON HARBOUR: coll. R. Pilgrim, 4 Oct 1954, 1 male. COOK STRAIT: NZOI Sta. C388, 1 male; C395, 3 males, 2 females. NELSON WHARF: NZOI Sta. A467, 2 males, 14 females, 12 juv.

***Cyclaspis triplicata* Calman, 1907 (figs. 94–102).**

Calman, 1907; Stebbing, 1913.

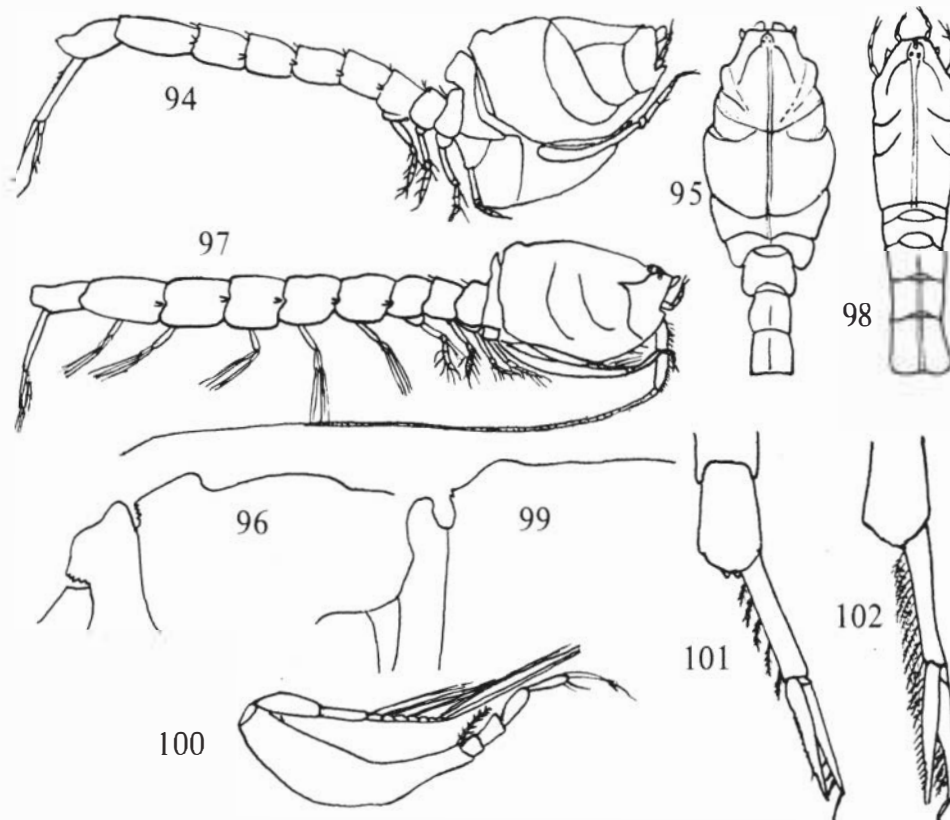
Female: Very similar in form to *C. argus* but the carapace more inflated posteriorly; the two oblique ridges on either side are much more prominent, while in front is a prominent tubercle, occupying about the position of the anterior upper tubercle in *C. elegans*, from which a third nearly vertical ridge runs downwards and joins a prolongation of the anterior oblique ridge which turns horizontally forwards to the anterior lower edge

of the carapace; the tooth at the posterior end of the dorsal keel is slightly different in shape from that of *C. argus* and has the hinder edge finely serrated.

The dorsal crest of the second pedigerous somite differs from that of *C. argus* in having the upper angle blunt, the oblique dorsal edge sinuous, and the posterior angle prominent and overhanging the third somite. The median keel is faint on the posterior thoracic and anterior abdominal somites, but a pair of lateral keels, not present in *C. argus*, are developed on the last two thoracic and first three abdominal somites.

First antennae with the third segment of the peduncle a little shorter and stouter than in *C. argus*.

First peraeopods shorter than in *C. argus*; the basis is $1\frac{1}{2}$ the length of the distal segments combined. Hinder peraeopods with longer and more numerous setae.



Cyclaspis triplicata Calman. Figs. 94, 95. Ovigerous female from side and front end from above. Fig. 96. Female dorsal outline of first free somite. Figs. 97, 98. Male from side and front end from above. Fig. 99. Male dorsal outline of first free somite. Fig. 100. Female first peraeopod. Fig. 101. Female last somite and right uropod. Fig. 102. Male last somite and right uropod. (All after Calman, 1907.)



Uropods similar to those of *C. argus* but a little stouter.

Length, about 4.0 mm.

Adult Male: Closely resembles that of *C. argus* but distinguished by the presence of the additional anterior ridge on the carapace, rising above into a blunt tubercle. The last two thoracic and first abdominal somites have strongly marked dorso-lateral ridges, the dorsal tooth of the second pedigerous somite is shorter and more curved, and the first pereopods are shorter than in *C. argus*.

Length, about 4.0 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm. (Calman, 1907).

HAWKE BAY: NZOI Sta. B37, 2 females; B38, 1 male; B42, 2 males; B43, 1 male.

Cyclaspis coelebs Calman, 1917 (figs. 103–106).

Calman, 1917.

Female: Unknown.

Adult Male: Resembling in general form the male of *C. thomsoni* but with the carapace shorter and deeper, its height being about $\frac{2}{3}$ instead of little over $\frac{1}{2}$ its length; surface of carapace obscurely and irregularly rugose or pitted; on either side below the lateral parts of the pseudorostral suture is a broadly rounded prominence, somewhat elongated lengthwise, occupying the position of the anterior upper tubercle in *C. elegans*; behind the middle of the carapace is a faintly marked oblique ridge inclined backwards and downwards

and dying out below in the general rugosity of the surface; a prominent curved ridge runs backwards from the antennal tooth; the eye lenses are conspicuous, 11 being visible.

The last thoracic and all the abdominal somites show a median dorsal but no lateral keels.

The first pereopods have the basis nearly $1\frac{1}{4}$ as long as the distal segments together; propodus longer than carpus; dactylus less than $\frac{2}{3}$ as long as propodus.

Peduncle of uropod $1\frac{1}{3}$ as long as the last somite and slightly longer than the rami; exopod with an apical spine and plumose setae on its inner edge; endopod sharply pointed, serrated on its inner edge, with a series of pectinate setae followed by five or six spines; peduncle with plumose setae on its inner edge.

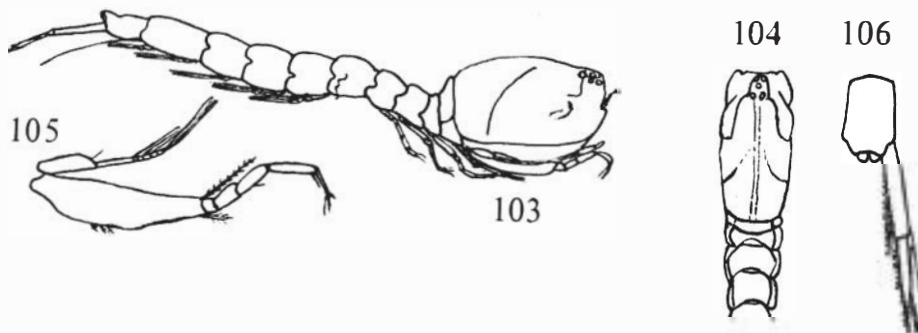
Length, about 5.6 mm.

Localities

PREVIOUSLY RECORDED: Spirits Bay, 20 m to surface (Calman, 1917). Also recorded from the Andaman Islands by Kurian (1956) but identification doubtful.

Family LEUCONIDAE G. O. Sars, 1878

Eight genera and about 71 species, of which six genera and nine species have been obtained from New Zealand.



Cyclaspis coelebs Calman. Figs. 103, 104. Male from side and front end from above. Fig. 105. First pereopod. Fig. 106. Last somite and right uropod. (All after Calman, 1917.)

KEY TO THE GENERA OF LEUCONIDAE

- 1 Pseudorostrum distinct and produced forwards, with the efferent orifice at the front (figs. 108, 124, 143) 2
- Carapace truncate anteriorly with the antero-lateral lappets curved backwards; efferent orifice dorsal (figs. 169, 180) 5
- 2 Male has 2 pairs of pleopods (p. 39) **Leucon**
Male has only 1 pair of pleopods or 0 (figs. 131, 145, 158, 163) 3
- 3 First two pairs of peraeopods only have exopods in either sex (figs. 143, 145) (p. 44)
Heteroleucon
First three pairs of peraeopods in female and first four in male have exopods (figs. 123, 125, 156, 158) 4
- 4 One pair of pleopods in the male (fig. 125) (p. 42) **Paraleucon**
No pleopods in the male (fig. 163) (p. 46)
Hemileucon
- 5 Endopod of the uropod shorter than the exopod (fig. 183) (p. 49) **Eudorellopsis**
Endopod of the uropod longer than the exopod (fig. 178) (p. 47) **Eudorella**

Genus **Leucon** Kröyer, 1846

Pseudorostrum well developed with the efferent orifice anterior. Carapace with a median dorsal serrated crest in the female, generally smooth in the male. Eye rarely developed. Female second antenna with the distal segment well defined. The first three in the female and first four pairs of peraeopods in the male with well developed exopodites. Male with two pairs of pleopods.

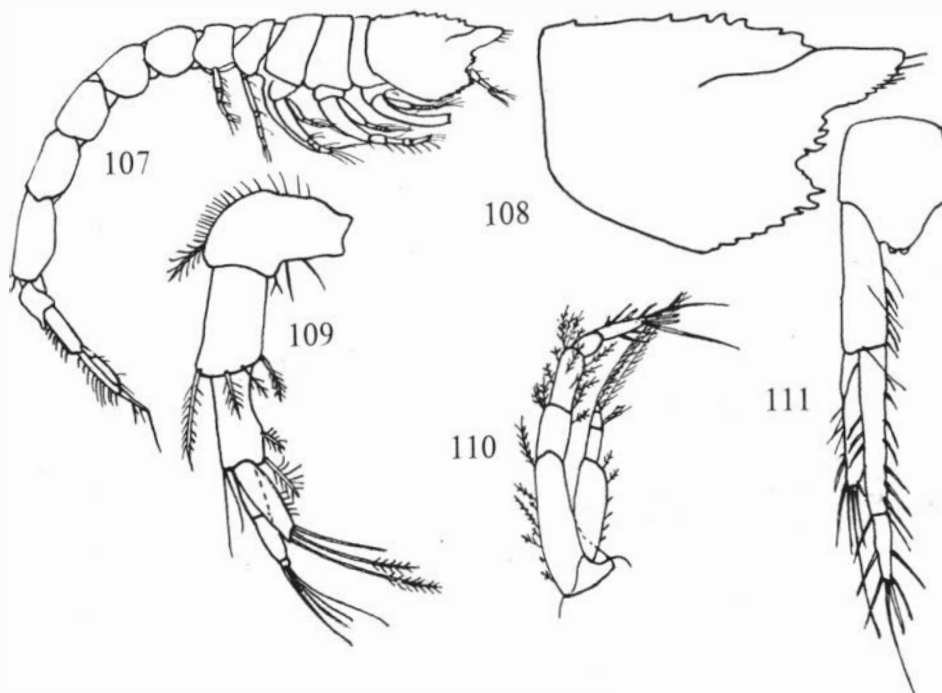
The two New Zealand species following are provisionally placed in this genus but until male specimens are found their generic position remains doubtful.

KEY TO THE SPECIES OF *Leucon*

- Exopod of the uropod shorter than the first segment of the endopod (fig. 111) **L. (?) heterostylis**
Exopod of the uropod a little longer than the first segment of the endopod (fig. 122) **L. (?) latispina**

Leucon (?) heterostylis Calman, 1907 (figs. 107-111).
Calman, 1907; Stebbing, 1913.

Female: Carapace a little more than $\frac{1}{3}$ of the total length, its height less than $\frac{3}{4}$ of its length; the dorsal edge is nearly straight, coarsely and somewhat irregularly serrated in the anterior half, with a small denticle near the posterior end and in front of it a shallow depression; pseudorostrum straight, horizontal, acute, measuring along its upper edge about $\frac{1}{4}$ of the total length of the carapace; the antennal notch forms a deep rounded sinus in the antero-lateral margin, which, above the notch, has about four coarse teeth; on the antero-lateral corner begins a series of strong acute teeth, diminishing to faint serrations on the lower margin; the side of the carapace is smooth.



Leucon (?) heterostylis Calman. Fig. 107. Female from side. Fig. 108. Carapace from side. Fig. 109. First antenna. Fig. 110. Second peraeopod. Fig. 111. Last somite and left uropod. (All after Calman, 1907.)

The abdomen is longer than the cephalothoracic region and is stout, the first two somites not longer than broad.

The first antennae have the first segment of the peduncle longer than the second, which is again a little longer and stouter than the third; the flagellum is a little longer than the last segment of the peduncle and is composed of three segments, the first and second subequal and the third minute; the accessory flagellum is unjointed and is nearly equal to the first two segments of the main flagellum together. The second antennae have three segments, the basal with three plumose setae.

The branchial apparatus of the first maxillipeds has two small papilliform lobules on its posterior part.

The second peraeopods have the ischium only partly separated.

Uropods with the peduncle longer than the last somite and about three times as long as broad; rami very unequal, the exopod being shorter than the peduncle and a little more than half the length of the endopod, which is composed of two segments, the proximal $2\frac{1}{2}$ times as long as the distal; there are about 10 slender spines on the inner edge and two unequal spines at the tip, while the outer edge bears a series of stout setae; the exopod bears a series of long setae on the inner edge and at the tip and some short setae on the outer edge.

Length, about 3.4 mm.

Adult Male: Unknown.

Locality

PREVIOUS RECORD: Akaroa Harbour, 6 fm (Calman, 1907).

Leucon (?) latispina sp. n. (figs. 112–122).

Female: Carapace about $\frac{1}{4}$ of the total length, its height about $\frac{2}{3}$ of its length, the dorsal edge arched in front and depressed at the hind end, with 5–7 irregularly spaced teeth on the front half; integument smooth with short scattered setae; a depression is present on each side in the branchial area; pseudorostrum long and pointed, upturned at the front, about $\frac{2}{3}$ of the total carapace length, its lower part faintly serrated; antennal notch forming a fairly deep sinus in the antero-lateral margin, with about four teeth above it; below the sinus is a downward pointing tooth followed by a diminishing series of about 12 teeth ending on the lowest part of the carapace.

There are five free pedigerous somites, their pleural parts prominent. The pleon is longer than the cephalothorax; the fifth pleon somite is long; the telsonic somite is slightly longer than wide and its distal part projects backwards over the bases of the uropods. The fifth thoracic sternite carries three forwardly directed hooked spines on a projection between the peraeopods and a pair of smaller spines is present on a ventral projection of the first pleon somite.

The first antennae have the three segments of the peduncle diminishing in size distally; the flagellum has three segments, the third short, together about twice as long as the third segment of the peduncle; the accessory flagellum, of one segment, is a little shorter than the first segment of the main flagellum. The second antennae have three segments, the basal with two stout plumose setae, the short second with one more slender seta, and the longer distal segment ending in two small pinnate setae.

The mouthparts are of normal type for the genus. The mandibles have the body widened, triangular in form, and there are only two small setae behind the cutting edge. The first maxillae have only one filament on the palp. The branchial apparatus of the first maxillipeds carries only about five papilliform branchial lobules. The third maxilliped carries an exopod; its basis is short and broad, only about as long as the distal segments together, with the distal end produced and bearing three stout plumose setae; the merus has a small spine on the upper edge and one large plumose seta.

The first three pairs of peraeopods have well developed exopods. The first has the basis about $\frac{2}{3}$ of the length of the remaining segments together, its lower edge strongly serrated; the carpus is slightly longer than the ischium and merus together; the propodus is about the same length as the carpus and about twice as long as the dactylus, which carries a series of setae diminishing in length proximally. The second peraeopods have the basis about $\frac{2}{3}$ as long as the remaining segments together; the ischium is not separated; the basis and merus each carry a strong spine on the lower distal edge; the dactylus is about twice as long as the propodus and carries seven distal one-pinnate spines. The third and fourth peraeopods have the basis much longer than the remaining segments together; the ischium and merus each have two and the carpus 5–7 strong plumose setae, all reaching beyond the tip of the dactylus, which is small and ends in a long spine, with a

similar spine springing from the propodus. The fifth peraeopod is about $\frac{1}{3}$ the length of the fourth.

The uropods have the peduncle slightly longer than the rami, with about seven spines on its inner edge; the two-segmented outer ramus is slightly longer than the proximal segment of the inner ramus, of which the distal segment is about $\frac{1}{3}$ as long as the proximal; the exopod has about eight long and slender plumose setae on the outer edge of the distal segment, which ends in three unequal setae; the endopod has about eight compound setae on the inner edge of the proximal segment and three and one respectively on the inner and outer edges of the distal segment, which ends in an unusually broad spine, with a long plumose seta beside it.

Length, 4.8 mm.

Adult Male: Unknown.

Type

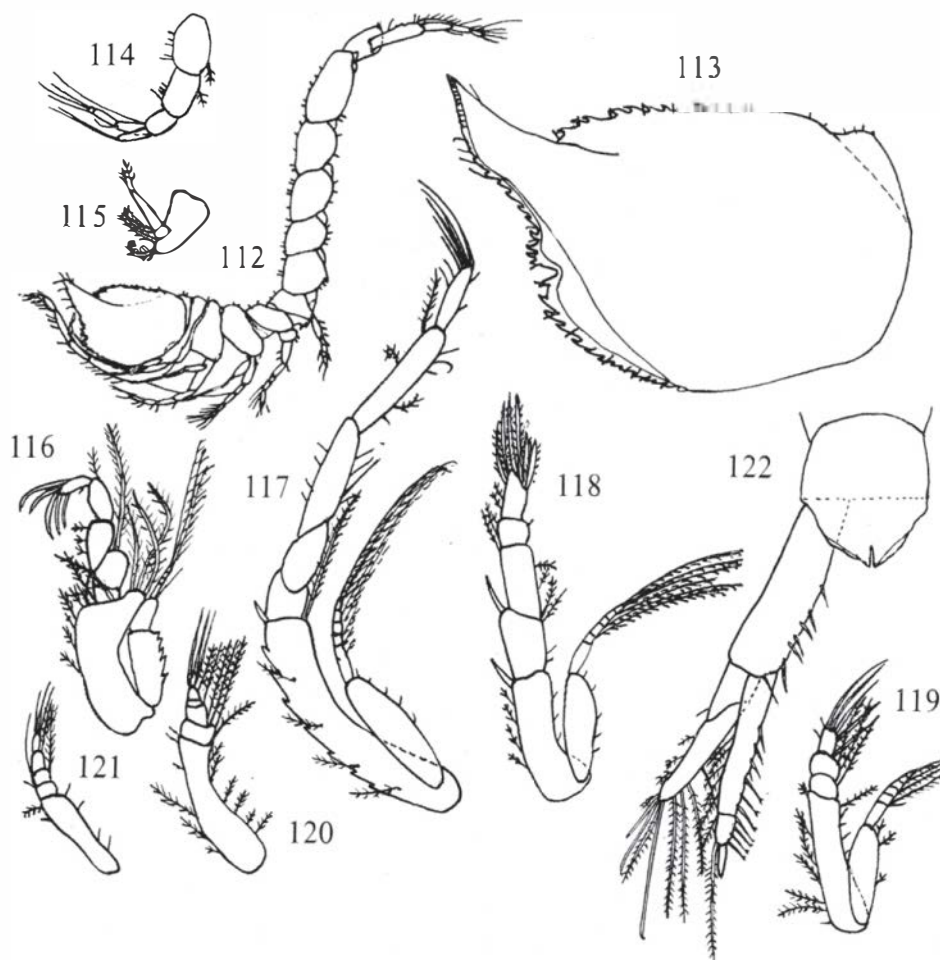
Deposited in the N.Z. Oceanographic Institute; No. 4.

Localities

HAWKE BAY: NZOI Sta. B56, 1 female; B59, 1 female; B60, 1 female; B61, 1 female; B62, 2 females, 1 juv.

Remarks

This species may be distinguished from *L. (?) heterostylis* by its more slender and upturned pseudorostrum and the different proportions of the segments of the two rami of the uropods. The female bears a closer resemblance still to



Leucon (?) latispina sp. n. Fig. 112. Female from side. Fig. 113. Carapace from side. Figs. 114, 115. First and second antennae. Fig. 116. Third maxilliped. Figs. 117, 118, 119, 120, 121. First, second, third, fourth, and fifth peraeopods. Fig. 122. Last somite and left uropod.



L. longirostris G. O. Sars than to *L. (?) heterostylis* in the shape and spinulation of the carapace, fifth thoracic sternite, basis of the first peraeopods, second peraeopods and the uropods. The pseudo-rostrum, however, is relatively shorter and more concave dorsally than in Sars' species and the basis of the second peraeopods is relatively shorter.

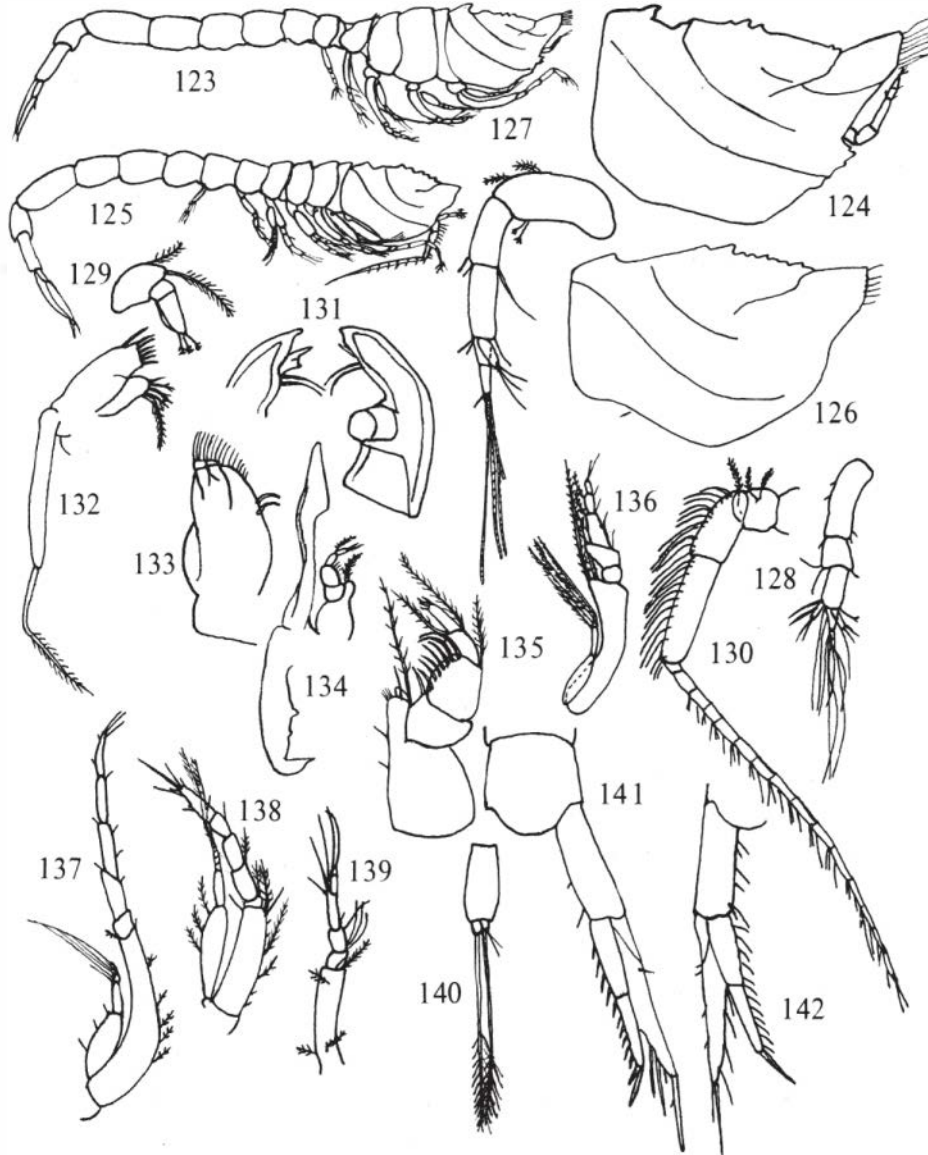
Genus **Paraleucon** Calman, 1907

Differing from *Leucon* in having only one pair of pleopods in the male sex.

Paraleucon suteri Calman, 1907 (figs. 123–142).

Calman, 1907; Stebbing, 1913.

Female: Carapace more than $\frac{1}{3}$ of the total length; compressed; its height a little more than



Paraleucon suteri Calman. Figs. 123, 124. Female from side and carapace from side. Figs. 125, 126. Male from side and carapace from side. Fig. 127. Female first antenna. Fig. 128. Male first antenna. Fig. 129. Female second antenna. Fig. 130. Male second antenna. Fig. 131. Female right and part of left mandible. Figs. 132, 133. Female first and second maxillae. Figs. 134, 135. Female first maxilliped. Fig. 136. Female third maxilliped. Figs. 137, 138, 139. Female first, second, and fourth peraeopods. Fig. 140. Pleopod. Fig. 141. Female last somite and right uropod. Fig. 142. Male last somite and left uropod. (All after Calman, 1907.)



$\frac{2}{3}$ of its length; the dorsal edge is nearly straight, keeled, with a large tooth near the hind margin overhanging a rounded excavation, in front of which are a number of irregular serrations; pseudo-rostrum straight, directed obliquely upwards and sharply pointed; its upper edge is less than $\frac{1}{4}$ of the total length of the carapace; antennal notch well marked and angular, defined below by a triangular tooth, below which the anterior part of the lower margin is obscurely serrated; on each side of the carapace are three subparallel ridges curving obliquely downwards and forwards.

The abdomen is longer than the cephalothorax.

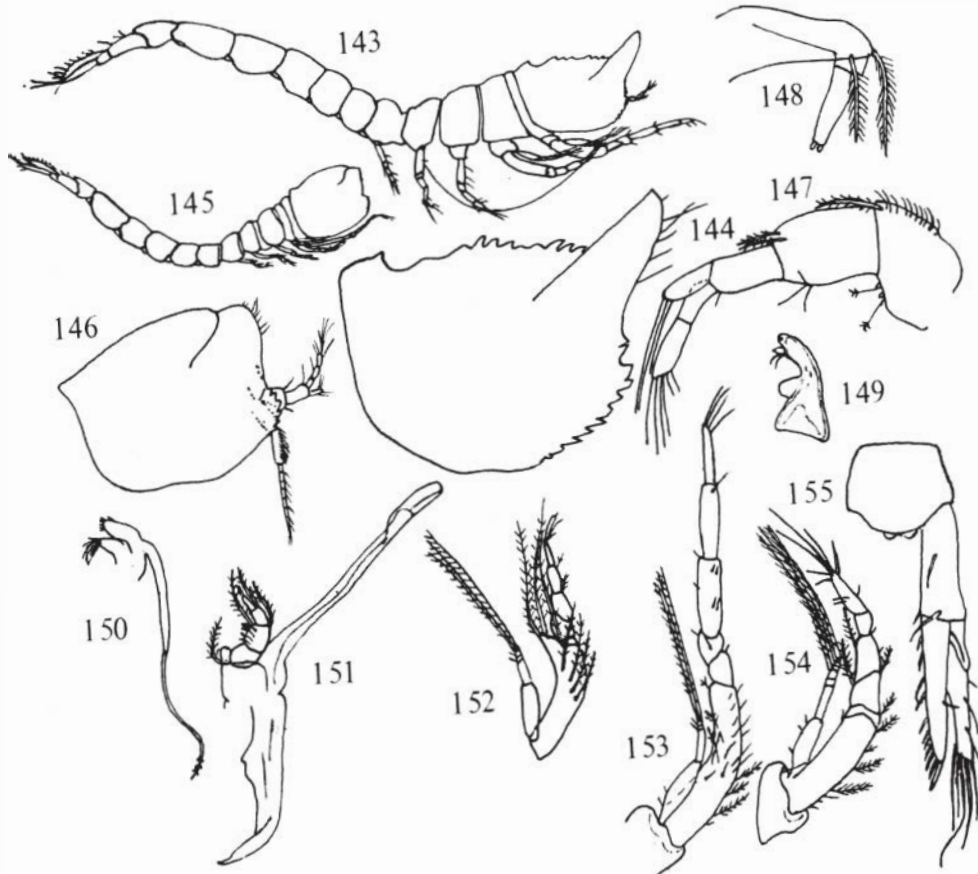
The first antennae have the first segment of the peduncle little stouter than the second and shorter than the second and third together; flagellum three-segmented and shorter than the third segment of the peduncle; accessory flagellum unjointed and about equal to the first segment of the main

flagellum. Second antennae of three segments, the proximal with two plumose setae.

Mouthparts of the usual Leuconid type. The second maxillae have two or three small setae on the distal part of the inner edge. Branchial system reduced, the lobules being represented only by two small papillae.

The first peraeopods extend beyond the pseudo-rostrum by little more than the length of their last segment; the basis is a little shorter than the remaining segments together, and the dactylus is nearly as long as the propodus; the exopod is shorter than the basis. The second peraeopods have the ischium distinct and the dactylus is longer than the carpus.

The uropods have the peduncle a little longer than the last somite and about $3\frac{1}{2}$ times as long as it is thick, with one or two minute setae on its inner



Heteroleucon akaroensis Calman. Figs. 143, 144. Female from side and carapace from side. Figs. 145, 146. Male from side and carapace from side. Figs. 147, 148. Female first and second antennae. Fig. 149. Female mandible. Fig. 150. Female first maxilla. Figs. 151, 152. Female first and third maxillipeds. Figs. 153, 154. Female first and second peraeopods. Fig. 155. Female last somite and right uropod. (All after Calman, 1907.)



edge; the endopod is about $1\frac{1}{4}$ times as long as the peduncle, somewhat indistinctly divided into two subequal segments, with about 12 spines on its inner edge and two unequal terminal spines; the exopod is a little longer than the endopod, with a slender terminal spine and a series of setae on its inner edge.

Length, about 2.9 mm.

Adult Male: Teeth of dorsal crest of carapace in some specimens only a little less marked than in the female, in others almost obsolete; pseudorostrum horizontal, truncated, about $\frac{1}{6}$ of the total length of the carapace; no antennal notch or tooth, the antero-lateral corner rounded off with a few obscure serrations; only two oblique ridges present on each side of the carapace, corresponding to the two posterior ridges of the female.

The first antennae have the second and third segments of the peduncle shorter than in the female and together shorter than the first segment. The second antennae have a very short flagellum, not more than twice as long as the peduncle and not extending back beyond the first free thoracic somite in the natural position.

Exopods are present on all except the last pair of pereopods. Only the first abdominal somite bears pleopods and these are very small; the peduncle is twice as long as broad and bears two minute unjointed rami; each ramus has a single long plumose seta and the outer has in addition one or two short simple setae.

Uropods hardly differing from those of the female, having only a few additional small setae on the inner edge of the peduncle.

Length, about 2.4 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm, 5.97; Akaroa Harbour, 6 fm, 8.97 (Calman, 1907).

Genus *Heteroleucon* Calman, 1907

Generally similar to *Leucon* but only the first and second pairs of pereopods have exopods in either sex. The endopod of the uropods is unsegmented. The male has no pleopods.

Heteroleucon akaroensis Calman, 1907 (figs. 143–155).

Calman, 1907; Stebbing, 1913.

Female: Carapace a little less than $\frac{1}{4}$ of the total length, compressed, its height about $\frac{2}{3}$ of its length; the dorsal edge is slightly arched, keeled, serrated in its anterior half with 8–10 teeth, and with a single large tooth just in front of the posterior margin; in front of the posterior tooth is generally a shallow rounded excavation of the dorsal edge; the pseudorostrum is straight, directed obliquely upwards, and sharply pointed; the length of its upper edge is a little less than $\frac{1}{3}$ of the total length of the carapace; the antennal notch forms a rather shallow rounded sinus in the antero-lateral margin, which has one or two teeth above the notch and below it is coarsely serrated and curves backwards into the lower margin without any distinct antero-lateral angle.

The abdomen is rather stout and a little shorter than the cephalothorax.

The first antennae have the first two segments of the peduncle very stout and subequal, the third only half the diameter of the second and $\frac{2}{3}$ of its length; the flagellum is about equal to the second segment of the peduncle and consists of two segments; the unjointed accessory flagellum is equal in length to the first segment of the main flagellum. The second antennae are composed of three segments; the proximal segment bears two plumose setae.

The mouthparts are of the usual Leuconid type. The posterior part of the branchial apparatus bears only two small papilliform lobules.

The first pereopods extend beyond the pseudorostrum by nearly the length of their last two segments; the basis is about $\frac{2}{3}$ as long as the distal segments together. The second pereopods have the basis shorter than the following segments together; the ischium is present as a narrow chitinous ring between the basis and the merus.

The uropods have the peduncle longer than the terminal somite and about three times as long as thick; the rami are subequal and a little longer than the peduncle; the exopod is obliquely truncated at the tip, which bears about five unequal setae; the endopod has a strong, dorsally curved apical spine and about 10 spines on its inner edge.

Length about 2.8 mm.

Adult (?) Male: Carapace $\frac{1}{4}$ of the total length, its height about $\frac{1}{3}$ of its length; dorsal edge slightly arched, smooth or with one or two small serrations anteriorly; pseudorostrum very short, horizontal, broadly rounded at the tip; no antennal notch; antero-lateral angle broadly rounded and serrated.



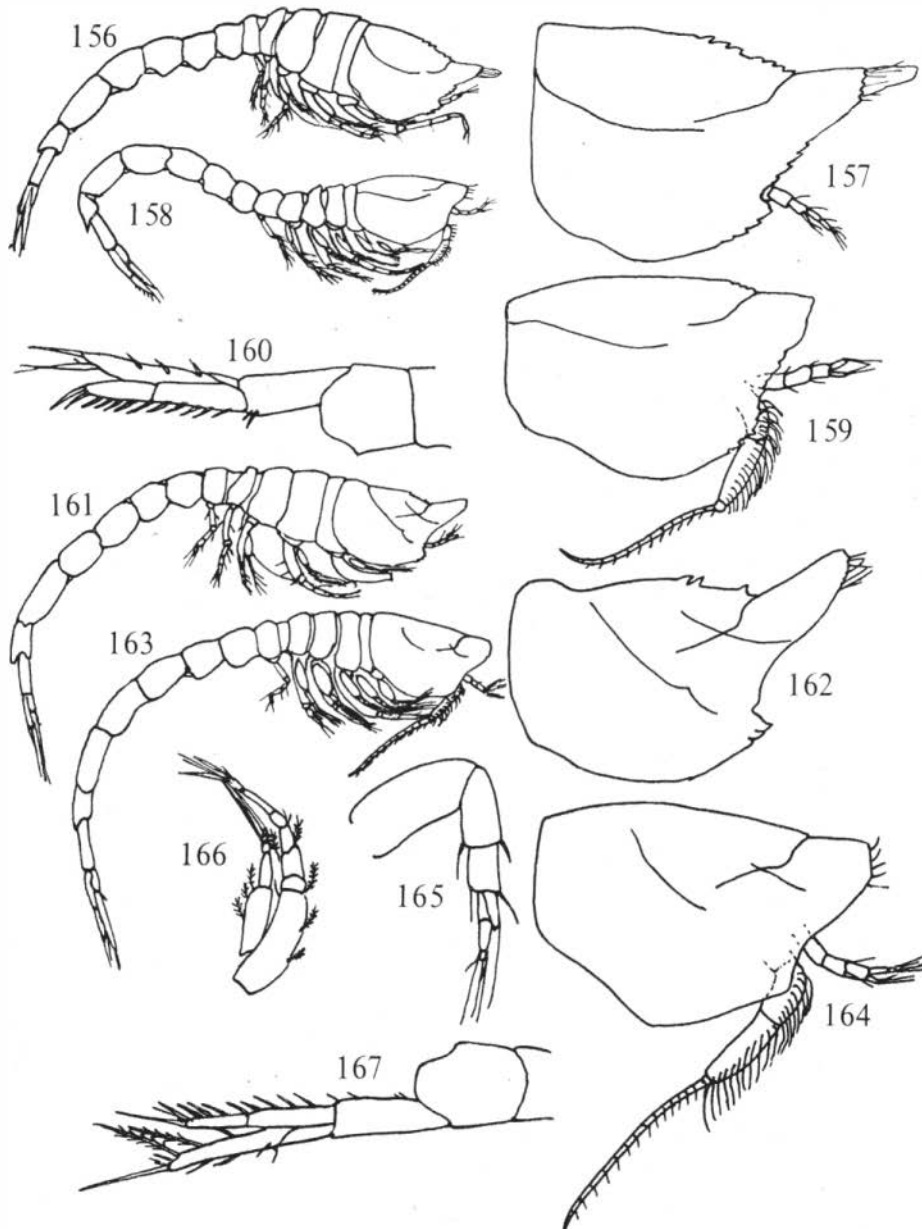
First antenna with three segments in the main flagellum. Second antenna with the flagellum short, not longer than the peduncle, composed of nine segments.

Remaining appendages not greatly differing from those of the female but the peduncle of the uropods little more than half the length of the rami.

Length, about 1.7 mm.

Localities

PREVIOUSLY RECORDED: Akaroa Harbour, 6 fm, 8-97; Lyttelton Harbour, 1-5 fm, 8-97 (Calman, 1907).



Hemileucon uniplicatus Calman. Figs. 156, 157. Female from side and carapace from side. Figs. 158, 159. Male from side and carapace from side. Fig. 160. Female last somite and left uropod.

Hemileucon comes Calman. Figs. 161, 162. Female from side and carapace from side. Figs. 163, 164. Male from side and carapace from side. Fig. 165. Female first antenna. Fig. 166. Female second paraeopod. Fig. 167. Female last somite and right uropod. (All after Calman, 1907.)



Genus *Hemileucon* Calman, 1907

Differing from *Leucon* and *Paraleucon* in having no pleopods in the male sex.

KEY TO THE SPECIES OF *Hemileucon*

- Carapace with one horizontal ridge on either side (figs. 157, 159) *H. uniplicatus*
Carapace with two oblique ridges on either side (figs. 162, 164) *H. comes*

Hemileucon uniplicatus Calman, 1907 (figs. 156–160).

Calman, 1907; Stebbing, 1913.

Female: Carapace about $\frac{1}{4}$ of the total length, its height a little more than $\frac{2}{3}$ of its length; dorsal crest slightly arched, its anterior half serrate; pseudorostrum straight, slightly upturned, obliquely truncate; its upper surface less than $\frac{1}{4}$ of the total carapace length; antennal notch well marked, defined below by a triangular tooth; the antero-lateral margin above the notch bears three or four serrations and the front part of the lower margin is serrated; side of the carapace with a single horizontal ridge above the middle of its height, curving upwards posteriorly to join the hind margin, and ending anteriorly below the end of the frontal suture.

First antennae with the flagellum of three segments, the accessory flagellum unjointed, equalling the first segment of the main flagellum.

Peraeopods similar to those of *Paraleucon*.

Uropods with the peduncle a little longer than the terminal somite and three times as long as thick; the rami subequal and $1\frac{1}{2}$ times as long as the peduncle; the endopod of two segments, the proximal $1\frac{1}{2}$ times as long as the distal segment; the terminal spine is not much longer than the distal spine of the inner edge; the exopod with several unequal setae at and near its tip.

Length, about 2.6 mm.

Adult Male: Dorsal edge of carapace slightly arched with only some slight traces of serration anteriorly; pseudorostrum horizontal, truncated, less than $\frac{1}{3}$ of the total carapace length; no antennal notch or tooth, the antero-lateral corner rounded, the antero-lateral margin serrated from the base of the pseudorostrum to the lower edge; the side of the carapace with a horizontal ridge similar to that of the female.

Second antennae with a very short flagellum, hardly reaching the hind end of the carapace.

Exopods are present on all except the last pair of peraeopods.

Uropods similar to those of the female.

Length, about 2.4 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm, 5.97; Akaroa Harbour, 6 fm, 8.97 (Calman, 1907).

Hemileucon comes Calman, 1907 (figs. 161–167).

Calman, 1907; Stebbing, 1913.

Female: Carapace less than $\frac{1}{4}$ of the total length, its height less than $\frac{2}{3}$ of its length; dorsal crest very slightly arched, irregularly serrate anteriorly, with a depression near the posterior end; pseudorostrum straight, directed obliquely upwards, sharply pointed, its upper edge about $\frac{1}{3}$ of the total carapace length; antennal notch rather widely open, defined by a triangular tooth, the lower edge of which is obscurely serrated; side of the carapace with two oblique ridges similar in position to, though less strongly marked than the two anterior ridges of *Paraleucon*.

Abdomen hardly longer than the cephalothorax.

Second peraeopods with the ischium distinct; the dactylus about equal to the merus and carpus together.

Uropods with the peduncle longer than the last somite and about $3\frac{1}{2}$ times as long as thick; the endopod is longer than the peduncle and shorter than the exopod; it has two segments, the first less than $1\frac{1}{2}$ times as long as the second; there are about nine spines on its inner edge, increasing in length towards the slender terminal spine; the exopod has two unequal terminal setae and series of setae on the inner and outer edges.

Length, about 2.8 mm.

Adult Male: Dorsal edge of carapace slightly arched, smooth, pseudorostrum horizontal, truncated, about $\frac{1}{6}$ of total carapace length; no antennal tooth or notch; antero-lateral corner rounded, no serrations on antero-lateral or lower edges; side of the carapace with two oblique ridges similar to, but fainter than those on the carapace of the female.

Second antennae with the flagellum short, reaching to about the second free thoracic somite in the natural position.



Exopods are present on all peraeopods except the last pair.

Uropods similar to those of the female.

Length, about 2.7 mm.

Locality

PREVIOUSLY RECORDED: Lyttelton Harbour, 1-5 fm, 5.97 (Calman, 1907)

Genus *Eudorella* Norman, 1867

No distinct pseudorostral projections, the antero-lateral lappets curved backwards. The efferent orifice of the branchial cavity placed dorsally. Carapace smooth above. No eyes or ocular lobe. The peduncle of the first antenna geniculate between the second and third segments. The distal segment of the second antenna of the female not well defined. The first three in the female and first four pairs of peraeopods in the male with well developed exopods. The inner ramus of the uropods longer than the outer.

KEY TO THE SPECIES OF *Eudorella*

Fifth pleon somite has a short pair of setae at its hind dorsal end; antero-lateral angle of female not produced beyond rest of carapace..... *E. truncatula*

Fifth pleon somite has a long pair of setae at its hind dorsal end; antero-lateral angle of female produced well beyond rest of carapace (figs. 169, 178)..... *E. hurleyi*

Eudorella truncatula (Bate, 1856).

Bate, 1856, as *Eudora truncatula*; Sars, 1879, 1900; Calman, 1907; Stebbing, 1913; Fage, 1951a.

Remarks

Calman recorded three specimens from New Zealand which he attributed to this species. They differed slightly from typical North Atlantic specimens as follows: The tooth of the antero-lateral angle was a little more prominent. The basis of the second peraeopods was not much shorter than the remaining segments together and the merus and carpus were relatively shorter than in northern specimens. The terminal spine of the endopod of the uropod was somewhat stronger. The length was about 2.8 mm, compared with about 5.0 mm for northern specimens.

Although it is possible that Calman's specimens are correctly referred to *E. truncatula*, it is more likely that they represent a new species, but

their determination must await the collection of further specimens. The genus *Eudorella* contains a number of closely related forms near to *truncatula* and their identification is difficult. The genus needs revision but at present there is not enough material of many species for this to be done successfully.

Locality

PREVIOUSLY RECORDED: Akaroa Harbour, 8.97, 3 specimens (Calman, 1907).

Eudorella hurleyi sp. n. (figs. 168-178).

Female: Integument smooth except for faint pitting. Carapace about $\frac{1}{5}$ of the total length, its height about $\frac{2}{3}$ of its length; the sides are smooth; the antero-lateral angle is prominent, with a strong tooth projecting forwards well beyond the remainder of the carapace; behind it the lower margin is strongly serrated to the lowest point; a little above the antero-lateral tooth there are four downbent teeth; the sinus is distinct but shallow and above it are a few very small teeth directed upwards; the upper margin of the pseudo-rostral lobes are regularly rounded as seen from the sides, each with fairly numerous short setae.

The pleon is slightly longer than the cephalothorax; the fifth abdominal somite has a pair of long setae set close together at its hind dorsal end and reaching beyond the peduncles of the uropods; the telsonic somite is produced between the bases of the uropods.

The first antennae have the first segment of the peduncle dilated; the second segment is only about $1\frac{1}{4}$ times as long as the third; the flagellum is three-segmented, the first segment distinctly shorter than the last peduncular segment; the single segment of the accessory flagellum is a little longer than the first segment of the main flagellum. The second antenna is two-segmented, the first segment bearing three plumose setae, the second segment small and imperfectly separated.

The mouthparts are of normal Leuconid type.

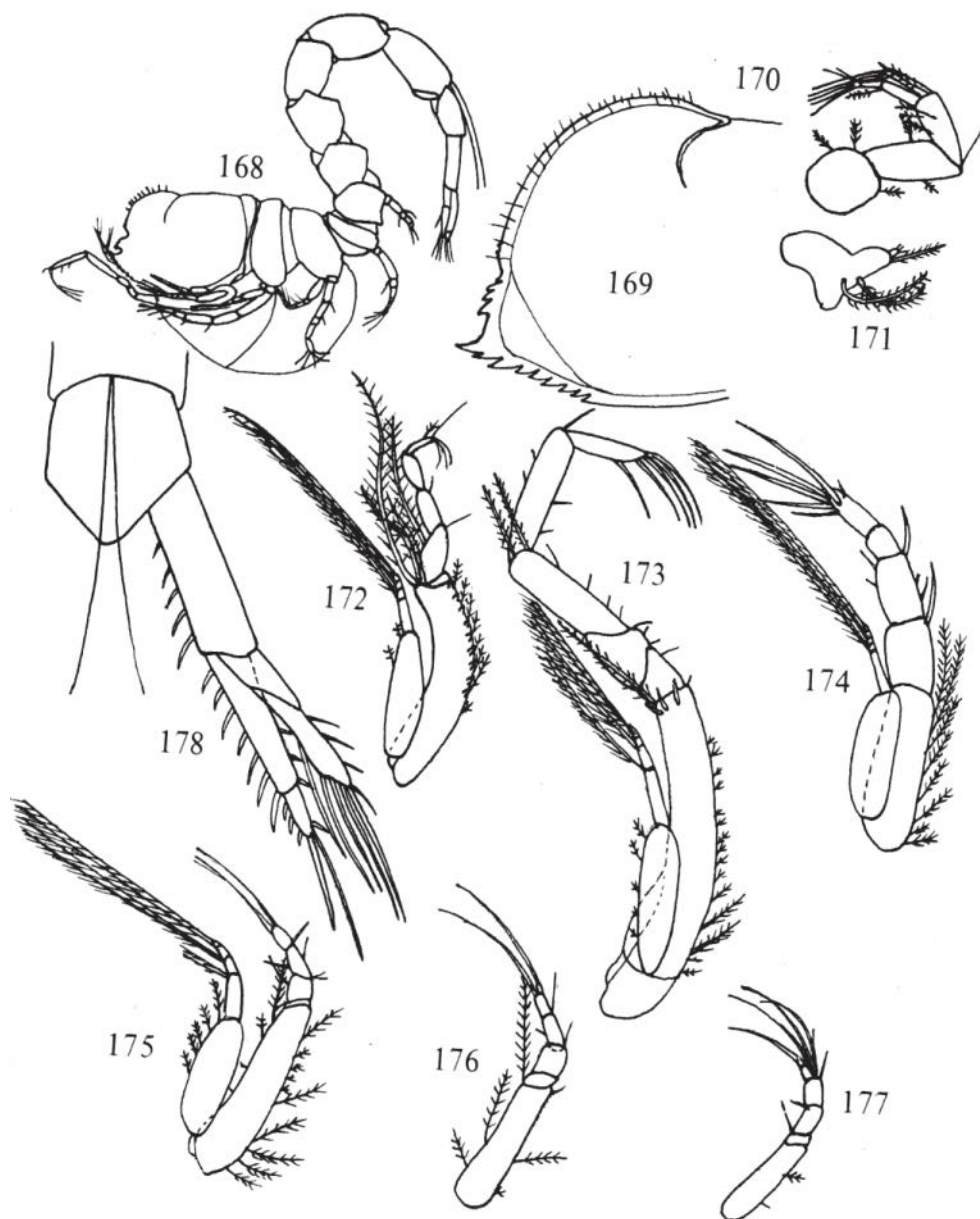
Third maxillipeds with the basis distinctly longer than the remaining segments together; the merus is slightly longer than the carpus, which is again longer than the propodus.

The first peraeopods are slender, with the basis more than $\frac{2}{3}$ as long as the remaining segments together; the propodus is only a little longer than the merus and about half as long again as the



dactylus. The second peraeopods have the basis little longer than the merus and carpus together, these being about equal in length; the dactylus is twice as long as the propodus; the ischium not separated. Third peraeopod with the basis much longer than the distal segments together; fourth with the basis longer than and fifth with basis about equal to the distal segments together.

The peduncle of the uropods not much longer than the telsonic somite, with five setae on its inner edge, and nearly equal in length to the endopod, the second segment of which is about $\frac{1}{3}$ the length of the first; the first segment has seven slender spines on the inner margin and three on the outer, the second segment three short spines on the inner margin and one on the outer. ending



Eudorella hurleyi sp. n. Figs. 168, 169. Ovigerous female from side and carapace from side. Figs. 170, 171. First and second antennae. Fig. 172. Third maxilliped. Figs. 173, 174, 175, 176, 177. First, second, third, fourth, and fifth peraeopods. Fig. 178. Last somite and right uropod.

in a long spine with a longer seta outside it; the exopod is slightly longer than the first segment of the endopod; its distal segment has three or four short setae on the outer margin and about five longer setae at its end and on the inner edge.

Length, 3.2 mm.

Adult Male: Unknown.

Type

Lost in transit.

Locality:

HAWKE BAY: NZOI Sta. B45, 22 fm, fine sandy mud, 1 female.

Remarks

Eudorella hurleyi resembles *E. nana* G. O. Sars in some respects but the antero-lateral lappets in that species are more vaulted above and bear longer setae, the antero-lateral tooth does not project so far, and the fifth pleon somite has a bundle of long setae instead of only two. The species shows many differences from *E. rochfordi* Hale (Hale, 1945b), described from New South Wales.

Genus *Eudorellopsis* G. O. Sars, 1883

General similar to *Eudorella* but body short and compact, pleon relatively short. First antenna geniculate between the first and second segments. Uropods with the exopod longer than the endopod.

Eudorellopsis resima Calman, 1907 (figs. 179–183).

Calman, 1907; Stebbing, 1913.

Female: Carapace with the pseudorostrum well marked but directed upwards, the distal end truncated, its length along the posterior edge about $\frac{1}{4}$ of the total carapace length; the posterior part of the dorsal edge of the carapace carrying a prominent tooth directed obliquely forwards; the antero-lateral edge coarsely serrated, the teeth becoming lower and more irregular on the upper part, the lower part curving backwards and ending in a small tooth defining the antennal notch; the side of the carapace shows, above the middle of its height, a longitudinal ridge which curves upwards towards the anterior edge of the pseudorostrum.

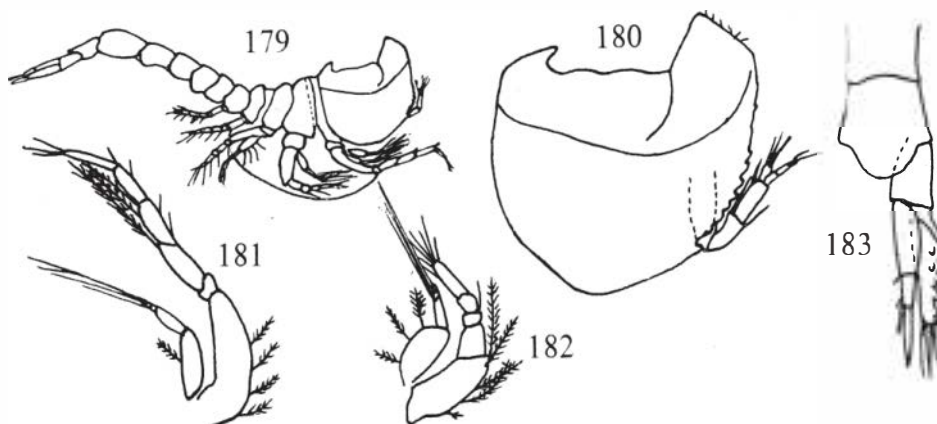
The first antennae have the flagellum three-segmented, shorter than the last segment of the peduncle; the accessory flagellum with one segment equal to the first segment of the main flagellum.

The first paeopods short, reaching beyond the anterior end of the carapace by not more than the length of the last segment. Second paeopods also short, with the carpus half as long as the merus and equal to the propodus.

Uropods short and stout, the peduncle about $\frac{2}{3}$ as long as the last somite; the exopod nearly twice as long as the peduncle, with irregular tubercles or blunt teeth on its outer surface, two unequal spines at the tip, and a single seta on the inner edge; endopod only a little shorter than the exopod; its first segment twice as long as the second, which has a long stout terminal spine and a smaller one inside it, the inner edge unarmed.

Length, about 1.8 mm.

Adult Male: Unknown.



Eudorellopsis resima Calman. Figs. 179, 180. Female from side and carapace from side. Figs. 181, 182. First and second paeopods. Fig. 183. Last somite and right uropod. (All after Calman, 1907.)



Locality

PREVIOUSLY RECORDED: Lyttelton Harbour, 1 specimen (Calman, 1907).

Family NANNASTACIDAE Bate, 1865;
Calman, 1905 emend.

Eleven genera and about 147 species. At present only two species in separate genera are known from the New Zealand fauna:

KEY TO THE GENERA OF NANNASTACIDAE

- Two ocular groups widely separated; antero-lateral angle of carapace well developed (figs. 184, 185) (p. 50) *Nannastacus*
A single median ocular group or eye not developed; antero-lateral angle of carapace only slightly developed (p. 52) *Campylaspis*

Genus *Nannastacus* Bate, 1865

Five thoracic somites visible from above. Carapace not overhanging the anterior thoracic somites. Lateral plates of pseudorostrum meeting in front of head. Efferent orifice of branchial cavity single. Antero-lateral angles of the carapace usually prominent. Two ocular groups widely separated. Molar process of the mandible stout and truncate. The inner ramus of the uropods longer than the outer. Exopodites may be lacking on the third maxillipeds and the first and second peraeopods.

Nannastacus pilgrimi sp. n. (figs. 184-191).

Female: Unknown.

Adult Male: Integument of carapace and thoracic somites with reticulate pattern, with some distally dilated tubercles dorsally, more concentrated at the hind end of the carapace and on the thoracic somites, and with some scattered short setae.

Carapace slightly less than $\frac{1}{2}$ of the total length, more than twice as long as deep; from the side the dorsum shows a slight elevation at the hind end; a low protuberance is present on each side in the branchial region behind the eye, with a shallow groove running backwards above it; the antero-lateral angle is obtuse, without prominent spines or serrations, and reaches forward nearly as far as the end of the pseudorostrum; the pseudo-rostral lobes gape widely above but meet below. The eyes are well separated, each with three prominent corneal lenses.

The thoracic somites together are about half as long as the carapace, the first shorter than the second and hidden at the sides; the second to fourth with their pleural parts expanded and

reticulate. Each pedigerous somite has a dorsal groove and an elevation on either side of it. These elevations are continued as far as the fifth pleon somite, and each bears one or more tubercles which are distally expanded on the thoracic but become spiniform on the pleon somites. The tubercles are hyaline and a high magnification is needed to distinguish them. A few short setae are present on each somite. The fifth pleon somite is nearly twice as long as the fourth and as the telsonic somite, which is nearly as broad as long.

The third segment of the peduncle of the first antenna is slightly shorter than the second and about half as long as the first segment; the second segment has an outer distal projection. The flagellum has three segments and there is a rudimentary one-segmented accessory flagellum. The second antennal flagellum reaches nearly to the hind end of the fourth pleon somite.

The third maxilliped has an exopod; the carpus, propodus and dactylus are about equal in length; the basis is slightly longer than the distal segments together and has a fairly prominent distal projection reaching about half way along the merus.

The first four pairs of peraeopods each have well developed exopods. The first pair with the dactylus slightly shorter than the propodus and about half the length of the carpus; the ischium with a weak spine on its outer margin; the basis little more than half as long as the rest of the appendage, with a comb-like outer edging to the exopodal recess. The second peraeopod with the basis broad; the carpus slightly longer than the dactylus and twice as long as the propodus. The fifth peraeopod with the basis slender; the carpus more than $1\frac{1}{2}$ times as long as the propodus, which is slightly shorter than the dactylus.

The peduncle of the uropod is about $1\frac{1}{2}$ times as long as the telsonic somite and the uropod without end spines is longer than the telsonic and fifth pleon somites together; the peduncle is serrated on the inner edge and about as long as the endopod without its end spine; the endopod is one-segmented with about six spines on its inner edge and a long end spine; the exopod is two-segmented, the first segment about half as long as the second, which has a small spine on either side of the very long end spine; exclusive of their end spines the exopod is about half as long as the endopod.

Length, about 1.8 mm.

Type

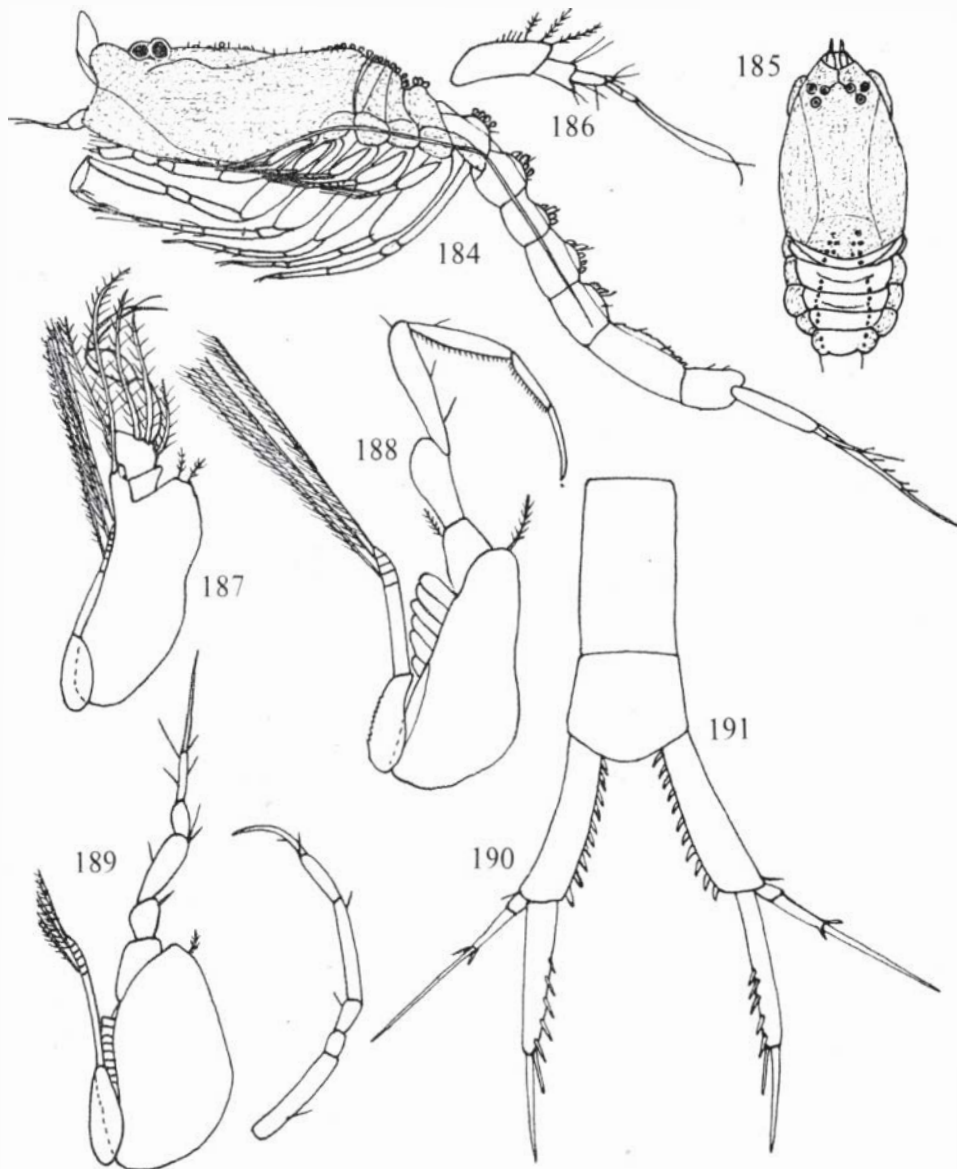
Deposited in the Canterbury Museum, C.M.
Crus. No. 8.

Localities

MENZIES BAY: Aug 1954, coll. R. Pilgrim, 4
males. LYTTELTON HARBOUR: 4 Oct 1954, coll.
R. Pilgrim, 1 male.

Remarks

Nannastacus pilgrimi seems to be closely related
to *N. clavatus* Hale (Hale, 1945a), recorded from
South Australia. The carapace is, however, rela-
tively more elongated than in that species, the
male of which also lacks the dorsal elevations of
the pedigerous and pleon somites, while there are
a number of differences in the relative proportions
of several appendages.



Nannastacus pilgrimi sp. n. Figs. 184, 185. Male from side and cephalothorax from above. Fig. 186. First antenna. Fig. 187. Third maxilliped. Figs. 188, 189, 190. First, second, and fifth pereopods. Fig. 191. Last somite and uropods.

Genus **Campylaspis** G. O. Sars, 1865

Five thoracic somites visible from above. Carapace strongly vaulted, especially in the female, where it bulges over the anterior thoracic somites. Antero-lateral angles of the carapace very slightly produced or obsolete. The eye is unpaired and may be rudimentary. Mandibles with the molar process styliform, pointed. Second maxilla reduced to a simple plate without movable endites. First maxilliped reduced, with only three distinct segments, the terminal very small. Second maxilliped with the propodus articulated at nearly a right angle to the carpus and ending in a long seta, the dactylus very short and armed with strong distal diverging spines. First pereopod with the ischium not specially elongated.

Campylaspis sp.

Calman, 1917.

Resembling *Campylaspis undata* G. O. Sars (Sars, 1900).

Locality

PREVIOUSLY RECORDED: Spirits Bay, plankton, 3 m depth, 1 immature female (Calman, 1917).

Remarks

Calman did not describe this specimen beyond remarking that it resembled *C. undata* but differed in certain details of sculpturing of the carapace.

Family LAMPROPIDAE G. O. Sars, 1878;
Fage, 1929, emend.

Ten genera and about 42 species of which a single species has so far been recorded from New Zealand waters.

Genus **Hemilamprops** G. O. Sars, 1883

Carapace without a distinct antennal notch. Eyes well developed or wanting. Flagellum of male second antenna long. First pereopods slender and elongated. Three pairs of well developed pleopods in the male.

Hemilamprops pellucida Zimmer, 1908 (figs. 192–201).

Zimmer, 1908; Stebbing, 1912, 1913; Jones, 1960b.

Female: Integument pellucid, thin and microscopically scabrous.

Carapace about $1\frac{1}{2}$ times the length of the thoracic somites together, its height little more than half its length; the small convex triangular eyelobe, which is without lenses, carries on its mid-dorsal line four or five small forward pointing teeth followed by a row of small denticles reaching backwards to about the middle of the carapace; on the hind part of the carapace there is a groove between the inflated branchial regions; the antero-lateral borders are finely serrated below the pseudorostrum to the lowest point.

The thoracic somites combined are shorter than the carapace. The pleon is longer than the cephalothorax.

The telson is a little shorter than the peduncle of the uropods, its margins serrated and carrying six to eight spines on each side and three longer end spines.

First antenna with the first segment widened, its inner edge serrated, nearly as long as the second and third segments together; the third segment about half as long as the second; the main flagellum with five segments, accessory flagellum with three segments, the last small. Second antenna with four segments, with a single plumose seta on each of the first two.

First and second pereopods with well developed exopodites. First with the basis curved, its convex border serrated for much of its length, about as long as the ischium, merus, and carpus together; the dactylus shorter than the propodus. Second pereopod with the basis shorter than the succeeding segments together; carpus strongly spined, longer than the short propodus and slender dactylus together. Third to fifth pereopods long and slender, the third and fourth with rudimentary two-segmented exopodites.

Uropods about as long as the last three abdominal somites together, with the peduncles longer than the rami; the exopod a little shorter than the endopod, with its first segment longer than the second; the endopod with its first segment longer than the two distal segments combined, these being about equal in length; peduncle with about 12–15 spines on its inner edge, its outer edge finely serrated; endopod with about 10, three, and two spines on the finely serrated inner edges of the three segments, about five, three, and four on the outer edges, and three end spines; exopod with about four and six spines on the inner edges and three and four on the outer edges of its two segments.

Length, about 8.5 mm.



Adult Male. Unknown. Subadult males differ little from females but the second antenna has the flagellum long with its segments short, the third and fourth peraeopods have well developed exopodites, three pairs of partly developed pleopods are present, and the telson and uropods are somewhat longer than in the female.

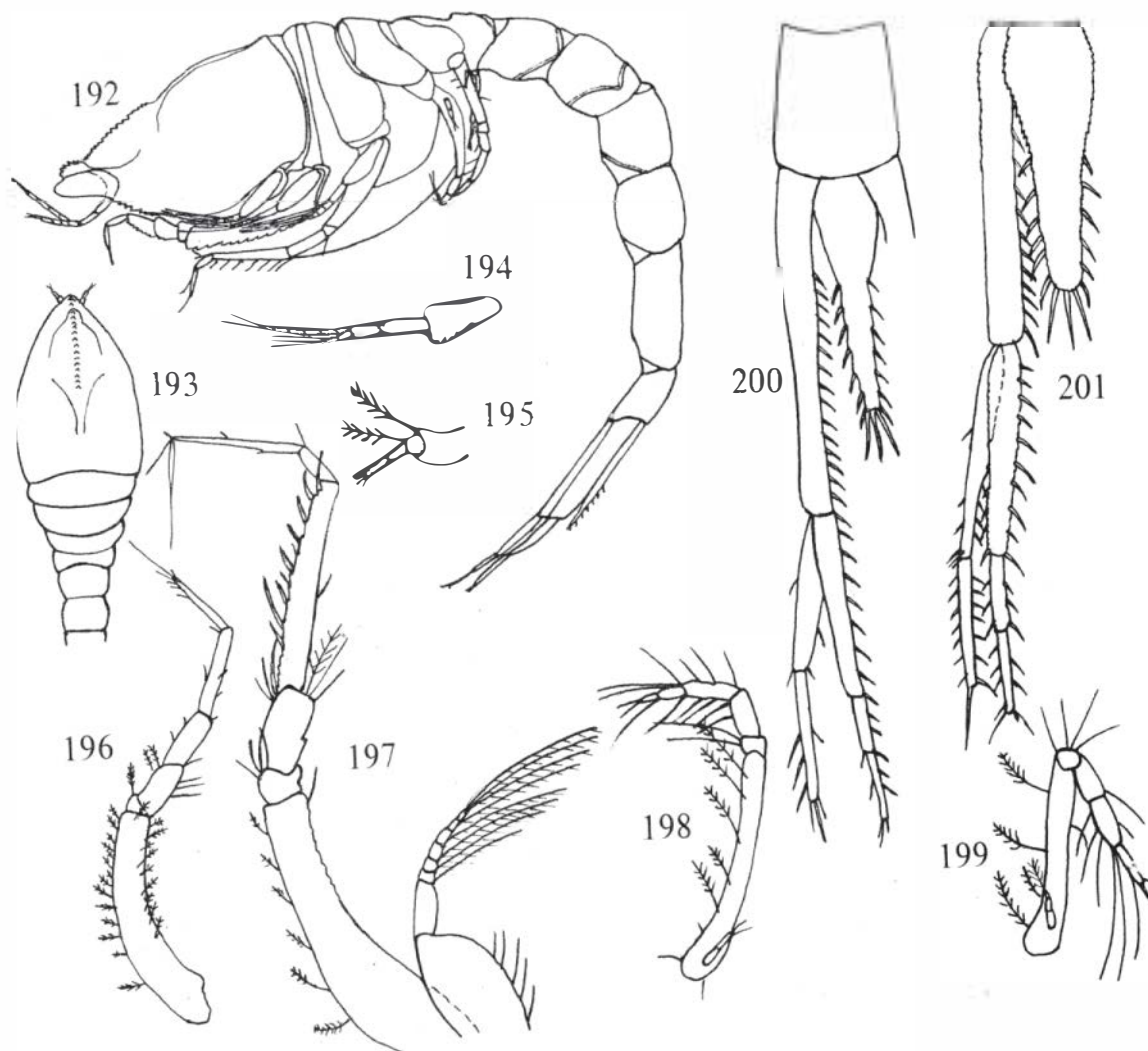
Length, about 6 mm.

Localities

PREVIOUSLY RECORDED: South Africa (Zimmer, 1908; Stebbing, 1912); Chatham Rise, 129 and 290 fm, 1954, 2 females (Jones, 1960b).

Family DIASTYLIDAE Bate, 1856;

Twenty genera and about 198 species have been described, of which five genera and 13 species are recorded from New Zealand.



Hemilamprops pellucida Zimmer. Fig. 192. Female from side. Fig. 193. Female from above (after Zimmer, 1908). Figs. 194, 195. Female first and second antennae (after Stebbing, 1912). Fig. 196. Female first peraeopod (after Zimmer, 1908). Fig. 197. Male second peraeopod (after Stebbing, 1912). Figs. 198, 199. Female third and fourth peraeopods (after Stebbing, 1912). Fig. 200. Female last somite, telson and left uropod (after Zimmer, 1908). Fig. 201. Male telson and left uropod (after Stebbing, 1912).



KEY TO THE GENERA OF DIASTYLIDAE

- 1 Male with pleopods; third maxilliped of female with an exopodite; first peraeopod without long propodial setae (figs. 201, 268, 205, 206)..... 2
Male without pleopods; third maxilliped of female without an exopodite; first peraeopod usually with a long brush of setae on the propodus (figs. 316, 324, 325)..... (p. 71) **Gynodiastylis**
- 2 Telson at least nearly half as long as the uropod peduncle (figs. 209, 224, 235, 263, 278)..... 3
Telson much less than half as long as the uropod peduncle (figs. 301, 312)..... (p. 66) **Colurostylis**
- 3 Telson has only one lateral spine on each side (figs. 278, 279)..... (p. 64) **Leptostylis**
Telson has 5 or more pairs of lateral spines (figs. 209, 224, 235, 263)..... 4
- 4 Pleural plates of third and fourth pedigerous somites not much produced backwards; peraeopods 2 and 3 of female not widely separated (figs. 202, 219)..... (p. 54) **Diastylis**
Pleural plates of third and fourth pedigerous somites well produced backwards; peraeopods 2 and 3 of female widely separated (figs. 225, 251)..... (p. 58) **Diastylopsis**

Genus **Diastylis** Say, 1818

Carapace with antero-lateral angles usually little produced. Pseudorostrum of female not strongly upturned. Third and fourth pedigerous somites with their pleural plates not much produced backwards. Telson long, post-anal part narrowed, with several pairs of lateral spines. Second antennae as long as the body. Mandibles normal. Third maxilliped with an exopodite in both sexes. First to fourth peraeopods of the male with the basis not greatly expanded. Sometimes rudimentary exopodites present on the third and fourth peraeopods of the female. Male with two pairs of pleopods. Endopod of the uropod usually with three segments.

KEY TO THE SPECIES OF *Diastylis*

- 1 Telson about $\frac{3}{4}$ of the length of the uropod peduncle (fig. 224)..... **D. acuminata**
Telson about $\frac{1}{2}$ of the length of the uropod peduncle (figs. 209, 218)..... 2
- 2 Sides of carapace with 3 oblique ridges and without spines (fig. 202)..... **D. neozealanica**
Sides of carapace without oblique ridges but with small spines (fig. 210)..... **D. insularum**

Diastylis neozealanica Thomson, 1892 (figs. 202–209).

Thomson, 1892, as *D. neo-zealanica*; Calman, 1908; Stebbing, 1913, as *Diastylopsis neozealanica*; Calman, 1917.

Female: Integument smooth with minute reticulation. Carapace a little less than $\frac{2}{3}$ of the total length, its height more than $\frac{1}{2}$ its length; dorsal outline slightly sinuous, raised at the hind end, the eyelobe rounded and a little prominent, the

pseudorostrum slightly arched and about $\frac{1}{4}$ of the total carapace length; antero-lateral angles not projecting; three ridges run obliquely downwards and forwards on each side, the first crossing the frontal lobe and bending forwards towards the pseudorostrum, the second fairly long and the third short, none reaching to the lower edge of the carapace; a fourth ridge is present near and parallel to the hind margin; a very short and ill-defined transverse ridge may also be present behind the eyelobe.

The first thoracic somite is narrow; the third and fourth have their pleural parts a little but not much produced backwards; the hind corners of the fifth are rounded and not much produced.

The telson is about as long as the last abdominal somite and about half as long as the peduncle of the uropods; its post-anal part is about as long as the pre-anal and has 7–9 pairs of fairly short lateral spines and two more robust end spines.

Third maxilliped with the basis nearly twice as long as the distal segments together, with several long plumose setae at its distal end; the propodus a little longer than the dactylus and carpus which are subequal, the three segments slender, and about as long as the broader ischium and merus together. Second peraeopods with the carpus longer than the propodus and dactylus together. Third and fourth with rudimentary two-segmented exopodites. Third to fifth peraeopods with numerous long and fairly stout setae on the propodus and dactylus.

Uropods with the peduncle about twice as long as the subequal rami; the endopod with the first segment a little longer than the two distal segments, with about six, five, and four spines on their inner edges, two unequal end spines and a few setae on the outer edge; the exopod with its first segment short, the second with three slender apical spines and a few setae on the outer edge.

Length, about 8 mm.

Adult Male: Carapace more than twice as long as deep and pseudorostrum comparatively shorter than in the female.

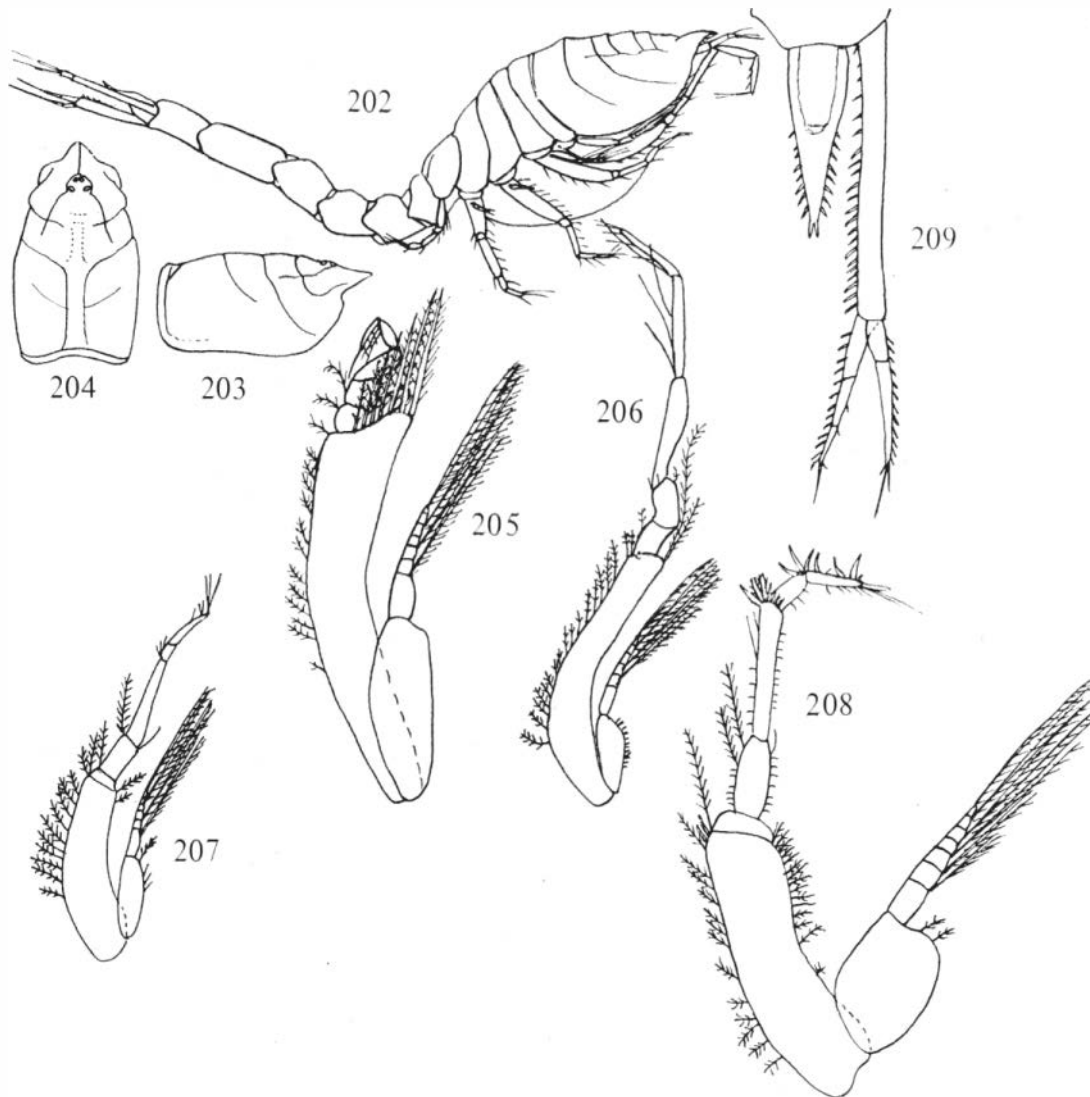
Fifth thoracic somite with its postero-lateral corners well produced but not acute.

Telson and uropods rather longer than in the female.

First antenna with the peduncle stouter, its third segment less than half as long as the second and bearing distally a brush of sensory setae; the flagellum of five segments, the basal one dilated; accessory flagellum of three segments, the last minute and the first having a pair of stout spines at its distal end. Second antennal flagellum with its segments very long, reaching beyond the telson.

The first four pairs of pereopods with well developed exopodites which in the first two pairs have their bases broader than in the female. Second pereopods with six short stout spines at the distal end of the carpus, three at the end of the propodus, and three along the length of the dactylus directed slightly backwards, together with one end spine.

Length, about 9 mm.



Diastylis neozelandica Thomson. Fig. 202. Ovigerous female from side (after Thomson, 1892). Figs. 203, 204. Male carapace from side and from above (after Calman, 1917). Fig. 205. Male third maxilliped. Figs. 206, 207. Female first and second pereopods (after Thomson, 1892). Fig. 208. Male second pereopod. Fig. 209. Female telson and right uropod (after Thomson, 1892).

Localities

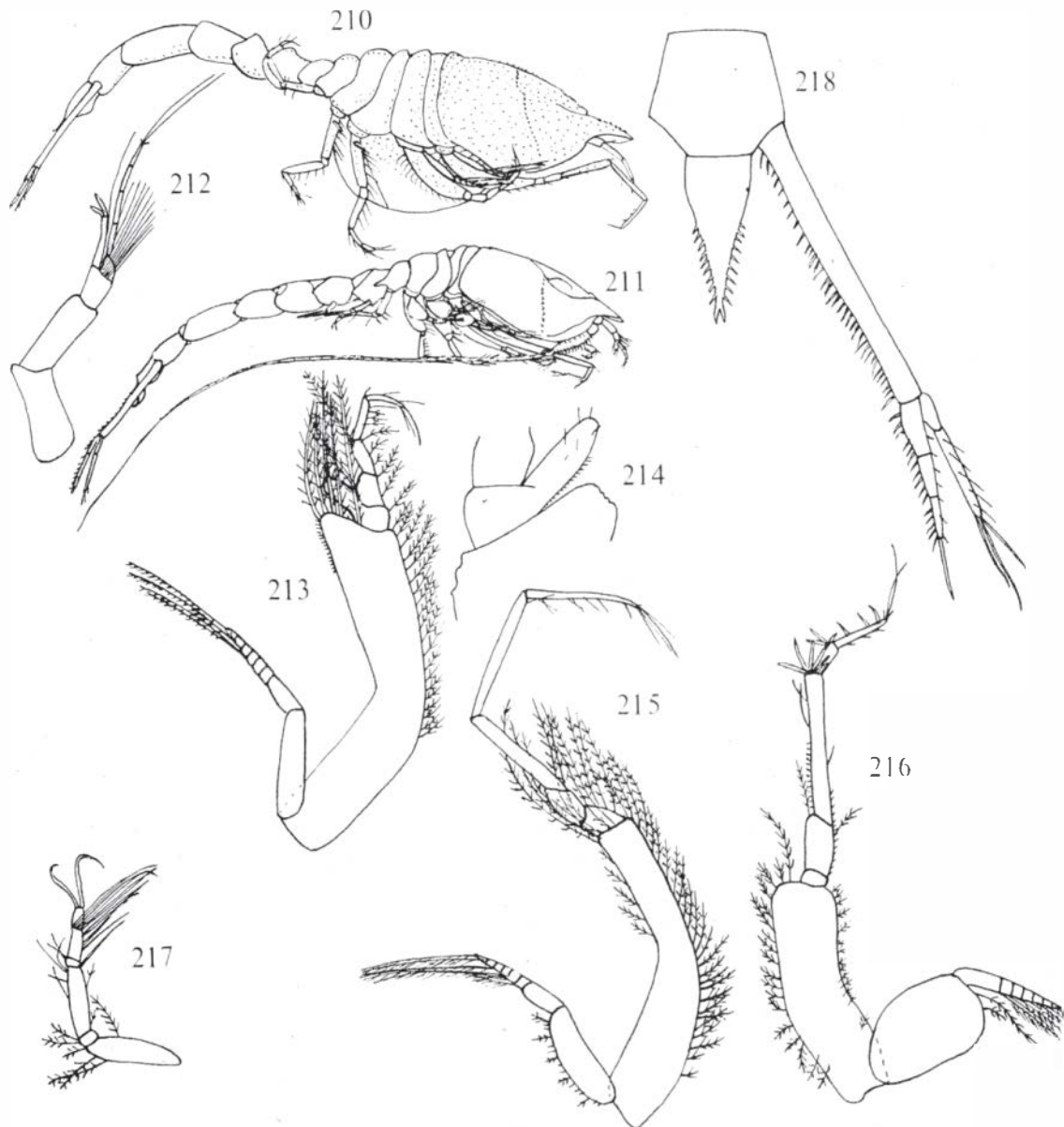
PREVIOUSLY RECORDED: Bay of Islands and Spirits Bay (Thomson, 1892; Calman, 1917).

MENZIES BAY: coll. R. Pilgrim, 1953, 3 males.
COOK STRAIT: NZOI Sta. C388, 4 males, 7 females;
C395, 1 male, 3 females; C486, 1 male, 3 females.

Remarks

Thomson's original description and figures of this species are deficient in many respects.

Diastylis insularum Calman, 1908 (figs. 210–218).
Calman, 1908, as *Leptostylis* (?) *insularum*; Calman, 1911; Stebbing, 1913, as *Diastylopsis insularum*.



Diastylis insularum Calman. Fig. 210. Ovigerous female from side (after Calman, 1908). Fig. 211. Male from side (after Calman, 1908). Fig. 212. Male first antenna (after Calman, 1908). Figs. 213, 214. Female third maxilliped with ischium and end of basis further enlarged (after Calman, 1908). Fig. 215. Female first pereopod (after Calman, 1908). Figs. 216, 217. Male second and fifth pereopods. Fig. 218. Female last somite, telson and right uropod (after Calman, 1908).

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Female: Differs only, as far as is known, from *D. neozealanica* in the markings on the carapace; the frontal lobe is crossed by two low, rounded, crescentic ridges; near the posterior end of the fronto-lateral suture on each side is a shallow depression, and there is a median depression posteriorly between the branchial regions; the whole surface of the carapace is rough with minute spines and short setae, and there is a line of small spines running obliquely downwards and forwards on the anterior part of the lateral surface.

Length, about 9.5 mm.

Adult Male: Similarly resembles the male of *D. neozealanica* except for the markings of the carapace, which are similar to those of the female of its own species but with the surface smoother.

Length, about 9.5 mm.

Localities

PREVIOUSLY RECORDED: Bay of Plenty, Lyttelton Harbour, Chatham Rise down to 320 fm (Calman, 1908, 1911; Jones, 1960b).

Lachlan Sta. NZ/50B,* 13 Nov, 1951, surf., 37 males, 24 females. MENZIES BAY: 1953, coll. R. Pilgrim, 9 males. KAPITI ISLAND: from trevally stomach, 19 specimens. HAWKE BAY: Dom. Mus. BS143, 8 males, 18 females; NZOI Sta. B16, 1 female; Sta. B38, 1 male, 8 females, 5 juv.; B50, 1 male. MILFORD SOUND: NZOI Sta. A322, 8–12 mm, 3 females. SEATOUN WHARF: NZOI Sta. A648, 1 male. PETONE WHARF: NZOI Sta. A649, 1 male. DEVONPORT WHARF, AUCKLAND: coll. M. C. Miller, 7 Aug 1960, 1 male, 1 juv.

Remarks

Diastylis insularum and *D. neozealanica* are very closely related. Stebbing (1913) suggested that *D. insularum* was only a variety of *D. neozealanica*. However, there is no difficulty in separating typical specimens of each by the markings on the carapace and it seems preferable at present to regard them as belonging to different species. A good series of adults of both sexes of the two forms will be needed to decide this point.

Zimmer (1921b) described a species, *Diastylis krameri*, distinguished from most other members of the genus by the possession of many small spines on the carapace, from a single immature female collected at Tofino Bay, Auckland. His figures and description do not provide any means of separating it satisfactorily from *D. insularum* and it must be regarded as dubious until the Cumacea

of New Zealand are better known. Zimmer does not mention any rudimentary exopodites on the third and fourth peraeopods but these may have been overlooked in an immature specimen, which apparently was not dissected. Immature specimens of *D. insularum* have a more spiny carapace than the adults.

Diastylis acuminata N. S. Jones, 1960 (figs. 219–224).
Jones, 1960b.

Female: Carapace a little more than half of the total length, its height about half its length; somewhat vaulted in dorsal outline and with many small spines interspersed with short setae which are also present on the free thoracic somites; the pseudo-rostrum long and pointed, about $\frac{1}{4}$ of the total carapace length; ocular lobe longer than wide, without apparent lenses; the antero-lateral margin slightly concave, the inferior margin with a few rather fragile teeth anteriorly.

The third and fourth free thoracic somites not much produced backwards; the fifth with its postero-lateral corners blunt and not much produced. The pleon somites fairly smooth, with scattered setae, the first four a little produced backwards at the sides.

The telson is about $\frac{3}{4}$ of the length of the uropod peduncles; its pre-anal and post-anal parts about equal in length, the latter with nine hair-like spines on each side and two strong apical spines.

First antennae with the peduncular segments successively shorter; flagellum three-segmented, the accessory flagellum two- or three-segmented, about as long as the first segment of the main flagellum.

Third maxillipeds with the basis about $1\frac{1}{2}$ times as long as the distal segments together and without an external lobe on the ischium.

First peraeopods with the basis about $\frac{3}{4}$ of the length of the remaining segments together; the dactylus about as long as the propodus and slightly longer than the carpus; the basis with a strong spine at the outer end and a row of fragile spines on the inner side. Second peraeopods with the basis slightly shorter than the distal segments together; dactylus about $1\frac{1}{2}$ times as long as the propodus and about half as long as the carpus; the basis with several stout but fragile spines at the outer

*This station number cannot be correlated with the *Lachlan* station lists. It may represent one of a line of stations off the south-east coast of the South Island, or, a position in western Cook Strait.



end, a row of slender spines on the inner edge and a row of blunt spines near the outer edge. Third and fourth pereopods without any trace of exopodites.

Uropods with the inner ramus slightly shorter than the outer and about $\frac{2}{3}$ of the length of the peduncle; peduncle with about 18 hair-like spines on the inner edge and a stouter terminal spine; endopod with six, four, and four spines respectively on the inner edges of its three segments and a single terminal spine.

Length, 14 mm.

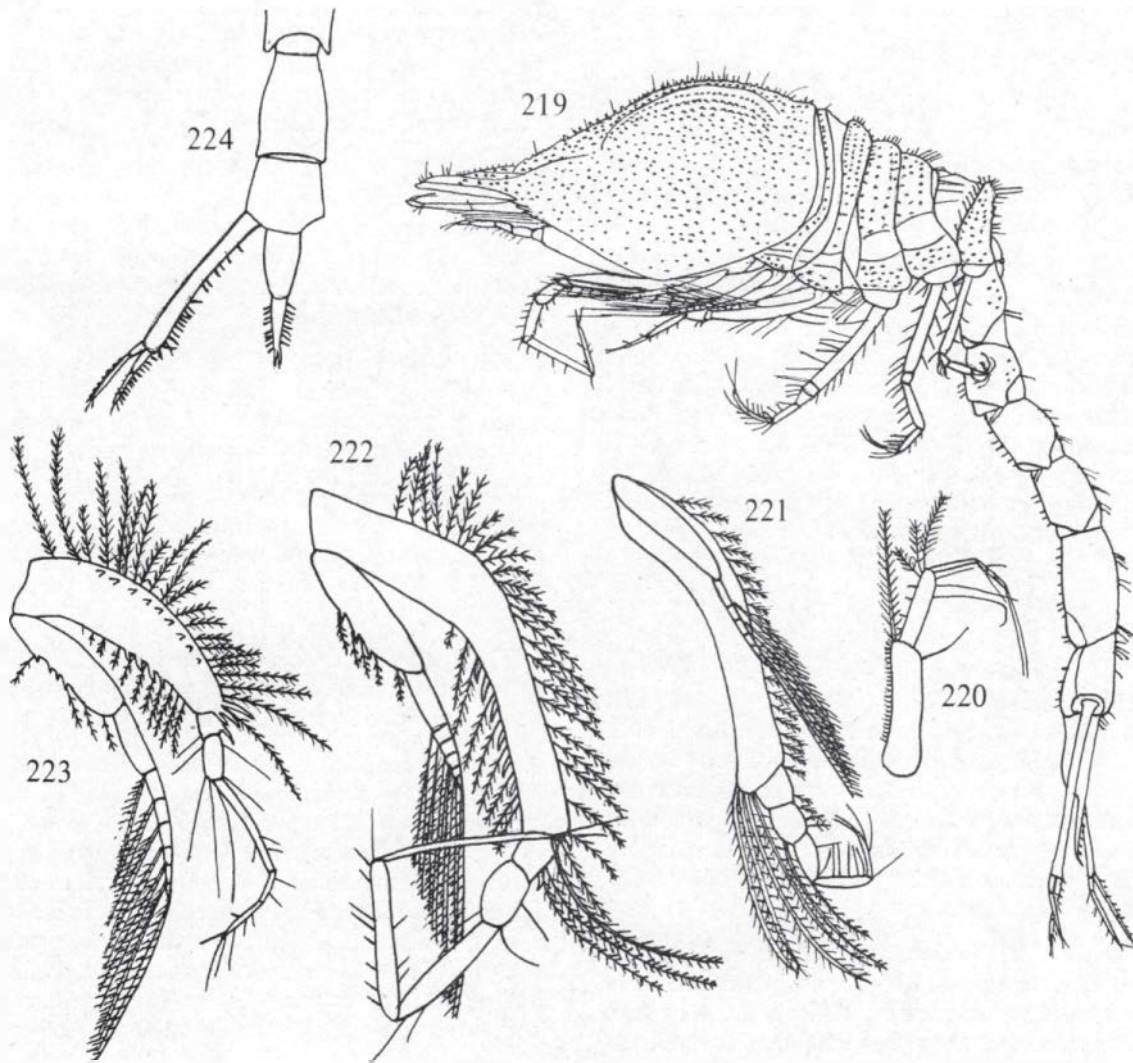
Adult Male: Unknown.

Locality

PREVIOUSLY RECORDED: Chatham Rise 220 fm, fine sandy mud, 24 Jan 1954, 1 female (Jones, 1960b).

Genus *Diastylopsis* S. I. Smith, 1880

Carapace with antero-lateral angles usually produced. Pseudorostrum of female not strongly upturned. Third and fourth pedigerous somites with their pleural plates much produced backwards. Telson long, post-anal part narrowed with several pairs of lateral spines. Second antenna of male as long as the body. Mandibles normal. Third maxilliped with an exopodite in both sexes. Third and



Diastylis acuminata N. S. Jones. Fig. 219. Female from side. Fig. 220. First antenna. Fig. 221. Third maxilliped. Figs. 222, 223. First and second pereopods. Fig. 224. Last somites, telson and left uropod. (All after Jones, 1960b.)



fourth pereopods of the female with rudimentary exopodites. First to fourth pereopods of the male with their bases not greatly expanded. Male with two pairs of pleopods. Endopod of the uropod with three segments.

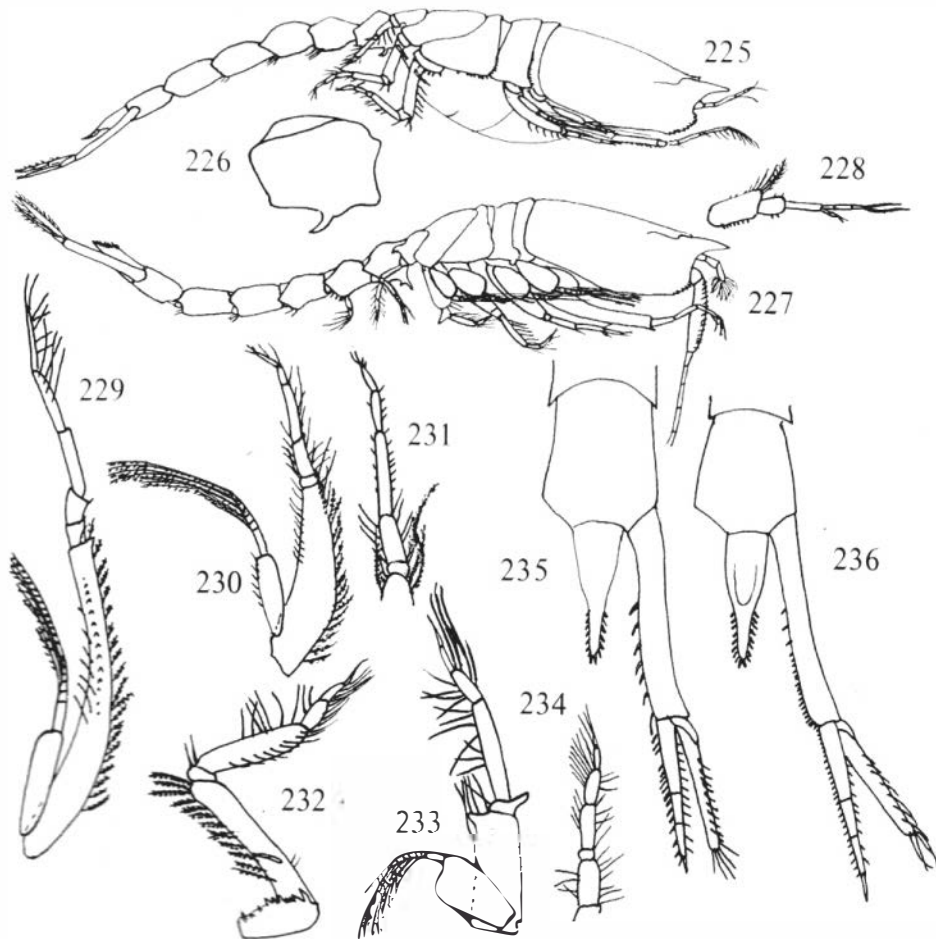
Diastylopsis elongata Calman, 1911 (figs. 225–236).
Calman, 1911; Stebbing, 1913.

Female: Carapace a little more than $\frac{1}{4}$ of the total length, compressed, its height less than half its length; dorsal edge very slightly arched; pseudo-rostrum straight, acute, slightly raised, about $\frac{1}{5}$ of the total carapace length; antennal notch shallow; antero-lateral angle rounded and coarsely serrated; ocular lobe with a minute terminal tooth projecting above the dorsal outline of the carapace; no distinct eye; surface of carapace smooth.

Five pedigerous somites distinct, the second much longer than the first; the third and fourth strongly expanded backwards at the sides, leaving a wide interval between the second and third pairs of legs.

KEY TO THE SPECIES OF DIASTYLOPSIS

- 1 Third maxilliped with large laminar distal expansion of ischium (fig. 258) **D. thileniusi**
- Third maxilliped with only small distal expansion of ischium (fig. 242) 2
- 2 First pleon somite of female with prominent medio-ventral tooth, without latero-ventral spines (fig. 226) **D. elongata**
- First pleon somite of female without prominent ventral tooth, with latero-ventral spines (fig. 238) **D. crassior**



Diastylopsis elongata Calman. Figs. 225, 226. Female from side and first abdominal somite from side. Fig. 227. Male from side. Fig. 228. Female first antenna. Figs. 229, 230. Female first and second pereopods. Fig. 231. Male terminal part of second pereopod. Fig. 232. Female third pereopod. Fig. 233. Male fourth pereopod. Fig. 234. Female fifth pereopod. Fig. 235. Male last somite, telson and right uropod. Fig. 236. Female last somite, telson and right uropod. (All after Calman, 1911.)



The abdomen about twice as long as the cephalothorax, rather slender, the fifth somite about twice as long as deep; the first somite with a prominent backwards-curved tooth in the middle of the sternal surface; the fifth somite with the postero-lateral angles spiniform.

Telson a little shorter than the last somite, its post-anal part narrowed and about as long as the pre-anal part, with about eight pairs of short lateral spines and two short terminal spines.

First antennae with the first segment of the peduncle stout, expanding distally, shorter than the other two together; the second more than $1\frac{1}{2}$ times as long as the third; flagellum of three and accessory flagellum of two segments, with perhaps a minute terminal segment in each case. Second antenna of three segments.

Mandible with an elongated body and about 12 spines on the inner edge. First maxilla with two setae on the palp.

Third maxillipeds with the basis twice as long as the distal segments together, little expanded distally, with a well developed exopodite; the ischium with a distal expansion similar to that in *Diastylis insularum*.

First peraeopods extending beyond the tip of the pseudorostrum by little more than the terminal segment; the basis more than $1\frac{1}{4}$ as long as the remaining segments together, with a row of denticles on its lower surface and a tooth at the distal inner corner; the carpus and propodus are about the same length and each a little longer than the dactylus. The second peraeopods have the basis a little less than $1\frac{1}{4}$ as long as the distal segments together, with a small tooth at its distal inner corner; the ischium and merus have their inner edges produced distally as a slight tooth; the merus is $\frac{2}{3}$ as long as the carpus and a little shorter than the propodus and dactylus together. The third and fourth peraeopods have rudimentary two-segmented exopods. The coxa of the third pair is broadened antero-posteriorly, its distal edge is serrated, and the basis is attached near its posterior end. The fifth pair of peraeopods are much shorter than the fourth.

The peduncle of the uropods is a little more than $1\frac{1}{2}$ as long as the telson and has about seven spines on the distal part of its inner edge; the rami are subequal and a little more than $\frac{2}{3}$ as long as the peduncle; the endopod has three segments, the first longer than the other two together; there are numerous short spines on the

inner edge and the apical spine is short; the exopod bears setae terminally and on the outer edge.

Length, about 9.2 mm.

Adult Male: The dorsal edge of the carapace is almost straight and the pseudorostrum horizontal; the ocular lobe is slightly prominent from the side but has no terminal tooth. The third and fourth free thoracic somites are less produced backwards than in the female and there is no marked interval between the second and third peraeopods. The last thoracic somite has the postero-lateral corner produced as a short spine. The ventral spine of the first abdominal somite is bifid. The telson is about as long as the last somite, and is more than half as long as the peduncle of the uropods.

The peduncle of the first antennae has its terminal segment stouter than in the female and carries a tuft of sensory filaments; the flagellum has five and the accessory flagellum three segments. The second antennae have the flagellum reaching beyond the telson.

The second peraeopods have the distal segments more elongated than in the female, together little shorter than the basis; the carpus is nearly twice as long as the merus; the propodus is stouter and longer than the dactylus, which bears terminally two small curved claws which are absent in the female. In the third and fourth peraeopods the basis is produced into a strong tooth at its distal end anteriorly. In the fourth and fifth peraeopods, but not in the third, the ischium is produced posteriorly into a tooth-like process.

Both pairs of pleopods are biramous, with the exopod of two segments.

The exopod of the uropods is slightly shorter than the endopod, which has numerous spinules on its inner edge; the peduncle has more spines on its inner edge than in the female.

Length, about 9 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1-5 fm, Akaroa Harbour (Calman, 1911).

HAWKE BAY: Dom. Mus. BS143, 1 male, 3 females; NZOI Sta. B2, 5 females; B3, 8 females; B4, 1 female; B5, 1 female; B10, 2 females; B18, 1 female; B39, 1 female; B45, 1 male, 1 female; B51, 4 males, 1 female; B52, 1 male, 1 female.

Diastylopsis crassior Calman, 1911 (figs. 237–250).

Calman, 1911; Stebbing, 1913.

Female: Closely resembles that of *D. elongata*. The slightly curved dorsal outline of the carapace is continued without a break by the upper edge of the pseudorostrum, which is less acutely pointed than in *D. elongata*; the eyelobe is not prominent dorsally and has no tooth.

The abdominal somites are much stouter than in *D. elongata*, the fifth being less than $1\frac{1}{2}$ times as long as deep. The first pleon somite is without a median ventral tooth or this is very small but with two ventro-lateral rows of denticles. The postero-lateral corners of the third, fourth and fifth somites are spiniform.

The telson is much less narrowed distally than in *D. elongata*.

The first antennae are relatively a little longer.

The first peraeopods have the spines on the lower surface of the basis stronger and more numerous than in *D. elongata*. The basis of the second peraeopods is a little shorter than the distal segments together and has some teeth on its lower surface and outer edge and a strong tooth at its distal inner corner; the ischium is produced on the inner side into two and the merus into three strong teeth; the merus is a little more than half as long as the carpus, and equal to the propodus and dactylus together. The remaining pairs of peraeopods are stouter and longer than in *D. elongata*. The tooth at the distal end of the basis in the third and fourth is strong, and in some cases bifid.

The peduncle of the uropods is twice as long as the telson and has six spines, much longer than those in *D. elongata*, on its inner edge; the exopod is distinctly longer than the endopod, which is about $\frac{2}{3}$ as long as the peduncle.

Length, about 9.3 mm.

Adult Male: Very similar to the male of *D. elongata*. Carapace with the pseudorostrum less acutely pointed. Last thoracic somite with the postero-lateral corners more produced. Pre-anal part of telson broader than in *D. elongata* and its terminal spines stouter; telson only about half the length of the peduncle of the uropod. The strong tooth on the basis of the third and fourth peraeopods has a number of accessory teeth below it.

Length, about 9 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm (Calman, 1911).

MENZIES BAY: coll. R. Pilgrim, Aug 1954, 1 male. HAWKE BAY: NZOI Sta. B1, 1 male; B3, 1 male, 1 female; B7, 3 females; B8, 2 males, 7 females; B14, 1 male; B15, 1 female; B37, 16 males, 26 females, 2 juv.; B42, 2 females; B43, 14 males, 78 females, 1 juv.; B44, 1 female; B52, 2 females. OFF KAWHIA: NZOI Sta. C280, 3 females; C281, 7 females.

As with *Diastylis neozealanica* and *Diastylis insularum*, this species and *Diastylopsis elongata* seem to be a closely related species pair.

Diastylopsis thileniusi (Zimmer, 1902) (figs. 251–264).

Zimmer, 1902, as *Leptostylis thileniusi*; Calman, 1908, as *Leptostylis* sp.; Zimmer, 1908; Stebbing, 1913; Zimmer, 1943b.

Female: Carapace little longer than the pedigerous somites combined; pseudorostrum blunt, its dorsal edge about $\frac{1}{3}$ of the total carapace length; antero-lateral angle acute, with a few serrations below; frontal lobes with two transverse lines or ill-defined ridges, a pair of lateral lines from the middle of the frontal sutures not reaching the lower edge of the carapace, a pair crossing the ends of the sutures, and sometimes an oblique pair running from above forwards to below backwards under the pseudorostrum.

The first three free thoracic somites are dorsally short, with their front margins finely serrated, the sides of the third almost encircling the long fourth, the fourth nearly surrounding the small fifth of which the hind corners are blunt and little produced. Some plumose setae are present on the borders of the thoracic somites.

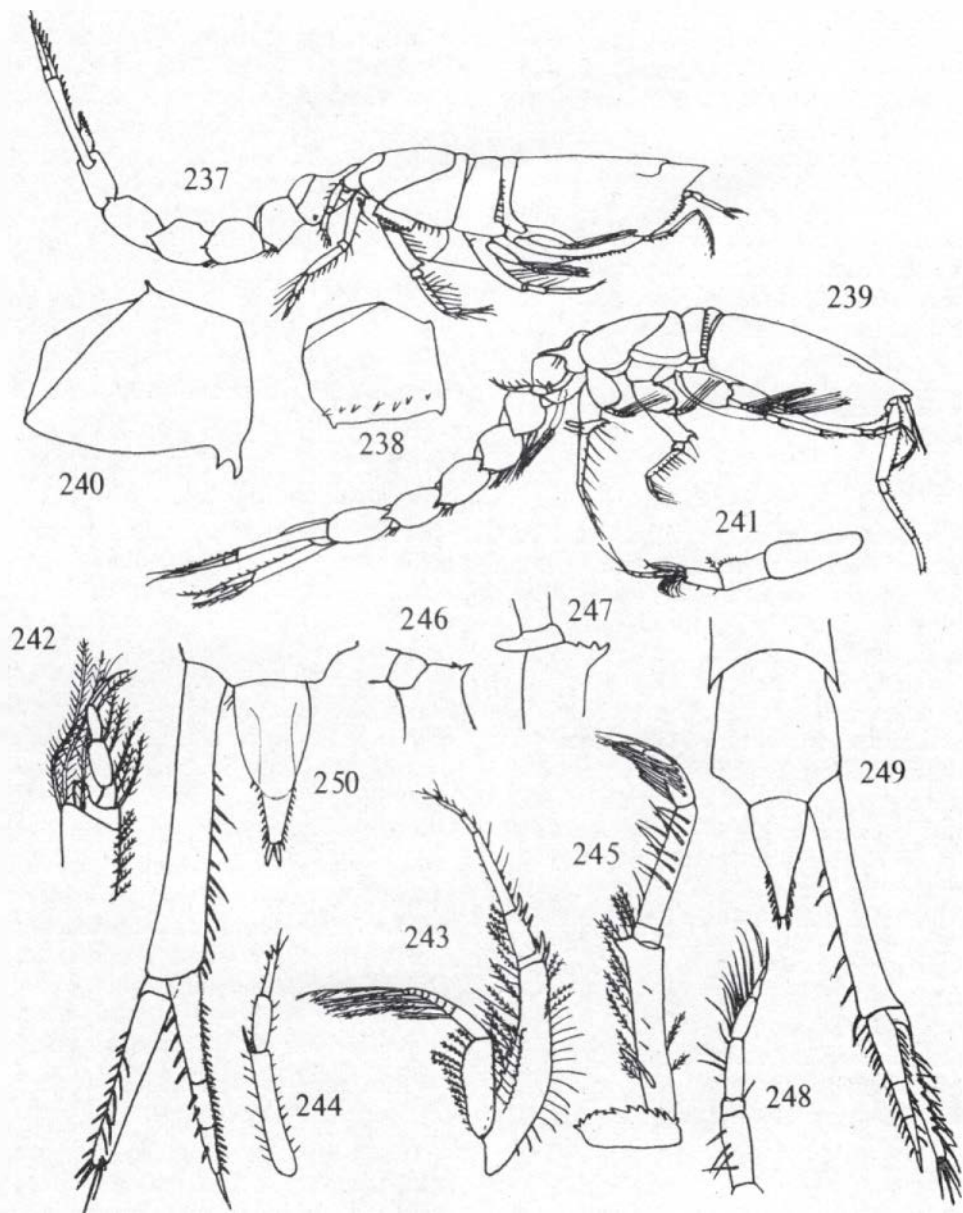
Pleon somites with postero-ventral spines and some dorsal plumose setae.

Telson little longer than the last abdominal somite, with two pairs of plumose setae on the wide basal part and six pairs of lateral spines on the narrowed distal part and two stouter end spines.

First antenna with the accessory flagellum small. Second antenna with four segments.

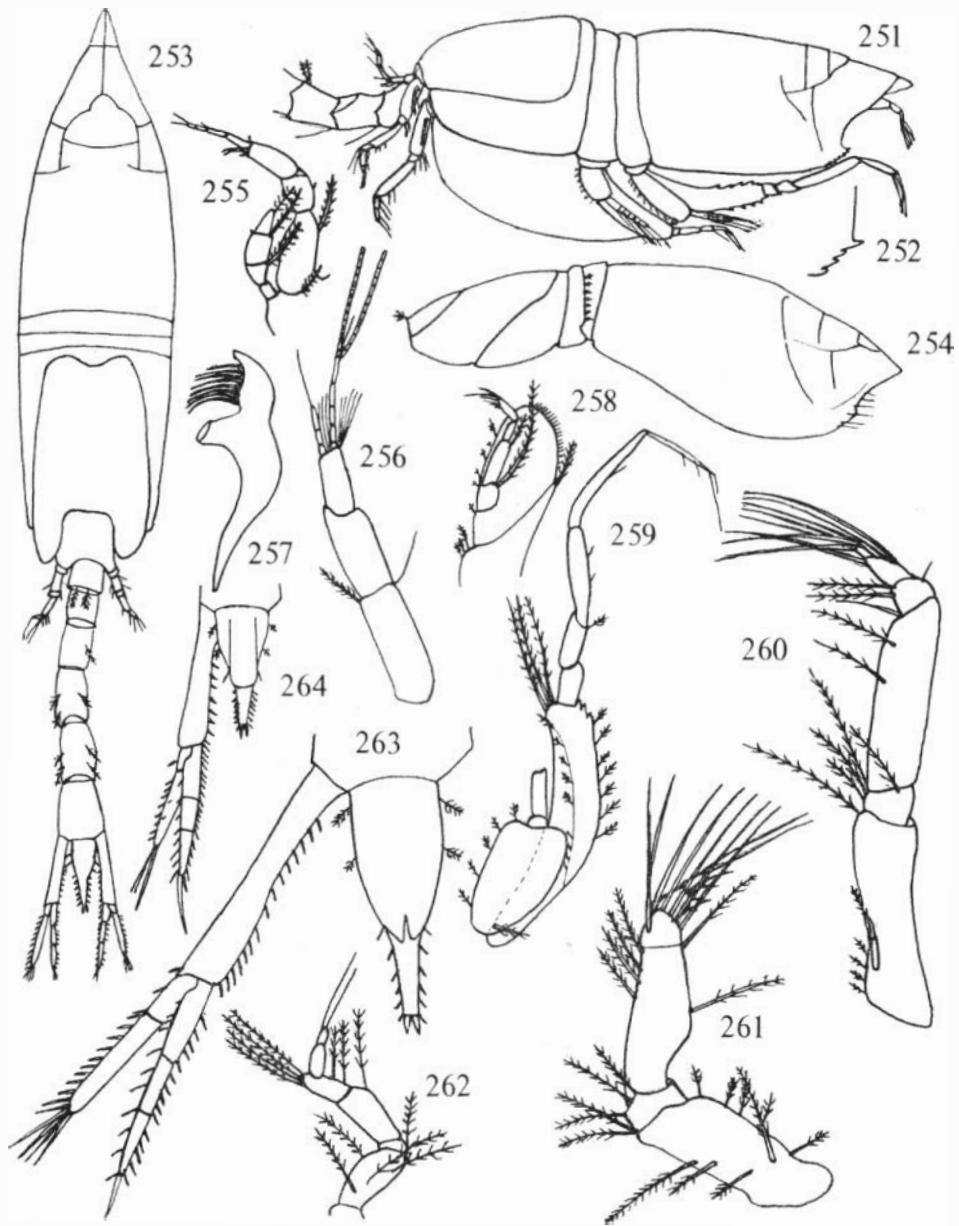
Third maxilliped with the basis more than $1\frac{1}{2}$ times the length of the distal segments together, strongly produced distally to an acute point reaching to the middle of the carpus; the ischium is greatly expanded to form a lamella which covers nearly all the remaining segments from below.





Diastylopsis crassior Calman. Figs. 237, 238. Female from side and first abdominal somite from side (after Calman, 1911). Figs. 239, 240. Male from side and first abdominal somite from side. Fig. 241. Male first antenna. Fig. 242. Male end of basis and distal segments of third maxilliped. Fig. 243. Female second peraeopod (after Calman, 1911). Fig. 244. Last three segments of male second peraeopod. Fig. 245. Female third peraeopod (after Calman, 1911). Figs. 246, 247. Ends of bases of male third and fourth peraeopods. Fig. 248. Female fifth peraeopod (after Calman, 1911). Fig. 249. Female last somite, telson and right uropod (after Calman, 1911). Fig. 250. Male telson and left uropod.





Diastylopsis thileni (Zimmer). Figs. 251, 252. Ovigerous female from side and antero-lateral angle of carapace from side. Fig. 253. Female from above. Fig. 254. Male from side. Fig. 255. Female first and second antennae. Fig. 256. Male first antenna. Fig. 257. Female mandible. Fig. 258. Male distal end of third maxilliped. Fig. 259. Male first pereopod. Figs. 260, 261, 262. Female third, fourth and fifth pereopods. Fig. 263. Female telson and left uropod. Fig. 264. Male telson and left uropod. (All after Zimmer, 1902, 1943b.)

First peraeopods with the basis much shorter than the remaining segments together; the carpus and propodus are about equal in length and each nearly twice as long as the dactylus. Second peraeopods with the basis about $1\frac{1}{4}$ as long as the distal segments together; the dactylus and carpus are about the same length and each twice as long as the propodus. The third and fourth peraeopods have rudimentary exopodites.

Uropods with the peduncle slightly longer than the telson; endopod about as long as the peduncle, the exopod a little shorter; the peduncle with about 15 spines on the inner edge; endopod with about five spines on the inner and three on the outer edge of each of its three segments and a long terminal spine; exopod with about two and 11 cylindrical spines on the outer edges of its two segments and four longer terminal spines.

Length, about 5 mm.

Adult Male: Markings of the carapace as in the female but sometimes very faint; antero-lateral tooth less prominent. The third free thoracic somite is less produced backwards than in the female. The telson is about $1\frac{1}{2}$ times as long as the last abdominal somite.

First antenna with the flagellum six-segmented, its first segment broadened and carrying a brush of sensory setae; accessory flagellum. Three-segmented, a little more than half as long as the main flagellum. Second antennal flagellum reaching to end of body.

Second peraeopods with the basis about $1\frac{1}{2}$ times as long as the distal segments together; the dactylus is shorter than the carpus but longer than the propodus.

Length, about 6 mm.

Localities

PREVIOUSLY RECORDED: Bay of Plenty, Bay of Islands, Portobello (Zimmer, 1902; Calman, 1908; Zimmer, 1943b).

MENZIES BAY: coll. R. Pilgrim, Aug 1954, 12 males, 11 females. DEVONPORT WHARF, AUCKLAND: coll. M. C. Miller, 7 Aug 1960, towntnet after dark, 1 female. HAWKE BAY: NZOI Sta. B37, 5 males, 10 females; B38, 10 males, 35 females; B42, 28 males, 84 females, 9 juv.; B43, 4 males, 4 females; B44, 6 females; B45, 1 male. ACKERS BAY, STEWART ISLAND: NZOI Sta. B232, 1 male, 6 females. COOK STRAIT: NZOI Sta. C388, 1 male; Sta. C486, 3 females.

Genus *Leptostylis* G. O. Sars, 1869

Near to *Diastylis* but with the abdomen and appendages relatively slender. The telson shorter, with few lateral spines. Male first antenna with the peduncle dilated and its distal segments bearing a dense brush of sensory filaments. Flagellum of male second antenna usually much shorter than the body. Third and fourth peraeopods of the female with rudimentary exopodites.

Leptostylis recalvastra Hale, 1945 (figs. 265–279).
Hale, 1945c.

Female: Integument thin, slightly calcified, with scattered but fairly long hairs. Carapace $\frac{2}{7}$ of the total length; dorsal edge somewhat sinuate because of the swollen branchial regions between which is a shallow groove; there is a low boss on each side of the frontal lobes at the posterior end of the sutures and outside the sutures is a low fold; from above it is subtriangular in shape, broadest at the hind end; pseudorostrum subacute, its dorsal edge about $\frac{1}{5}$ of the total carapace length; eyelobe very small, rounded, and without apparent lenses; antero-lateral margin very shallowly concave, antero-lateral angle obtuse, and the inferior margin serrate.

Pedigerous somites each with a transverse fold; the first partly hidden, the remainder not differing much in length and not greatly expanded at the sides.

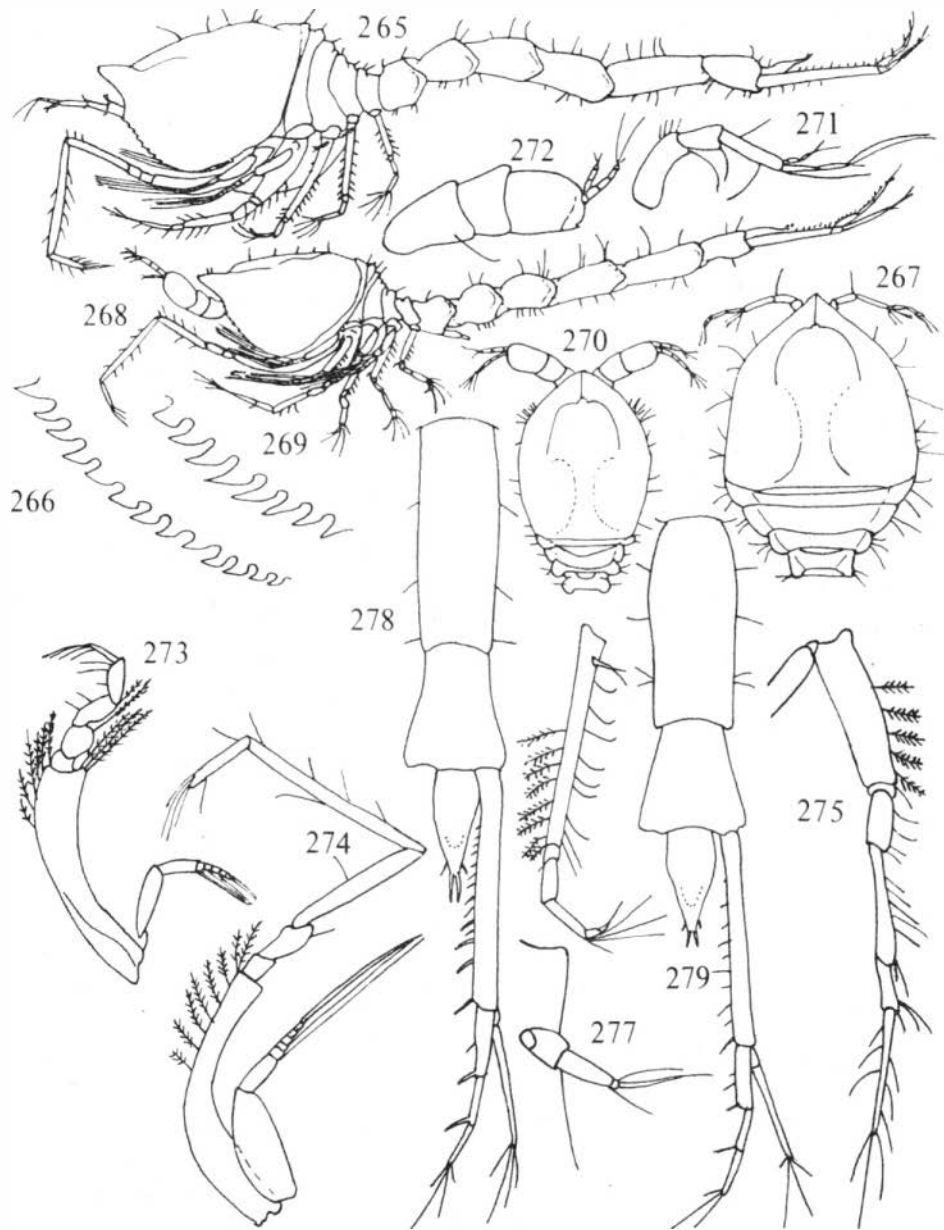
Pleon about $1\frac{1}{2}$ times the length of the cephalothorax; the fifth somite nearly three times as long as wide; sixth somite only half as long as the fifth and distinctly dilated posteriorly. Telson about as long as the sixth somite, with a pair of rather long apical spines and a single pair of lateral spines; post-anal part about $\frac{1}{4}$ of its total length.

First antenna with first and third segments of the peduncle subequal in length, each considerably longer than the second; flagellum with two subequal segments, together almost as long as the last segment of the peduncle; accessory flagellum two-segmented, shorter than the first segment of the main flagellum.

Mandible with 10 or 11 spines.

Third maxilliped slender, the basis nearly $1\frac{1}{2}$ times as long as the distal segments together; the last four segments subequal in length.

First peraeopod long, the carpus reaching well beyond the tip of the pseudorostrum; the basis only about half as long as the remaining segments together; the propodus nearly $1\frac{1}{2}$ as long as the



Leptostylis recalvastra Hale. Figs. 265, 266. Female from side and serrations of lower margin of carapace from side. Fig. 267. Female cephalothorax from above. Figs. 268, 269. Male from side and serrations on lower margin of carapace from side. Fig. 270. Male from above. Fig. 271. Female first antenna. Fig. 272. Male first antenna. Fig. 273. Female third maxilliped. Fig. 274. Male first pereopod. Figs. 275, 276, 277. Female second and third pereopods and exopod of third further enlarged. Fig. 278. Female last somites, telson and right uropod. Fig. 279. Male last somites, telson and right uropod. (All after Hale, 1945c.)

carpus and nearly three times as long as the dactylus. Basis of the second pereopod only half as long as rest of appendage; the ischium distinct; the carpus twice as long as the merus, a little more than twice as long as the propodus, and equal in length to the long dactylus. Third and fourth pereopods with the basis longer than the rest of the appendage and with the merus shorter than the carpus; the propodal seta and the longest carpal setae reaching well beyond the tip of the slender dactylus; their exopodites three-segmented, the last segment minute, and furnished with three setae. Fifth pereopod with the basis not longer than the remaining segments together.

Uropods with the peduncle more than twice as long as the telson, its inner edge with about 12 irregular spines; endopod three-segmented, about $\frac{2}{3}$ as long as the peduncle; first segment longer than the second or third and with two spines on its inner edge; second segment with one spine on its distal inner edge; third with four unequal spines at its distal end; exopod little longer than the first two segments of the endopod, unarmed except for about four unequal end spines.

Length, 5.4 mm.

Adult Male: Unknown. Subadult male with carapace suboval in shape viewed from above, widest at about the middle of its length; antennal angle not at all marked.

First antenna relatively very large, the last segment of the peduncle globose but without brush of sensory filaments, which probably appear in the adult; flagellum five-segmented, the first and last segments short; accessory flagellum four-segmented and as long as the first three segments of the main flagellum.

Length, 4.5 mm.

Localities

PREVIOUSLY RECORDED: New South Wales, Australia (Hale, 1945c).

CANTERBURY BIGHT: *Lachlan* Sta. 337/51B, 1 imm. male, 1 imm. female.

Remarks

The New Zealand specimens are immature and it is not possible to identify them with complete certainty but they show no characters separating them from *L. recalvastra*.

Genus *Colurostylis* Calman, 1911

Pleural plates of third and fourth free thoracic somites well but not greatly expanded backwards, third legs separated from second in adult female. Telson very small, flattened, without spines. Third maxillipeds with exopodites in both sexes. Third and fourth pereopods with rudimentary exopodites in the female. Two pairs of biramous pleopods in the male. Endopod of the uropod of two segments.

KEY TO THE SPECIES OF COLUROSTYLIS

- 1 Carapace of female with prominent toothed anterolateral angle; uropods with peduncle nearly as long as last three pleon somites combined (figs. 303, 304)..... *C. longicauda*
Carapace of female without prominent anterolateral angle; uropods with peduncle not longer than last two pleon somites combined (figs. 280, 295)..... 2
- 2 Sides of carapace with two oblique ridges (figs. 295, 297)..... *C. lemurum*
Sides of carapace without ridges (figs. 280, 281)..... *C. pseudocuma*

Colurostylis pseudocuma Calman, 1911 (figs. 280–294).

Calman, 1911; Stebbing, 1913.

Female: Carapace about $\frac{2}{3}$ of the total length, its height about $\frac{1}{3}$ of its length; dorsal edge slightly curved, sides pitted with shallow depressions; Pseudorostrum straight, acute, horizontal or slightly raised; antennal notch obsolete, anterolateral corner rounded; eyelobe broader than long, without apparent lenses.

Free thoracic somites deeper than the carapace anteriorly; pleural plates of the third curved backwards.

Abdomen a little shorter than the cephalothorax. Telson about $\frac{2}{3}$ as long as the last somite, obtusely pointed behind, carrying a few minute setae but without spines.

First antennae with the first segment of the peduncle longer than the second or third; the flagellum three-segmented, about equal in length to the third segment of the peduncle; accessory flagellum three-segmented, the first and third minute, about equal to the first segment of the main flagellum. Second antennae three-segmented, the first bearing two setae, the second and third one each.

Mandible of normal shape, with about nine spines.

Third maxilliped with the basis expanded distally and slightly produced.



Second pereiopods with the basis about $\frac{3}{4}$ of the length of the distal segments together; the dactylus short, less than twice as long as the propodus. Third and fourth pereiopods with the basis shorter than the distal segments together, each with a two-segmented rudimentary exopodite nearly half as long as the basis. Fifth pereiopods not much shorter than the fourth.

Uropods with peduncle more than twice as long as the last somite, with a single spinule at its distal inner corner; the rami subequal, shorter than the peduncle; endopod of two segments, the proximal shorter than the distal, fringed with fine setae on the inner edge, and with a terminal spine and three or four spinules on the distal part of the inner edge partly hidden among the setae; exopod with a long terminal spine and two short ones on either side of it.

Length, about 2.3 mm.

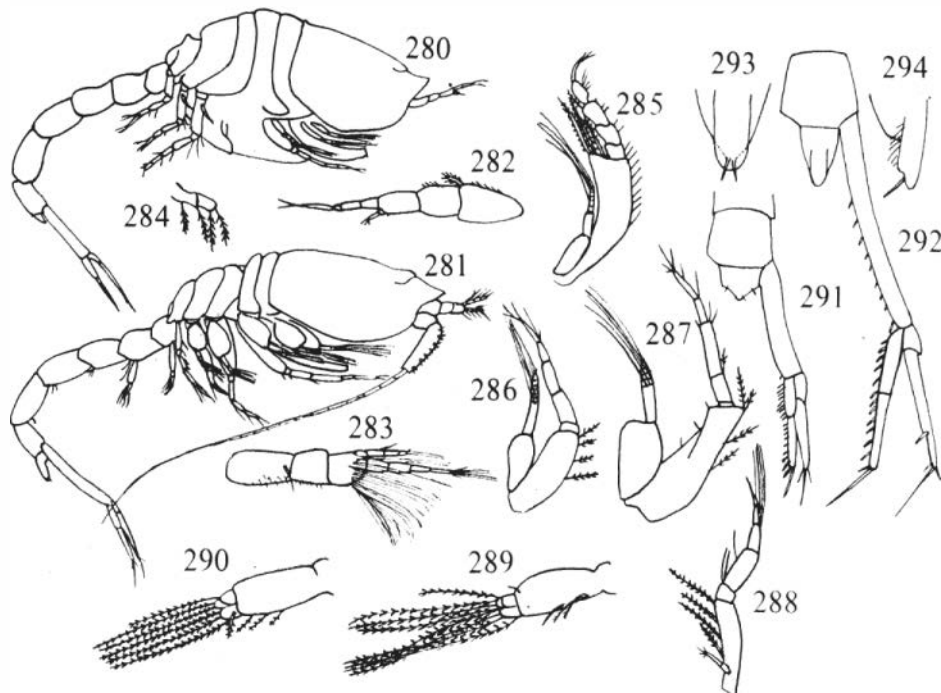
Adult Male: Carapace nearly $\frac{1}{3}$ of the total length, its height about half its length. Free thoracic somites less deep than in the female. Second and third pairs of pereiopods not separated. The penultimate thoracic somite has a marked median

dorsal keel. The posterior corners of the last somite are slightly produced and acute. Telson about $\frac{3}{4}$ as long as the last abdominal somite and produced well beyond the anal valves, the post-anal part forming a tongue-shaped lobe, of which the outline is continued forwards by two ridges on the dorsal surface of the telson; two small setae spring from the under surface, close to the tip, and there are some very fine setae below the lateral margins.

First antennae with the peduncle slightly increasing in diameter distally, the first segment almost as long as the other two together, the last segment as broad as long and bearing a dense tuft of sensory filaments; flagellum four-segmented, more than half as long as the peduncle; accessory flagellum four-segmented, the first and last very small, more than half as long as the main flagellum. Second antennae about as long as the body.

Two pairs of biramous pleopods are present, the outer ramus of each two-segmented.

Uropods with the peduncle nearly three times as long as the last somite, with about nine spinules interspersed with minute setae on the inner edge;



Coluwostylis pseudocuma Calman. Fig. 280. Female from side. Fig. 281. Male from side. Fig. 282. Female first antenna. Fig. 283. Male first antenna. Fig. 284. Female second antenna. Fig. 285. Female third maxilliped. Fig. 286. Female second pereiopod. Fig. 287. Male second pereiopod. Fig. 288. Female third pereiopod. Figs. 289, 290. First and second pleopods. Fig. 291. Female last somite, telson and right uropod. Figs. 293, 294. Apex of male telson from above and side. (All after Calman, 1911.)



the rami are less than $\frac{2}{3}$ as long as the peduncle; endopod with six spinules on the inner edge of the proximal segment and seven on the distal, with very small setae between.

Length, 2.7 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm; Akaroa Harbour, 6 fm (Calman, 1911).

Colurostylis lemurum Calman, 1917 (figs. 295–301).

Calman, 1917; Zimmer, 1943b.

Female: Carapace rather more elongate than in *C. pseudocuma* and having the pseudorostrum, in most specimens, distinctly longer and more acute; there is a strong oblique ridge running forwards and downwards on the side of the carapace; in front of this a weaker ridge, running more horizontally, defines a somewhat depressed area occupying the lateral region of the frontal lobe; these ridges unite with a narrow U-shaped ridge on the dorsal surface; there is a strong ridge running close to and parallel with the hind margin of the carapace; between the ridges the surface is pitted with shallow depressions, less marked than those of *C. pseudocuma*; eyelobe large, about twice as wide as long, with visual elements apparently well developed, in four groups, but without conspicuous corneal lenses.

Third and fourth free thoracic somites separated dorsally only by a superficial groove. Second and third pereopods less widely separated than in *C. pseudocuma*.

Telson a little less than half as long as the last somite, shaped as in *C. pseudocuma*.

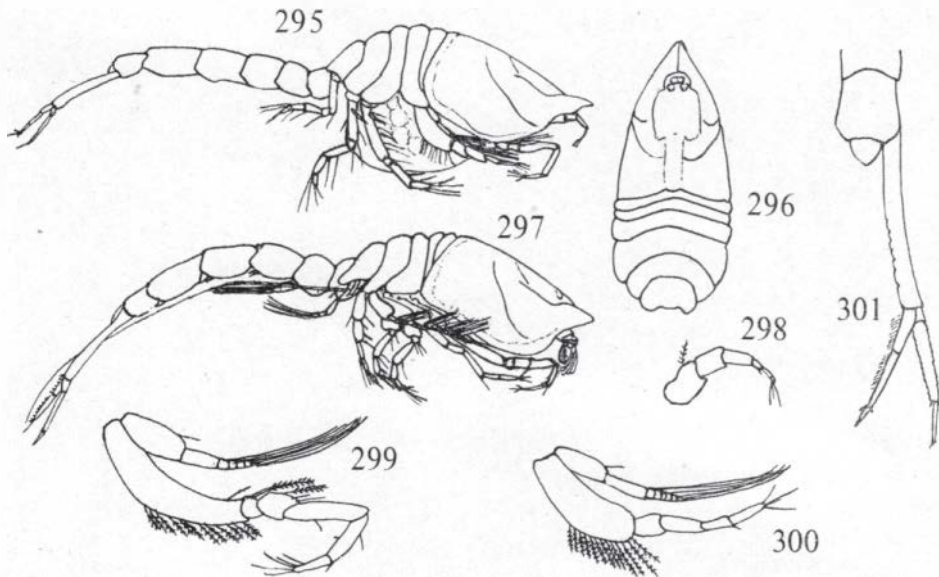
First antennae with the third segment of the peduncle narrower and longer than the second. Second antennae apparently of four segments, each bearing a single seta.

Branchial apparatus of the first maxillipeds with about 10 digitiform lobules.

First pereopods rather stout, the distal segments combined about $1\frac{1}{3}$ as long as the basis; the propodus nearly as long as the carpus and twice as long as the dactylus. Second pereopods with the basis nearly as long as the distal segments together; dactylus less than $1\frac{1}{2}$ times as long as the propodus. Exopodites of the third and fourth pereopods less than $\frac{1}{3}$ as long as the basis.

Peduncle of the uropods from twice to $2\frac{1}{2}$ times as long as the last somite, the endopod a little longer than the exopod and less than $\frac{2}{3}$ as long as the peduncle; proximal segment of the endopod $\frac{3}{4}$ of the length of the distal segment or a little more; peduncle and exopod serrated on their inner edges; endopod with a close-set row of fine setae.

Length, about 4 mm.



Colurostylis lemurum Calman. Figs. 295, 296. Female from side and from above. Fig. 297. Male from side. Fig. 298. Female first antenna. Figs. 299, 300. Female first and second pereopods. Fig. 301. Female last somite, telson and right uropod. (All after Calman, 1917.)



Adult Male: Ridges on carapace similar to those in the female but less strongly marked. In most other characters it resembles the male of *C. pseudocuma*.

The peduncle of the uropod is fully three times as long as the last somite; the endopod may be $\frac{2}{3}$ as long as the peduncle and the exopod distinctly longer than the endopod; the peduncle with about 16 spines on the inner edge; the endopod with five and seven spines on the inner edges of its two segments; the exopod with a few slender setae and spines on its outer edge, with a long end spine about half as long as the exopod itself.

Length, about 4.2 mm.

Localities

PREVIOUSLY RECORDED: Spirits Bay and Portobello (Calman, 1917; Zimmer, 1943b).

MENZIES BAY: coll. R. Pilgrim, Aug 1954, 2 males, 3 females, 1 juv. DEVONPORT WHARF, AUCKLAND: coll. M. C. Miller, Aug 1960, 3 fm, townet after dark, 1 male, 3 juv. COOK STRAIT: NZOI Sta. C388, 2 males, 1 female. NELSON WHARF: NZOI Sta. A469, 10 males, 2 females.

Colurostylis longicauda sp. n. (figs. 302–312).

Female: Integument smooth but showing a finely beaded appearance under high magnification. Carapace slightly more than $\frac{1}{4}$ of the total length, more than $1\frac{1}{2}$ times as long as high and wider posteriorly than its length; dorsal outline smooth and slightly elevated at the hind end; pseudorostrum blunt, horizontal, the front edge straight when viewed from above, its edges faintly crenulated; antennal notch shallow and rounded; antero-lateral angle well developed with four prominent teeth; eyelobe broader than long, with visual elements distinct.

Five free thoracic somites are visible from the side, the second and third being deeper than the carapace; the pleural plates of the third and fourth are curved backwards, separating the second and third peraeopods; the fifth somite has its hind corners moderately produced backwards.

The abdomen as long as the cephalothorax. Telson short, without spines, about $\frac{1}{3}$ as long as the last somite, its hind border sinuate but not produced posteriorly, bent downwards; in one specimen the shape of the telson resembles more closely that of *C. pseudocuma*.

First antenna with the three segments of the peduncle decreasing slightly in length distally; flagellum with three segments, the third short, the whole distinctly longer than the third segment of the peduncle; accessory flagellum three-segmented, the first and third segments very short, and about half as long as the first segment of the main flagellum. Second antenna composed of four flattened segments, the distal very small; the first segment with two plumose setae and the remainder with one each.

Mouthparts of normal shape. Mandibles with about nine spines in the row.

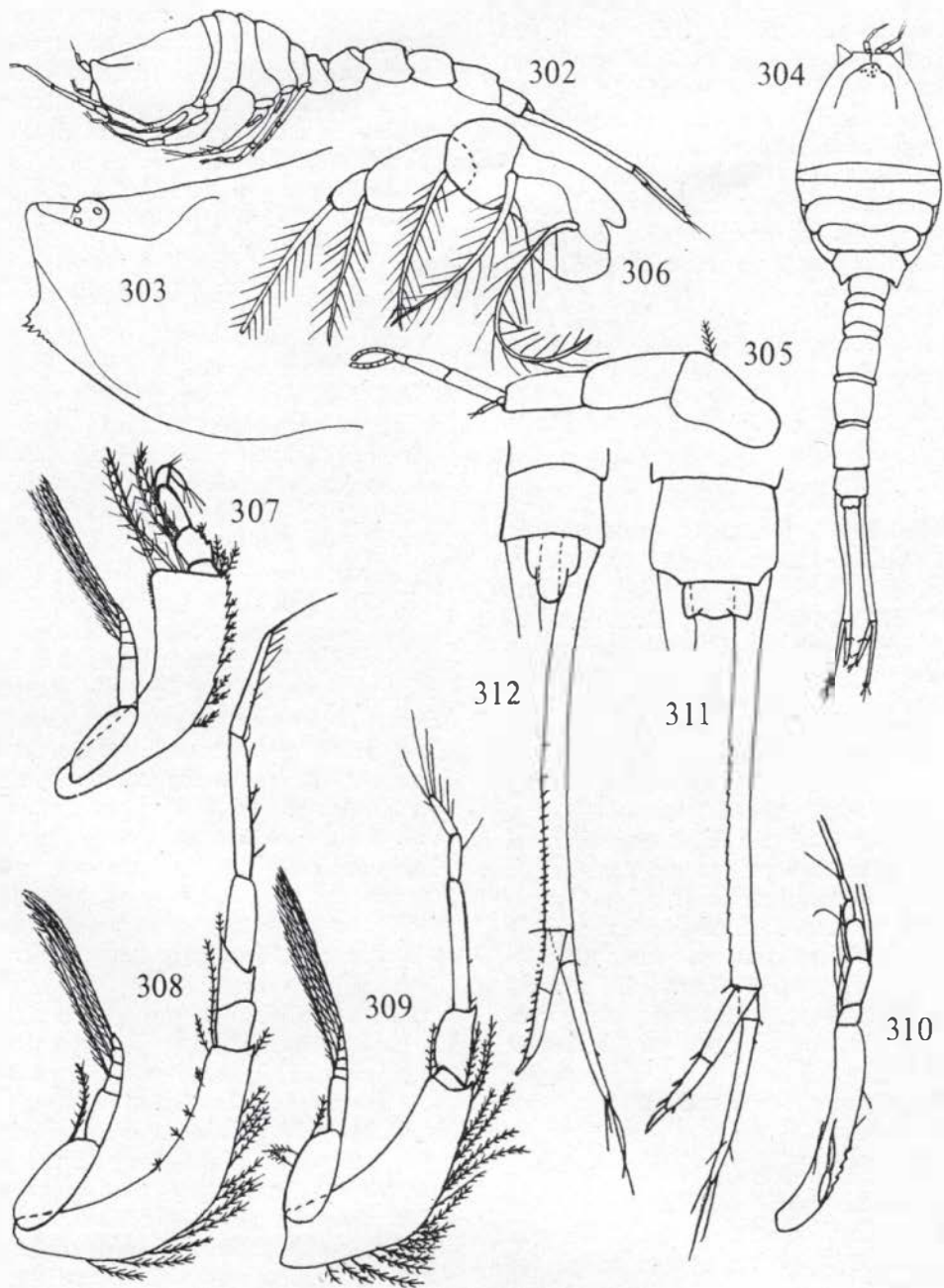
First maxillipeds bearing 13 digitiform branchial lobules. Third maxillipeds bearing an exopodite, with the basis nearly twice as long as the remaining segments together, expanded distally, its lower edge serrated; the ischium and merus have one and several teeth respectively on their lower edges.

The first two pairs of peraeopods have well developed exopodites. The first are long, extending forwards from the middle of the carpus beyond the tip of the pseudorostrum; the basis is about $\frac{2}{3}$ of the total length, curved upwards distally, with a distal spine on its lower edge; the dactylus is shorter than the propodus but longer than the carpus. The second peraeopods have the basis nearly as long as the remaining segments together; the dactylus is about as long as the propodus but only a little more than $\frac{1}{3}$ as long as the carpus. The third and fourth peraeopods have the basis longer than the remaining segments together and each bears a two-segmented rudimentary exopodite which is about $\frac{1}{3}$ as long as the basis.

The peduncle of the uropods is almost as long as the last three pleon somites combined; its inner edge is slightly serrated and bears a slender spine at the distal end; the exopod is two-segmented and is distinctly longer than the two-segmented endopod, and about half as long as the peduncle; it has three slender blunt-ended spines at the end of the second segment, two smaller spines set near the end, and a single small spine on the outer distal edge of the first segment, which is less than $\frac{1}{4}$ as long as the second; the endopod has the two segments about equal in length, the first with one and the second with two stout spines on the inner edge and some very fine setae between them, two on the outer edge, and a fairly long and robust terminal spine.

Length, 4.3 mm.





Colurostylis longicauda sp. n. Figs. 302, 303. Female from side and front of carapace from side. Fig. 304. Female from above. Figs. 305, 306. Female first and second antennae. Fig. 307. Female third maxilliped. Figs. 308, 309, 311. Female first, second and third pereopods. Fig. 310. Female last somite, telson and right uropod. Fig. 312. Male last somite, telson and right uropod.

Adult Male: Only the abdomen and last three thoracic somites are available for description, the remainder of the single specimen having been lost during collection. It has well developed exopodites on the third and fourth pairs of peraeopods, the bases of which are moderately expanded, and two pairs of biramous pleopods. A pair of hooked setae is present on the underside of each of the third to fifth pleon somites. The telson differs from that of the female in having a tongue-shaped lobe directed backwards and downwards, somewhat as in the male of *C. pseudocuma*; no setae or spines are visible. The uropods are similar in general shape and size to those of the female but the peduncle bears a row of about 16 small spines interspersed with very fine setae on the distal half of its inner edge in addition to the more slender spine at the end, while the endopod has eight and six small spines on the inner edges of the first and second segments respectively.

Length unknown.

Type

Deposited in the N.Z. Oceanographic Institute No. 6.

Locality

HAWKE BAY: NZOI Sta. B42, 13 fm, fine sandy mud, 1 male, 4 females; Sta. B43, 11 fm, 1 female.

Remarks

This species of *Colurostylis* differs considerably from the other two described from New Zealand. It may readily be distinguished from them by the prominent toothed antero-lateral angle of the female carapace, the shape of the telson, and the greater length of the uropods.

Genus *Gynodiastylis* Calman, 1911

Pleural plates of third and fourth free thoracic somites slightly or greatly expanded backwards. Telson with or without terminal spines and its post-anal part often reduced in size. First antenna of male without brush of sensory setae. First antenna of female with proximal segments of peduncle not at all dilated. Third maxillipeds of the female without an exopodite. Exopodites are present on the first and second peraeopods of both sexes and may or may not be present on the third and fourth peraeopods of the male but are absent from these in the female. First to fourth peraeopods of the male with their bases not conspicuously expanded. Male without pleopods. Peduncle of uropods usually comparatively stout; endopod with one, two or three segments.

KEY TO THE SPECIES OF GYNODIASTYLIS

- 1 Uropods with endopod of two segments; carapace with ridges (fig. 313, 343).....2
- Uropods with endopod unsegmented; carapace without ridges (figs. 335, 342).....*G. laevis*
- 2 5 or 6 pairs of longitudinal ridges (fig. 313).....*G. carinata*
- 3 pairs of longitudinal ridges (fig. 343).....*G. milleri*

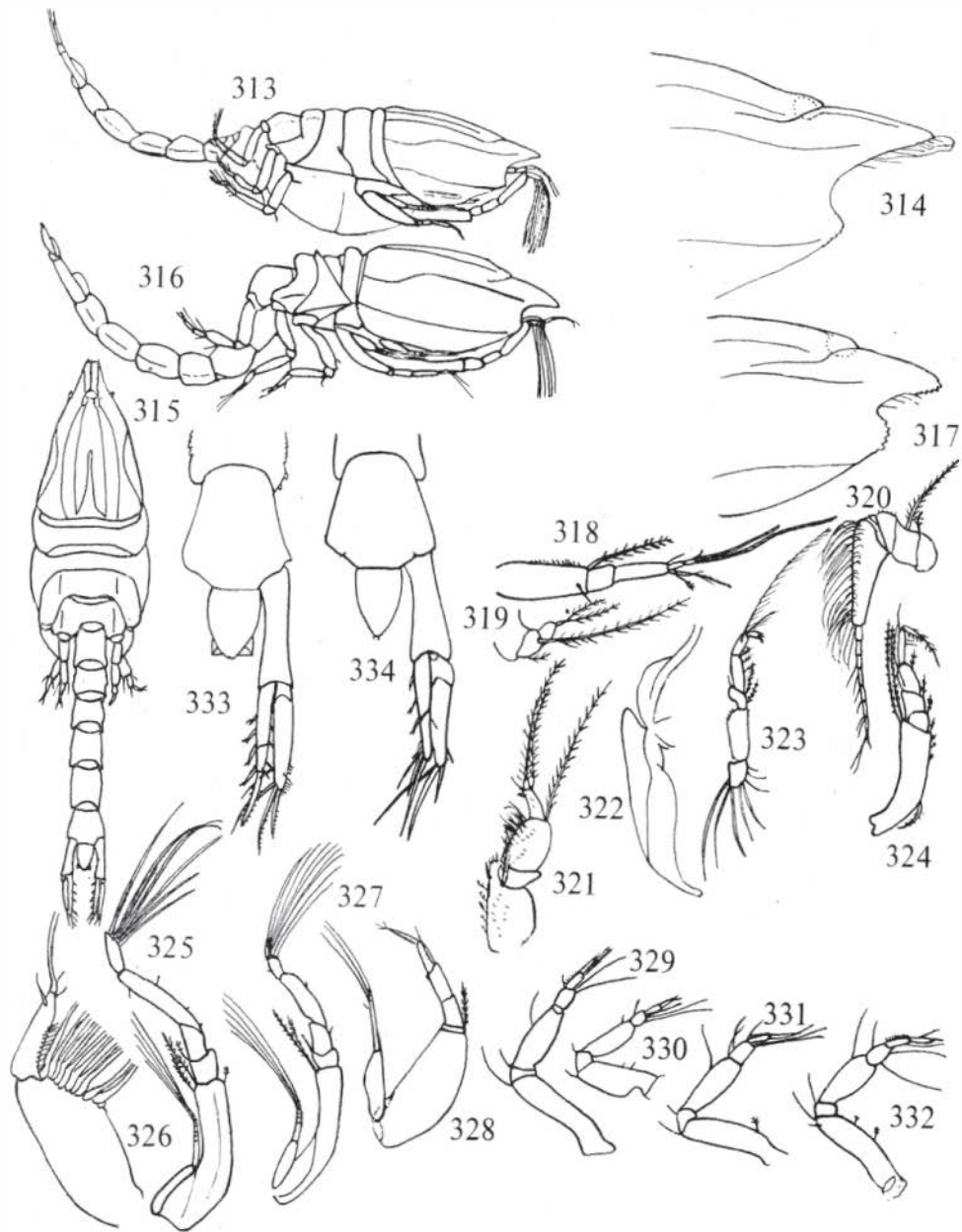
Gynodiastylis carinata Calman, 1911 (figs. 313–334).

Calman, 1911; Stebbing, 1913; Hale, 1946a.

Female: Carapace a little less than $\frac{1}{3}$ of the total length, its height a little more than half its length, subcylindrical, narrowed in front; dorsal outline very slightly arched; pseudorostrum straight, horizontal, acutely pointed, a little less than $\frac{1}{4}$ of the total carapace length; antennal notch widely open, defined below by the slightly produced antero-lateral tooth; surface of carapace with six longitudinal ridges on each side; starting from the hind edge near the middle line, a ridge, rather less strongly marked than the others, runs forwards and inwards to meet its fellow at about the middle of the carapace length; from nearly the same point on the hind margin the second ridge runs forwards as far as the eyelobe; the third ridge, nearly parallel with the second, curves slightly inwards anteriorly and ends close to the fronto-lateral fissure; the fourth ridge curves upwards a little in front of its origin, bounding a shallow depression on the side of the carapace, and then runs forwards on to the base of the pseudorostrum; the fifth ridge, which is very strong, runs below the lateral depression and ends at the antero-lateral angle; a faintly marked sixth ridge is visible in some specimens just above the lower margin of the carapace; the eyelobe is less than twice as broad as long and bears three large but indistinctly defined corneal lenses.

All five pedigerous somites are distinct. The pleural plates of the third are expanded and produced in front and behind. In this somite and to a greater extent in the two succeeding somites, the attachment of the peraeopods is rotated backwards and upwards, so that in the last somite the extended peraeopod points directly backwards. The last two thoracic somites have each a pair of longitudinal ridges on the dorsal surface.

Abdomen distinctly shorter than the cephalo-thorax; the somites are slightly depressed, with a longitudinal ridge on each side; the last somite is flattened and about as broad as long. Telson about $\frac{2}{3}$ as long as the last somite; from above it is ovate in outline, its breadth $\frac{1}{3}$ of its length, truncated in



Gynodiastylis carinata Calman. Figs. 313, 314. Female from side and front of carapace from side. Fig. 315. Female from above. Figs. 316, 317. Male from side and front of carapace from side. Figs. 318, 319. Female first and second antennae. Fig. 320. Male second antenna. Figs. 321, 322. Female first maxilliped and branchial apparatus. Figs. 323, 324. Female second and third maxillipeds. Figs. 325, 326. Female first pereopod and distal segments further enlarged. Fig. 327. Male first pereopod. Figs. 328, 329. Female second and third pereopods. Fig. 330. Male third pereopod. Figs. 331, 332. Female fourth and fifth pereopods. Fig. 333. Female last somite, telson and right uropod. Fig. 334. Male last somite, telson and right uropod. (All after Calman, 1911.)

front and bluntly pointed at the tip, which bears two minute setae; from the side it appears tubular anteriorly but cut away below from about the middle of its length to receive the obliquely placed anal valves: the apex of the telson does not project beyond the upper ends of the valves.

First antennae with the first segment of the peduncle longer than the other two together, the second about half as long as the third; flagellum of two segments, the first the longer, accessory flagellum of three segments, together about equal in length to the first segment of the main flagellum. Second antenna short, with three segments, each with a plumose seta.

Mandibles normal with about 12 spines in the row. Palp of first maxilla short with two setae.

First maxilliped with three very long setae springing from the last three segments; branchial apparatus with only one vestigial lobule near the proximal end. Second maxilliped with a very long seta on the penultimate segment; the basal plate with eight setae. Third maxilliped without an exopodite; the basis slightly expanded but not produced distally; the distal segments rather slender, the propodus a little longer than either the carpus or the dactylus.

First peraeopods stout and not projecting much in front of the pseudorostrum; the basis about $\frac{3}{4}$ as long as the distal segments together; the carpus nearly twice as long as the ischium and merus together, its inner edge irregularly tuberculate; propodus less than half as long as the carpus; the distal half of its inner edge is oblique and bears a series of 10 very long smooth setae, each slightly expanded at the base and four times as long as the propodus; the dactylus is little more than half as long and $\frac{1}{4}$ as broad as the propodus, and is armed with one very long and several short setae at the tip. Second peraeopods with the basis little more than twice as long as broad and as long as the remaining segments together; the distal segments are successively more slender; the dactylus is about as long as the propodus; the ischium is distinct but very short. Remaining peraeopods stout; the merus slightly inflated, two to three times as long as the carpus, dactylus slender, as long as the propodus, and its terminal spine straight and very short.

Uropods with the peduncle a little shorter than the last somite and about $\frac{3}{4}$ longer than the telson, slightly thickened distally, where the diameter is about $\frac{1}{3}$ of the length; exopod about $\frac{5}{8}$ as long as the peduncle, with two unequal stout setae at the tip and two or three, more slender, on the inner

edge, while the outer edge bears numerous very fine setae; the two-segmented endopod about $\frac{4}{5}$ as long as the exopod, with the distal segment less than half as long as the proximal; it has a long terminal spine and four spines, each with a secondary seta, on the inner edges.

Length, about 4.0 mm.

Adult Male: Closely resembles the female in general form. Differs in having the ridges of the carapace more marked and especially in having strong paired dorso-lateral ridges on all the free thoracic somites instead of only the last two. The pseudorostrum is narrowly truncated at the tip. The antero-lateral angle is rounded and obscurely serrated, and projects laterally so as to be visible from above.

The first antennae have the flagellum composed of three segments. The second antennae are very short, concealed by the carapace in the natural position, the flagellum little longer than the last segment of the peduncle and composed of only eight segments.

Third maxillipeds with a well developed exopodite.

First peraeopods shorter than in the female, the carpus much less than twice as long as the ischium and merus together. Third and fourth peraeopods without exopodites. Third peraeopod with the basis stouter than in the female, expanding inwards just above the base to form a projecting shoulder. The setae on the distal segments of the third and succeeding peraeopods are stouter than in the female.

Uropods with the rami nearly equal in length and the endopod with the proximal segment only a little longer than the distal; the inner edge of the endopod with five spines including the subterminal one.

Length, about 3.0 mm.

Locality

PREVIOUSLY RECORDED: Lyttelton Harbour, 1–5 fm (Calman, 1911).

***Gynodiastylis laevis* Calman, 1911 (figs. 335–342).**

Calman, 1911; Stebbing, 1913; Hale, 1946a.

Female: Carapace a little more than $\frac{1}{4}$ of the total length, its height less than half its length, subcylindrical, narrowed in front; dorsal outline

slightly arched; pseudorostrum straight, slightly deflexed, truncate, not more than $\frac{1}{8}$ of the total carapace length; antennal notch slightly marked, defined below by a very small antero-lateral tooth; surface of carapace quite smooth; eyelobe slightly prominent from the side, without apparent lenses.

First free thoracic somite very short. Second very long, more than $\frac{1}{3}$ of the length of the carapace dorsally, its pleural plate produced anteriorly as a narrow lobe. Third and fourth somites together little longer dorsally than the second, with their pleural plates strongly produced backwards.

Abdomen slightly shorter than the cephalo-thorax, its somites rather depressed and with faint lateral keels. The last somite is little shorter than the penultimate, about $\frac{1}{3}$ longer than broad. Telson little more than half as long as the last somite, its breadth less than $\frac{2}{3}$ of its length.

First antenna shorter and more robust than in *G. carinata*; first segment of the peduncle less than twice as long as broad and about equal to the other two together, the second $\frac{2}{3}$ as long as the third; flagella short, each three-segmented.

Third maxilliped without an exopodite, its basis longer than in *G. carinata* and less expanded distally, with fewer plumose setae.

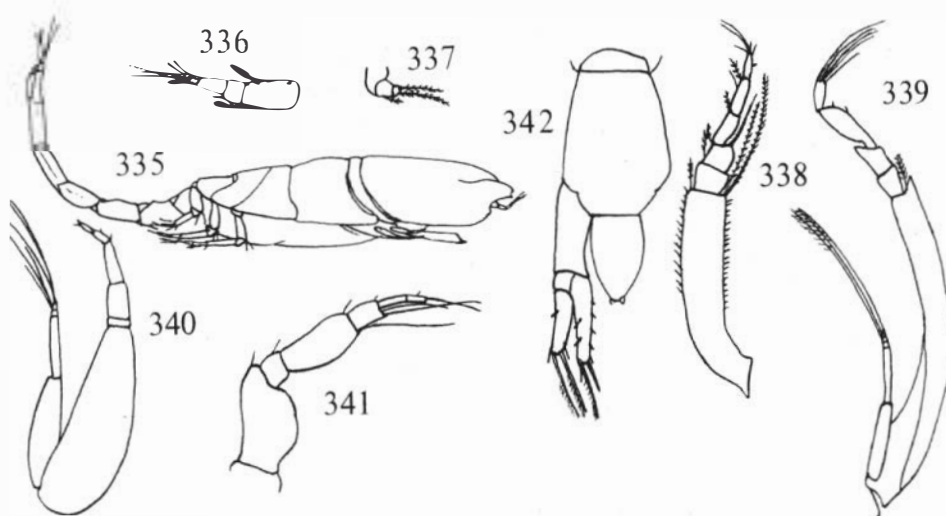
First peraeopods with the basis nearly twice as long as the distal segments together, produced at the distal inner end as a strong tooth; the carpus

about as long as the ischium and merus together; the propodus half as long as the carpus and with three long setae on the distal part of its inner edge; the dactylus $\frac{2}{3}$ as long as the propodus. Second peraeopods with the basis three times as long as broad and nearly twice as long as the remaining segments together; the dactylus and propodus are subequal and together shorter than the carpus. Third and succeeding peraeopods stout. The merus in the fifth pair is more than twice as long as the carpus; the dactylus is shorter than the propodus and its terminal spine is short and claw-like.

Uropods with the peduncle $\frac{2}{3}$ as long as the last somite and reaching to $\frac{2}{3}$ of the length of the telson, its distal diameter about $\frac{1}{3}$ of its length; exopod about as long as the peduncle, with two unequal stout setae at the tip and a single small seta on the inner and two on the outer edge; endopod a little longer than the exopod and unsegmented, with a long terminal spine and six spines on the inner edge, the distal much longer than the others, and two or three setae on the outer edge.

Length, about 4.1 mm.

Adult Male: Carapace shaped as in the female, with the pseudorostrum a little shorter and broader and the antero-lateral angle rounded. The second free thoracic somite is a little longer than the first. The pleural plate of the third somite is produced as a broad lobe anteriorly.



Gynodiastylis laevis Calman. Fig. 335. Female from above. Figs. 336, 337. First and second antennae. Fig. 338. Third maxilliped. Figs. 339, 340, 341. First, second, and fifth peraeopods. Fig. 342. Last somite, telson and left uropod. (All after Calman, 1911.)

Last abdominal somite only a little longer than broad and less than half as long again as the telson.

First antennae with four segments in the main flagellum. Second antennae with the flagellum short.

Third maxilliped with a well developed exopodite.

Third and fourth peraeopods without exopodites.

Difference in length of the rami of the uropod a little greater than in the female while the endopod has only four spines on the inner edge.

Length, about 2.4 mm.

Localities

PREVIOUSLY RECORDED: Lyttelton Harbour, 1-5 fm (Calman, 1911).

MENZIES BAY: coll. R. Pilgrim, 1953, 1 female.
COOK STRAIT: NZOI Sta. C486, 1 female.

Gynodiastylis milleri sp. n. (figs. 343-350).

Female: Carapace less than $\frac{1}{3}$ of the total length, its height more than half its length; its greatest breadth posteriorly, narrowing in front; dorsal outline arched; pseudorostrum acutely pointed, slightly downbent, less than $\frac{1}{4}$ of the total length of the carapace; antennal notch well defined below by a prominent antero-lateral tooth; on each side a ridge runs backwards, starting about half way along the pseudorostrum and dividing into two below the eyelobe, the upper division extending to about half way along the carapace, the lower division short; a second ridge runs backwards from below the antero-lateral tooth to end at about the same level as but below the upper ridge; eyelobe broader than long with three large visual elements.

Pedigerous somites much as in *G. carinata*.

Abdomen distinctly shorter than the cephalothorax, the last somite little longer than broad.

Telson about $\frac{2}{3}$ as long as the last somite, about $\frac{2}{3}$ as long as broad, and ending in a small pair of teeth with several subsidiary teeth on either side.

First antennae with the first segment of the peduncle longer than the other two together, the second a little shorter than the third.

Third maxillipeds without an exopodite; the propodus shorter than the dactylus.

First peraeopods fairly stout, projecting some distance in front of the pseudorostrum, otherwise as in *G. carinata*. Second to fifth peraeopods resembling those of *G. carinata*.

The uropods are very similar to those of *G. carinata* except that the two-segmented endopod is a little longer than the exopod (without their spines).

Length, about 4.0 mm.

Adult male: Unknown.

Type

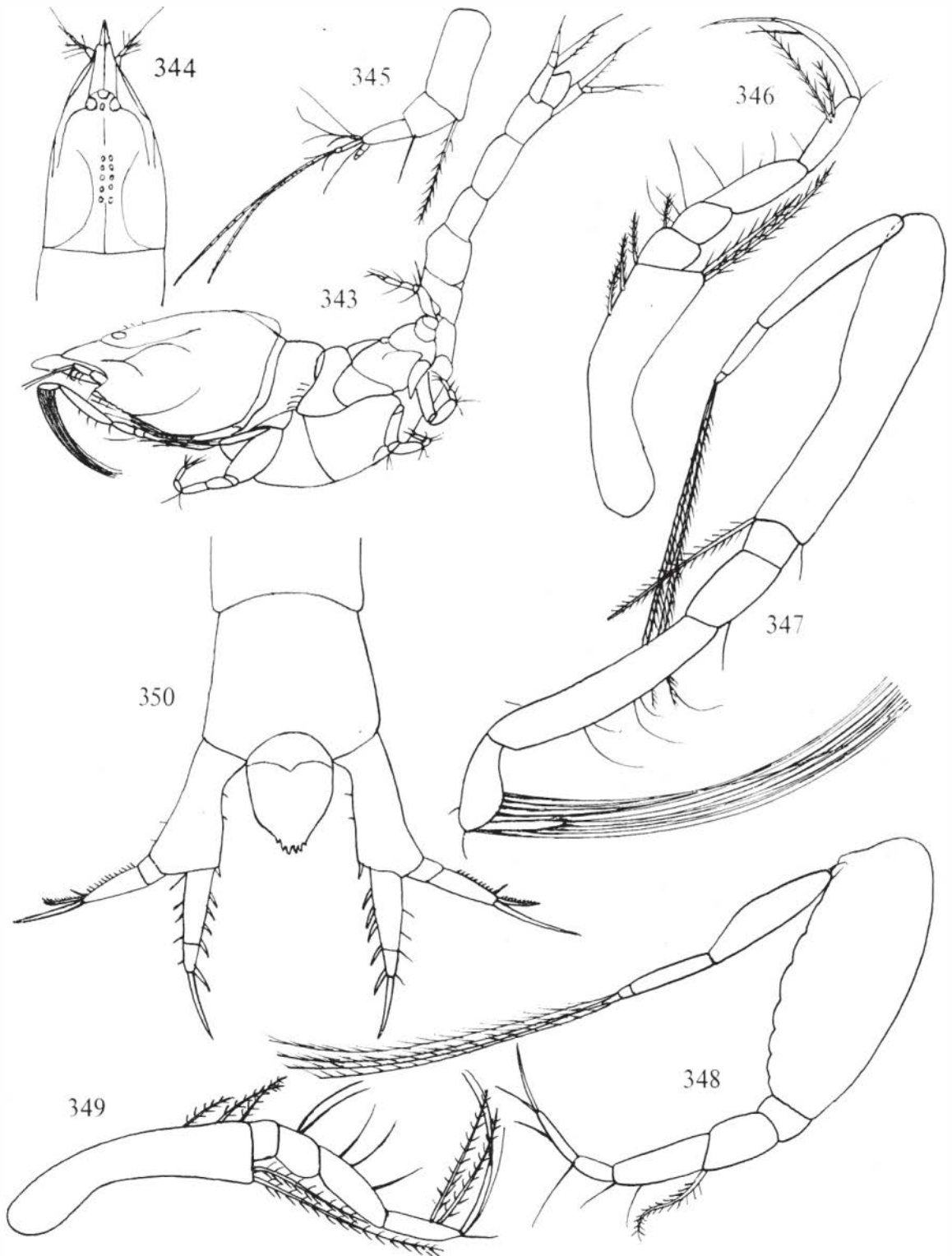
Deposited in the N.Z. Oceanographic Institute, No. 10.

Locality

DEVONPORT WHARF, AUCKLAND: 1960, tow net after dark, bottom muddy sand, 3 fm, 1 female, coll. M. C. Miller.

Remarks

This species is closer to *G. carinata* than to *G. laevis* as shown by the armature of the propodus of the first peraeopod and other characters. It is easily distinguished from *G. carinata* by the different sculpturing of its carapace. In general shape it perhaps most closely resembles *G. carinorostri* Hale (Hale, 1946a), but among other differences the latter has a three-segmented endopod of the uropod.



Gynodiastylis milleri sp. n. Figs. 343, 344. Ovigerous female from side and front end from above. Fig. 345. First antenna. Fig. 346. Third maxilliped. Figs. 347, 348, 349. First, second, and third pereopods. Fig. 350. Last somite, telson and uropods.

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BIBLIOGRAPHY

The works in the following list include those referred to in the text and also those dealing specifically with Cumacea published within the last 21 years and therefore not listed in Zimmer (1941). A number of additional works in Russian may be found in Lomakina (1958).

- BĂCESCU, M. 1950a: Cumacei Mediteraneeni Modificati de Mediul Pontic. *Anal. Acad. române*, 3 (11) : 423-60.
- 1950b: Specie de *Iphinoe* (Crustacei Cumacei) din Marea Neagra. *Ibid.* 3 (12) : 461-515.
- 1950c: Capturi de Cumacei Făcute in Apele Românești și Studial a Doua Forme Mai Aparte: *Bodotria arenosa mediterranea* (Steuer) și *Schizorhynchus scabriusculus danubiensis* n.f. *Lucr. Acad. române, ser. gen. Stiint.* 2-12 June 1950 : 1-35.
- 1951a: Cumacea. *Fauna R. P. române*, 4 (1). 91 pp. Bucharest.
- 1951b: *Namastacus euxinicus* n.sp. Cumaceu nou găsit in Apele Maru Negre. *Comun. Acad. române. I* (7) : 586-92.
- 1956: *Cumopsis fagei* n.sp. Cumacé Nouveau provenant des Eaux du Littoral Français de la Manche. *Vie et Milieu*, 7 : 357-65.
- 1961a: Deux Espèces Nouvelles de *Makrokyllindrus* sous-genre *Vemakylindrus* n. sg. (Crustacés Cumacés) des Eaux Tropicales du Pacifique (Côte Américaine). *Rev. Biol. Acad. române*, 6 : 325-33.
- 1961b: Contributions à l'Étude des Cumacés de la Méditerranée et particulièrement des côtes d'Israël. *Rapp. Cons. Explor. Mer.* 16 : 495-502.
- 1962: Contribution à la Connaissance du Genre *Makrokyllindrus* Stebbing (Crustacea Cumacea) recueillis au Cours des Campagnes du Lamont Geological Observatory de New York. Research Series, *Abyssal Crustacea*, Columbia Univ. Press, New York.
- CALMAN, W. T. 1907: On New or Rare Crustacea of the Order Cumacea from the Collection of the Copenhagen Museum. Pt. I. *Trans. zool. Soc. Lond.* 18 : 1-58.
- 1908: Notes on a Small Collection of Plankton from New Zealand. I, Crustacea (excluding Copepoda). *Ann. Mag. nat. Hist. ser.* 8, 1 : 232-40.
- 1909: Crustacea. In Lankester, R: "A Treatise on Zoology", 7, (3) : 346 pp. London.
- 1911: On New or Rare Crustacea of the Order Cumacea from the Collection of the Copenhagen Museum. Pt. II. *Trans. zool. Soc. Lond.* 18 : 341-98.
- 1912: The Crustacea of the Order Cumacea in the Collection of the United States National Museum. *Proc. U.S. Nat. Mus.* 41 : 603-76.
- 1917: Stomatopoda, Cumacea, Phyllocarida and Cladocera. *Nat. Hist. Rep. Terra Nova Exped. Zool.* 3 : 137-62.
- DIXON, A. Y. 1944: Notes on Certain Aspects of the Biology of *Cumopsis goodsiri* (van Beneden) and Some Other Cumaceans in Relation to their Environment. *J. mar. biol. Ass. U.K. n.s.* 26 : 61-71.
- EKMAN, S. 1953: "Zoogeography of the Sea." 417 pp. London.
- FAGE, L. 1944: Sur Quelques Caractères Sexuels Secondaires des Cumacés du Genre *Iphinoe*. *Arch. Zool. exp. gén.* 83, (N. et R.) : 112-21.
- 1945: Les Cumacés du Plankton Nocturne des Côtes d'Annam. *Arch. Zool. exp. gén.* 84 : 165-224.
- 1950: Sur un Nouveau Cumacé de la Côte Occidentale d'Afrique, *Eocuma cadenati* n.sp. *Bull. Mus. Hist. nat. Paris ser.* 2, 22 : 450-52.
- 1951a: Cumacés. *Faune Fr.* 54, 136 pp.
- 1951b: Cumacés. *Res. Sci. Exped. océangr. Belge Eaux Côt. afr. Atl. sud.*, 3 (1) : 1-9.
- FOXON, G. E. H. 1932: Report on Stomatopod larvae, Cumacea and Cladocera. *Sci. Rep. Gr. Barrier Reef Exped.* 4 : 375-98.
- GAMÔ, S. 1958: On Some Species of Cumacean Crustacea from Sagami Bay. *Zool. Mag. Tokyo*, 67 : 383-9.
- 1959: On a Cumacean Crustacea (*Diastylis corniculatus* Hale) obtained by the Second Japanese Antarctic Research Expedition (1957-58). *Biol. Res. Jap. Antarctic Res. Exped.* 7 : 3-7.
- 1960a: On Three New Species of Cumacean Crustacea Genus *Campylaspis* from Tanabe Bay, Kii Peninsula. *Publ. Seto Mar. biol. Lab.* 8 (1) : 153-61.
- 1960b: Five New Species of Cumacean Crustacea Genus *Dimorphostylis* (Diastylidae) from Sagami Bay. *Zool. Mag. Tokyo*, 69 (3) : 17-27.
- 1961: On Two New Species of Cumacean Crustacea Genus *Gynodiastylis* (Diastylidae) from Sagami Bay. *Ibid.* 70 (4) : 105-9.
- HALE, H. M., 1928: Australian Cumacea. *Trans. roy. Soc. S. Aust.* 52 : 31-48.
- 1932: A Cumacean New to South Australia. *Rec. S. Aust. Mus.* 4 : 549-50.
- 1936a: Three New Cumacea from South Australia. *Ibid.* 5 : 395-403.
- 1936b: Cumacea from a South Australian Reef. *Ibid.* 5 : 404-38.
- 1937: Further Notes on the Cumacea of South Australian Reefs. *Ibid.* 6 : 61-74.
- 1944a: Australian Cumacea. No. 7. The Genus *Cyclaspis*. *Ibid.* 8 : 63-142.
- 1944b: Australian Cumacea. No. 8. The Family Bodotriidae. *Trans. roy. Soc. S. Aust.* 68 : 225-85.
- 1945a: Australian Cumacea. No. 9. The Family Nannastacidae. *Rec. S. Aust. Mus.* 8 : 145-218.
- 1945b: Australian Cumacea. No. 10. The Family Leuconidae. *Trans. roy. Soc. S. Aust.* 69 : 86-95.
- 1945c: Australian Cumacea. No. 11. The Family Diastylidae (Part 1). *Ibid.* 69 : 173-211.
- 1946a: Australian Cumacea. No. 12. The Family Diastylidae (Part 2) *Gynodiastylis* and Related Genera. *Rec. S. Aust. Mus.* 8 : 357-444.
- 1946b: Australian Cumacea. No. 13. The Family Lampropidae. *Trans. roy. Soc. S. Aust.* 70 : 178-88.
- 1948: Australian Cumacea. No. 14. Further Notes on the Genus *Cyclaspis*. *Rec. S. Aust. Mus.* 9 : 1-42.



- 1949a: Australian Cumacea. No. 15. The Family Bodotriidae (cont.). *Ibid.* 9 : 107–25.
- 1949: Australian Cumacea. No. 16. The Family Nannastacidae. *Ibid.* 9 : 225–45.
- 1951: Australian Cumacea. No. 17. The Family Diastylidae (cont.). *Ibid.* 9 : 353–70.
- 1953a: Australian Cumacea. No. 18. Notes on Distribution and Night Collecting with Artificial Light. *Trans. roy. Soc. S. Aust.* 76 : 70–76.
- 1953b: Two new Cumacea from South Africa. *Ibid.* 76 : 45–50.
- HANSEN, H. J. 1879: "The Choniostomatidae, a Family of Copepoda Parasitic on Crustacea Malacostraca". 205 pp. Copenhagen
- 1925: "Studies on Arthropoda, II." 176 pp. Copenhagen.
- HARADA, I. 1959: Cumacean Fauna of Japan. I. Family Lampropidae. *Jap. J. Zool.* 12 : 229–46.
- JONES, N. S. 1955: Cumacea of the Benguela Current. "Discovery" *Rep.* 27 : 279–92.
- 1956: Cumacea from the West Coast of Africa. "Atlantide" *Rep.* 4 : 183–212.
- 1957: Cumacea from the Coast of Sénégal Collected by J. Cadenat. *Bull. Inst. franç. Afr. noire* 19 (A) : 482–4.
- 1958: Cumacea. *Fich. Ident. Zool.* 71–76.
- 1960a: Cumacea from South Africa. *Ann. Mag. nat. Hist. ser. 13*, 2 : 171–80.
- 1960b: Cumacea of the Chatham Islands 1954 Expedition. *Bull. N.Z. Dep. Sci. industr. Res.* 139 : 9–11. (*N.Z. Oceanogr. Inst. Mem.* 4).
- JONES, N. S.; BURBANCK, W. D. 1959: *Almyracuma proximioculi* gen. et sp. nov. (Crustacea Cumacea) from Brackish Water of Cape Cod, Massachusetts. *Biol. Bull. Wood's Hole* 116 : 115–24.
- KURIAN, C. V. 1951: The Cumacea of Travancore. *Bull. Res. Inst. Univ. Travancore (C)*, 2 : 77–118.
- 1956: Notes on Cumacea (Symfoda) in the Zoological Survey of India. *Rec. Indian Mus.* 52 : 275–311.
- LE SUEUR, R. E. 1955: Anatomical Notes on the Male of *Eocuma dollfusi* Calman (Cumacea) obtained from St. Aubin's Bay, Jersey. *Bull. Soc. jersiaise*, 16 : 319–22.
- LOMAKINA, N. B. 1955: Cumacea of Far Eastern Seas. *Trud. Zool. Inst. Akad. Nauk SSSR*, 18 : 112–65.
- 1958: Kumovie Raki (Cumacea) Morei SSSR. *Opredaliteli po Faune SSSR*, 66. 301 pp. Moscow.
- 1960: K Fauni Cumacea (Crustacea Malacostraca) pribrezhnoe zoni zheltogo mori. *Oceanologia et Limnologia Sinica*, 3 : 94–114.
- OELZE, A. 1931: Beiträge zur Anatomie von *Diastylis rathkei* Kr. (Blutgefäß- und Respirationssystem, Nervensystem, Drüsen). *Zool. Jb. Anat.* 54 : 235–94.
- PIKE, R. B.; LE SUEUR, R. F. 1958: The Shore Zonation of Some Jersey Cumacea. *Ann. Mag. nat. Hist. ser. 13*, 1 : 515–23.
- SARS, G. O. 1879: Middelhavets Cumaceer. *Arch. Math. Naturv.* 3–4 : 1–196.
- 1900: "Cumacea. Crustacea of Norway 3." 115 pp. Oslo.
- SHEARD, K. 1941: Improved Methods of Collecting Marine Organisms. *Rec. S. Aust. Mus.* 7 : 11–14.
- SIEWING, R. 1952: Morphologische Untersuchungen an Cumaceen. *Zool. Jb. Anat.* 72 : 522–60.
- STAAHL, F. 1938: Über das Vorkommen von inkretorischen Organen und Farbwechselhormonen im Kopf einiger Crustaceen. *Acta Univ. Lund. n.F.* 34, Nr. 12 : 1–20.
- STEBBING, T. R. R. 1912: The Symfoda. *Ann. S. Afr. Mus.* 10 : 129–76.
- 1913: Cumacea (Symfoda). *Tierreich*, 39. 210 pp. Berlin.
- STEPHENSEN, K. 1943: Leptostraca, Mysidacea, Cumacea, Tanaidacea, Isopoda and Euphausiacea. The Zoology of East Greenland. *Medd. Grønland*, 121 : 1–82.
- THOMSON, G. M. 1892: On the Occurrence of Two Species of Cumacea in New Zealand. *J. linn. Soc. (Zool.)* 24 : 263–71.
- WIESER, W. 1956: Factors Influencing the Choice of Substratum in *Cumella vulgaris* Hart (Crustacea, Cumacea). *Limn. and Oceanogr.* 1 : 274–85.
- ZIMMER, C. 1902: Die von Prof. Dr. Thilenius gesammelten Cumaceen. *Zool. Jb. Syst.* 17 : 444–56.
- 1908: Die Cumaceen der Deutschen Tiefsee-Expedition. *Wiss. Ergebn. "Valdivia"*, 8 : 155–6.
- 1913: Die Cumaceen der Deutschen Südpolar-Expedition 1901–03. *Dtsch. Südpol Exped.* 14, *Zool.* 6 : 437–92.
- 1921a: Cumaceen (Res. Mjöberg Exp. Australia 1910–13). *K. svenska VetenskAkad. Handl.* 61, C7) : 1–13.
- 1921b: Mitteilung über Cumaceen des Berliner Zoologischen Museums. *Mitt. zool. Mus. Berl.* 10 : 117–49.
- 1941: Cumacea. *Bronn's Klassen* 1, 4 : 1–222. Leipzig.
- 1942: Die Gattung *Iphinoe*. *Zool. Anz.* 139 : 190–200.
- 1943a: Über neue und weniger bekannte Cumaceen. *Ibid.* 141 : 148–67.
- 1943b: Cumaceen des Stillen Ozeans. *Arch. Naturgesch.* 12 : 130–74.
- 1944: Cumaceen des tropischen Westatlantiks. *Zool. Anz.* 144 : 121–37.
- 1952: Indochinische Cumaceen. *Mitt. zool. Mus. Berl.* 28 : 5–35.

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