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A Guide to the Natant Decapod Crustacea (*Shrimps and Prawns*) of New Zealand*

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EXCEPTING FOR ONE SPECIES common in our lowland running fresh waters, our shrimps and prawns are marine, ranging from sea-shore pools into deeper waters. These animals are crayfish-like, having a body divided into an anterior region of fused head and thorax, equipped with walking legs, and an abdomen which is segmented, terminating in a tail, and bearing a pair of limbs on all segments. The crayfish and its allies swim only backwards, doing this by violent flexion of the abdomen; but shrimps and prawns also swim forwards using their well-developed abdominal appendages (pleopods) for this purpose. 'Shrimp' and 'prawn' are names of unknown origin and of no strict zoological reference. In common usage, 'shrimp' are small, some three inches or less in length, taken for food by netting, usually from shallow water. 'Prawn' are larger, up to twelve inches long, taken by trapping and trawling. The species recognised in most countries as prawns, in general have a more or less compressed (i.e. deeper than wide) body, and a long armed rostrum, features shown in many small species which from their size alone are known in common usage as 'shrimp'; however, the rostrum is short in the principal commercial shrimp of Europe. Although scientists have ruled that the common names should be restricted to certain zoologically defined groups, it is doubtful that the popular use of these names can be modified.

Prawns are recognised as a major delicacy for the table and in many parts of the world prawn fisheries have developed extensively during the last forty years. Traditionally, prawning was a shallow-water fishery, prawns being trawled from coastal and estuarine waters; but with the increased demand for prawns, trawling and trapping have now been extended down to 400 fathoms. So far commercially usable shallow-water prawns are not known for New Zealand waters. In the absence of equipment and experience developed in a shallow-water fishery, the establishment of a prawn fishery in our deeper waters will prove a major novel project. We report here four deep-water species suitable for investigation as the basis of a fishery. All are known to us in fifty or more fathoms. All are bottom-dwelling, having

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probably a diurnal cycle of movement, rising in shoals from the bottom for a short period, probably twice in each twenty-four hours, and trawlable at these times, or trappable while on the bottom. *Aristaeomorpha foliacea*, growing to some seven inches long as known to us, is definitely suitable for initial investigation and utilisation. It has been taken already in numbers off the west coast of the North Auckland Peninsula in some fifty to 100 fathoms. This is the same prawn as fished commercially in the Mediterranean and elsewhere in 200 to 400 fathoms. *Hymenopanaeus sibogae*, up to eight inches long, has been taken in the Bay of Plenty in hauls from 270 to 400 fathoms. A large prawn of this genus is marketed in the United States under the name of 'royal red shrimp', and is the most recent outstanding addition to the North American fishery. *Sergestes potens* has long been known to us as a prawn eaten in large quantities by groper in eastern Cook Strait. This prawn grows to four and a half inches, and prawns of this genus are the basis of a Japanese fishery. A new species of *Parapandalus* taken in the Bay of Plenty from sixty to 120 fathoms grows to six inches and is a most promising commercially usable species since prawns of this group are fished off Norway, Denmark, and off both coasts of Canada. To the list may be added the six-inch-long *Campylonotus rathbunae* known from Cook Strait to Dunedin and abundant on the Chatham Rise.

It is not possible at this time to forecast the full potentiality of a prawn fishery in our waters. Prawns are not solitary animals. Shoaling of prawns is certain in our waters, and ample evidence is found in groper stomachs. From present indications we anticipate that prawning is a definite possibility along the west coast of the North Auckland Peninsula, in the Bay of Plenty, the eastern waters of Cook Strait, and with reasonable probability along the west coast of the South Island. We are confident that our list of usable species is incomplete, and that others remain to be discovered.

Work on this guide began more than ten years ago with a survey of literature and of accessible material. The results were too frequently confusing. Ordinarily it is reasonable to expect that the species established from early sporadic collecting will be readily rediscovered. This was usually not the case. Prior to 1890 three species of snapping-shrimp had been described from our waters by Heller, Miers and Kirk. Heller's species has been found, but Miers' and Kirk's species have not been collected, even at the original localities, and the commonest and most readily collected species of the northern shores, which has often been assigned to Miers' species, is new. Miers described a species of *Hippolyte* which is small and attractively coloured, but a second, similar, though larger species, lives in the same habitat and has not been previously recognised. A glance at the genus *Pontophilus* will further illustrate the situation which was developing in the initial stages of this study, and it was only when one of us (J.C.Y.) devoted himself to the group that many problems such as the above, and others obvious elsewhere in the guide, were solved.

The group has been neglected here by zoologists for some forty years. The returns from reopening investigation have been rich, as will prove to be

the case with many other of our neglected groups. Miers produced a catalogue of our Crustacea in 1876, listing some twelve natant species. This number was increased to about thirty-four species in Hutton's index to our fauna in 1904, but nearly half of these were included from *Challenger* collections and mostly from the Kermadec area.

Arising from the preparation of this index, G. M. Thomson published the only really impressive account to that time of members of the group from our waters, but not many species were treated. Borradaile in 1916 described the material taken by the *Terra Nova* in a single haul off North Cape, adding five species new to our fauna. De Man contributed a small paper in 1931, describing *Ophophorus novaezeelandiae* from a Kaikoura gopher stomach. By 1949 an uncritical list of forty-seven species could be drawn together. Within a year ten more species had been added. Since then, as the result of the deliberate investigation of intertidal and littoral waters, and the commencement of local collecting in our deeper waters, more than seventy species can be retained in a reasonably critical list. Of these some nineteen are new, at present under description, and with others new to the fauna are indicated with an asterisk in these keys.

It is now clear that we share a mid-water and deep-water natant fauna with our neighbours of the Southern Hemisphere, and some of this fauna is cosmopolitan. Studies here have more than parochial interest, and contribute significantly to many zoogeographic considerations. Our inshore fauna is proving richly endemic, but the publication of intimate complete accounts of the species which have been so long concealed in our fauna may lead to their recognition in other parts of the world. The trend of results at the moment is in the opposite direction. Our commonest intertidal shrimp was formerly believed present in Australia, South Africa, the western coasts of America, in the Atlantic up to the West Indies and at our Subantarctic islands. *Palaemon affinis* is now known to be restricted to New Zealand waters. Earlier inadequate descriptions have led zoologists into extensive errors of this type.

Reference to the description of the external anatomy of the crayfish, in a standard undergraduate textbook of zoology, should provide an adequate, morphological background for the user of this guide. The unnecessarily elaborate terminology of many specialist workers in the group has been deliberately avoided. 'Exopod' and 'epipod' are used for elements of the biramous limb for practical convenience, rather than the lengthier 'exopodite' and 'epipodite', the latter being a reduced non-filamentous gill. The legs are numbered as from the front; but having established that the full five pairs are present it will generally be found most convenient to handle the legs in reverse order. The number of teeth on the rostrum can vary widely, due, as shown by one of us (J.C.Y., *Trans Roy. Soc. N.Z.* 84, Part 4), to damage and incomplete regeneration. This should always be kept in mind, especially when there appears to be rostral irregularity. A rostrum less than half the length of the carapace is considered as short, in contrast to long, when the rostrum will be more or less the length of the carapace, or

longer. In general there is no difficulty in deciding whether the rostrum is unarmed or armed. In the formulae, teeth on the dorsal aspect are given first. The presence of teeth above and below, or only on one aspect, is initially far more important than the actual number of teeth. Even for a damaged rostrum the relative frequency of teeth can be an adequate guide to the probable number. The sequence of spines on the anterior margin of the carapace is: supraorbital and suborbital, above and below the eye stalk; antennal and branchiostegal, level with the antennule and antenna respectively; and pterygostomial, at the anteroventral angle of the carapace. The length given for each species is the maximum as known to us, and is measured on a straightened specimen from the tip of the rostrum to the end of the telson. Species noted here as small may grow to larger size. Certain descriptive data in the keys are bracketed. Such data exclude genera or species not yet known in our waters.

It will prove advantageous to collect several species before attempting an identification and the following list shows that a reasonably representative collection can be readily made:—

STREAMS AND RIVERS — Fresh water: *Paratya curvirostris*. Brackish water:

Palaemon affinis.

MARINE — Intertidal; rocky coasts: *P. affinis*, *Betaeus aequimanus*, *Hippolyte* n. sp., *Alope spinifrons*, *Alpheus socialis*; sandy coasts and mangrove swamps: *P. affinis*, *Alpheus* sp. ('*Edwardsi*' group). Shallow water: *Periclimenes batei*, *Pontophilus* spp., *Hippolyte* n. sp., *H. bifidirostris*, *A. socialis*, *Ogyrides* n. sp. Commercial trawling grounds — Bay of Plenty: *Chlorotocus novaezealandiae*, *Parapandalus* sp., *Pandalus magnoculus*, *Solenocera novaezealandiae*, *Pontocaris lacazei*; Cook Strait: *P. magnoculus*, *C. novaezealandiae*, *A. socialis*, *Pasiphaea* aff. *P. sivado*, *Tozeuma novaezealandiae*, *Nauticaris marionis*.

Simplified Analysis of Our Natant Decapods Based on Rostral Characters

(Caution: This is intended as a first step for the beginner, or as an aid for those only casually interested in the group. All are advised to confirm identification by full use of the main keys. In all keys the reference, e.g. 1 (2), are alternatives. Where there is not agreement with 1, refer to 2. Where the agreement is with 2, then proceed to the next number, i.e. 3, etc.)

- 1 (2) Rostrum absent (*Betaeus aequimanus*), or so short as to be virtually obsolete (*Lucifer typus*; *Ogyrides* n. sp.).
- 2 (1) Rostrum distinct, clearly not obsolete.
- 3 (10) Rostrum completely unarmed dorsally or ventrally, but lateral teeth sometimes present.
- 4 (9) Rostrum shorter than, subequal with, or a little longer than eye stalk.
- 5 (6) Rostrum narrow, neither depressed nor compressed; with tip simple (*G. Alpheus*), or with tip bifid (*Processa* ? n. sp.).
- 6 (5) Rostrum clearly either depressed or compressed.

- 7 (8) Rostrum depressed (Fam. CRANGONIDAE); without lateral teeth (Gg. *Prionocrangon*, *Sclerocrangon*, *Pontophilus* excluding *P. challengeri* and *P. indicus*), or with lateral teeth (*Pontophilus challengeri*; *P. indicus*; *Pontocaris lacazei*).
- 8 (7) Rostrum compressed; clearly arising behind anterior margin of carapace (*G. Pasiphaea*), or not arising behind anterior margin of carapace (*G. Sergestes*, excluding *S. potens*).
- 9 (4) Rostrum many times length of eyestalk (*G. Glyphocrangon*).
- 10 (3) Rostrum armed dorsally and/or ventrally.
- 11 (18) Rostrum armed on one margin only.
- 12 (13) Rostrum armed with ventral teeth only; dorsal margin weakly concave, tip simple (*Tozeuma novaezealandiae*), or dorsal margin weakly convex, tip trifid (*Hippolyte* n. sp.).
- 13 (12) Rostrum armed with dorsal teeth only.
- 14 (17) Rostrum less than half carapace.
- 15 (16) Rostrum rod-like, not compressed (*Alope spinifrons*).
- 16 (15) Rostrum compressed; with 1 to 3 dorsal teeth (Gg. *Benthesicymus*, *Gennades*; *Sergestes potens*), or with more than 3 teeth (*Solenocera novaezealandiae*; *Aristaeomorpha foliacea* mature males).
- 17 (14) Rostrum substantially more than half length of carapace; with 3 dorsal teeth on proximal portion (*G. Aristeus*), with 4 to about 12 dorsal teeth (*Aristaeomorpha foliacea* females and immature males), or with about 32 dorsal teeth (*Nematocarcinus serratus*).
- 18 (11) Rostrum armed on both margins.
- 19 (20) Rostrum movably articulated with carapace (*G. Rhynchocinetes*).
- 20 (19) Rostrum immovable.
- 21 (22) Rostrum distinctly less than 1-½ times length of carapace and 'palaemonid' in form (i.e. compressed, relatively broad, usually blade-like and with proximal portion characteristically narrower than midpoint). *Paratya curvirostris* (fresh-water); *Palaemon affinis*, *Hippolyte bifidirostris* (inter-tidal and shallow-water); *G. Periclimenes*, *Periclimenaeus novaezealandiae*, *Nauticaris marionis*, *Chlorotocus novaezealandiae* (shallow-water and shelf); *Hymenopenaeus sibogae*, *Campylonotus rathbunae* (continental slope).
- 22 (21) Rostrum usually longer than carapace, often elongate, narrow, not blade-like.
- 23 (24) Rostrum with distinctly more dorsal than ventral teeth, and (except for *Nematocarcinus*) 'Oplophorid' in form (i.e. attenuate, the dorsal and ventral margins mostly parallel and with teeth opposed over much of length). *Oplophorus novaezealandiae*, *Acanthephyra pelagica*, *A. quadrispinosus*, *Notostomus* cf. *N. mestergreni* (all bathypelagic); *Nematocarcinus hiatus* (bathybenthic).
- 24 (23) Rostrum with distinctly more ventral than dorsal teeth, narrow, more than 1-½ times length of carapace, often grossly elongate (*Pandalus magnoculus*, *Plesionika martia*; *Parapandalus* sp.).

We wish to record our appreciation of the assistance which we received from many, and particularly from Mr. F. Abernethy of Wellington; Mr. F. A. McNeill of the Australian Museum; Mr. A. C. Kaberry and also Mr. J. H. Sorensen of the Marine Department; Dr. K. H. Barnard of the South African Museum whose magnificent monograph has guided us through many difficulties; Dr. Isabella Gordon of the British Museum; Dr. L. B. Holthuis of the Rijksmuseum van Natuurlijke Historie, Leiden, who has settled many of our taxonomic problems; Mr. H. M. Hale of the South Australian Museum; Dr. R. K. Dell and Mr. J. Moreland of the Dominion Museum, Wellington; Dr. Elizabeth J. Batham of the Portobello Marine Station; Mr. E. W. Gilliver of Auckland; Miss S. Krefft and Miss Diana Norris of Wellington; and to Mr. J. A. F. Garrick, Mr. P. J. Castle, Mr. R. E. Barwick of this university who, with Dr. R. V. Brunson and Mr. R. I. Close, have so freely given their time and energy to the investigation of the deep-water fauna of Cook Strait.

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Key to the Suborders of Crustacea Decapoda

- 1 (2) Antennal scale generally large and lamellar; 5 pairs of characteristically biramous (rarely uniramous) pleopods present, always well developed and used for swimming; abdomen always macrurous (i.e. symmetrical, well chitinised, with pleura and complete tail-fan). Shrimps and prawns.
- NATANTIA
- 2 (1) Antennal scale generally small or absent; never 5 pairs of biramous pleopods present, i.e. pleopods characteristically absent from first segment, but, if present, uniramous; abdomen macrurous (crayfish, lobsters). anomurous (i.e. asymmetrical, reduced in some features, but showing clear

traces of some function other than that of reproduction, and almost always with biramous limbs (uropods) on sixth segment; hermit-crabs), or brachyurous (i.e. small, straight, symmetrical, bent under thorax, showing no trace of function other than reproduction, uropods absent: true crabs *).

REPTANTIA

Key to the Sections of Natantia

- 1 (4) · Pleuron of second abdominal segment not overlapping that of first segment; abdomen ordinarily straight, not flexed sharply or humped in lateral view; third legs chelate (except when legs are greatly reduced); gills ramified, filamentous, or rarely, absent.
- 2 (3) One or both of third pair of legs longer and much stouter than the first two pairs; eggs carried on pleopods of female; first pleopod of male without special sexual organ, i.e. similar to second pair; gills filamentous (as in crayfish). STENOPODIDEA
(Spiny shrimps; regarded as close to Reptantia; not yet known from New Zealand waters.)
- 3 (2) First three pairs of legs subequal; eggs shed loose into sea; first pleopod of male bearing a petasma (a medial, elaborate, sexual organ); gills ramified (absent in *Lucifer*). PENAEIDEA (p. 23)
- 4 (1) Pleuron of second abdominal segment expanded into a lobe covering part of first segment; abdomen ordinarily sharply flexed or humped (fig. 22); third legs non-chelate; eggs carried on pleopods of female; gills laminate (as in Brachyura). CARIDEA (p. 28)

Key to the Families of Penaeidea

- 1 (2) First three pairs of legs chelate; fourth and fifth pairs well developed; rostrum usually extends beyond eye; gills numerous (more than 8 on each side). F. PENAEIDAE (p. 24)
- 2 (1) First legs characteristically non-chelate; fourth and fifth pairs obviously shorter than anterior legs, or even absent; rostrum short or absent; gills few (not more than 8 on each side) or absent.
- 3 (4) Head not elongated; second and third legs with minute chelae. F. SERGESTIDAE (p. 25)
- 4 (3) Head greatly elongated; first two pairs of legs non-chelate; third minutely chelate; fourth and fifth legs absent; gills absent. F. LUCIFERIDAE
(Contains the single planktonic genus *Lucifer*, one species known here. *L. typus* M.-Edwards, 1837 (fig. 10), with relatively long eyestalks together with eyes subequal to elongated 'head', taken off North Auckland Peninsula. Length up to 0.5 in. In our literature as *L. batei*).

* For guides to the New Zealand true crabs, i.e. Brachyura, see Richardson, L. R., 1949, *Tuatara* II (1), II (2), II (3).

**Key to the N.Z. Species of the
Family Penaeidae**

- 1 (6) A vertical foliaceous appendage (prosartema), developed from basal segment of the antennule, present between the eyes; rostrum prominent and at least dorsally toothed, but not elevated proximally; pleopods biramous; exoskeleton rigid.
- 2 (5) Postorbital spine present on carapace; definite cervical groove reaching or almost reaching dorsal surface. (Subf. SOLENOCERINAE). Benthic, mud-burrowing forms.
- 3 (4) Rostrum shorter than eye, armed with dorsal teeth only; flagella of antennules long, compressed, concave on inner side, forming together a respiratory tube. *G. Solenocera*. *S. novaezealandiae* Borradaile, 1916 (fig. 1), with pterygostomial spine present; rostrum with 5 teeth (2 behind the orbit); no postrostral keel on carapace, known only from our northern waters, 70-120 fms.; up to 3 in.; very similar, if not synonymous with the South African *S. comitum* Stebbing, 1915.
- 4 (3) Rostrum longer than eye, armed with dorsal and sometimes ventral teeth; flagellum of antennule normal. *G. Hymenopenaeus*. Large deep-water forms. * *H. sibogae* (de Man, 1911), (fig. 2) with rostrum prominent, dorsally arched, its teeth 6-8/1-2; a single postrostral tooth widely separated from rostral series; pterygostomial but no branchiostegal spine; recently taken in numbers in the Bay of Plenty at 270-400 fms. Commercially usable, length up to 8 in. *H. sibogae* has been made the type species of *G. Parahaliporus* Kubo, 1949, but this is unjustified. (*H. obliquirostris* (Bate, 1881), with two post-rostral teeth, a branchiostegal but no pterygostomial spine, and an upturned, but not dorsally arched, rostrum, taken off the Kermadecs at 500 fms. may be found in our northern waters. In our literature as *Haliporus*.)
- 5 (2) Postorbital spine absent; cervical groove incomplete or absent. Mostly sublittoral and shallow water benthic forms, often of large size. (Subf. PENAEINAE.) Majority of commercial species elsewhere belong to this group but none known from our waters. *Penaeus plebejus* Hess, 1865, the Australian King Prawn, with longitudinal grooves each side of postrostral crest extending almost full length of carapace, rostrum with teeth 10-11/1 and secondary pair of lateral keels, is imported for the table. Length up to 8 in. Attempts to introduce this prawn by liberation in our waters were made in the 1890's. (In our literature as *P. canaliculatus*.) *Metapenaeus macleayi* (Haswell, 1879), Australian School Prawn, lacking longitudinal carapace grooves and with rostral teeth 6-7/0, was formerly imported. Length up to 6.5 in. (In our literature as *Penaeus* and *P. haswelli*.) (A pelagic genus *Funchalia*, with body densely pubescent and telson with 3 pairs of fixed spines, may occur in our northern waters.)
- 6 (1) No prosartema present.
- 7 (8) Pleopods uniramous; exoskeleton rigid; carapace and abdomen dorsally keeled. (Subf. EUSICYONINAE.) Shallow-water forms not yet known from our waters.

- 8 (7) Pleopods biramous ; rostrum long, or if short, compressed and deep (Subf. ARISTAEINAE.)
- 9 (12) Exoskeleton rigid ; rostrum usually long with 3 or more dorsal teeth ; antennular exopod inserted near base of third segment of peduncle and strikingly shorter than endopod. Large deep-water benthic, or sometimes bathypelagic, prawns.
- 10 (11) Rostrum with low, elevated basal crest, distal portion long in female, shorter in male, 4-12 dorsal teeth ; hepatic spine and cervical groove present. * *Aristaeomorpha foliacea* (Risso, 1826), (fig. 3). Commercially usable. Recently taken in numbers off the west coast of North Auckland Peninsula at 50-100 fms. Length up to 7 in.
- 11 (10) Rostrum with 3 dorsal teeth on proximal portion ; hepatic spine and cervical groove absent. *G. Aristeus*. (*A. semidentatus* Bate, 1881, with keel of pterygostomial spine long and inner margin of merus of first leg concave, taken off the Kermadecs at 500-600 fms.; may be found in our northern waters. Length up to 6 in. In our literature as *Hemipenaeus*.)
- 12 (9) Exoskeleton membranous, body soft ; rostrum short, compressed and elevated to a basal crest with 1-2 (rarely 3) dorsal teeth ; antennular exopod inserted at apex of third segment of peduncle and subequal in length to endopod. Bathypelagic and abyssal forms.
- 13 (14) At least fifth and sixth abdominal segments dorsally keeled ; telson usually terminating in a distinct median point. *G. Benthesicymus*. Large partially benthic, abyssal forms. *B. cereus* Burkenroad, 1936 (fig. 4), with hepatic spine present, pterygostomial spine at margin of carapace and a tooth on ventrolateral margin of sixth abdominal segment, taken off southern Hawke's Bay at 1,100 fms. Length up to 6 in. (In our literature as *B. brasiliensis*.) (Other species, especially *B. altus* Bate, 1881, with hepatic spine absent, pterygostomial spine set behind margin of carapace, fifth and sixth abdominal tergites not terminating in a tooth, length up to 5 in., taken off the Kermadecs in 500-600 fms.; may occur in our deeper waters.)
- 14 (13) Only sixth segment dorsally keeled ; telson terminating in a distinct median point. *G. Gennades*. Small scarlet pelagic forms often with many intense blue spots on body and appendages. Fourteen closely allied species mainly distinguished on characters of sexual appendages.
- 15 (16) Anteroventral angle of carapace acute ; blue patches laterally on abdomen. * *G. gilchristi* Calman, 1925 (fig. 5). Recently taken in mid-water at about 150-300 fms. in the Bay of Plenty and at 400-600 fms. in Cook Strait. Length up to 1.5 in.
- 16 (15) Anteroventral angle of carapace blunt ; no blue pigment laterally on abdomen. * *G. kempfi* Stebbing, 1914. Recently taken in the deeper mid-waters of Cook Strait at 500-600 fms. Length up to 1.5 in.

Key to the N.Z. Species of the Family Sergestidae

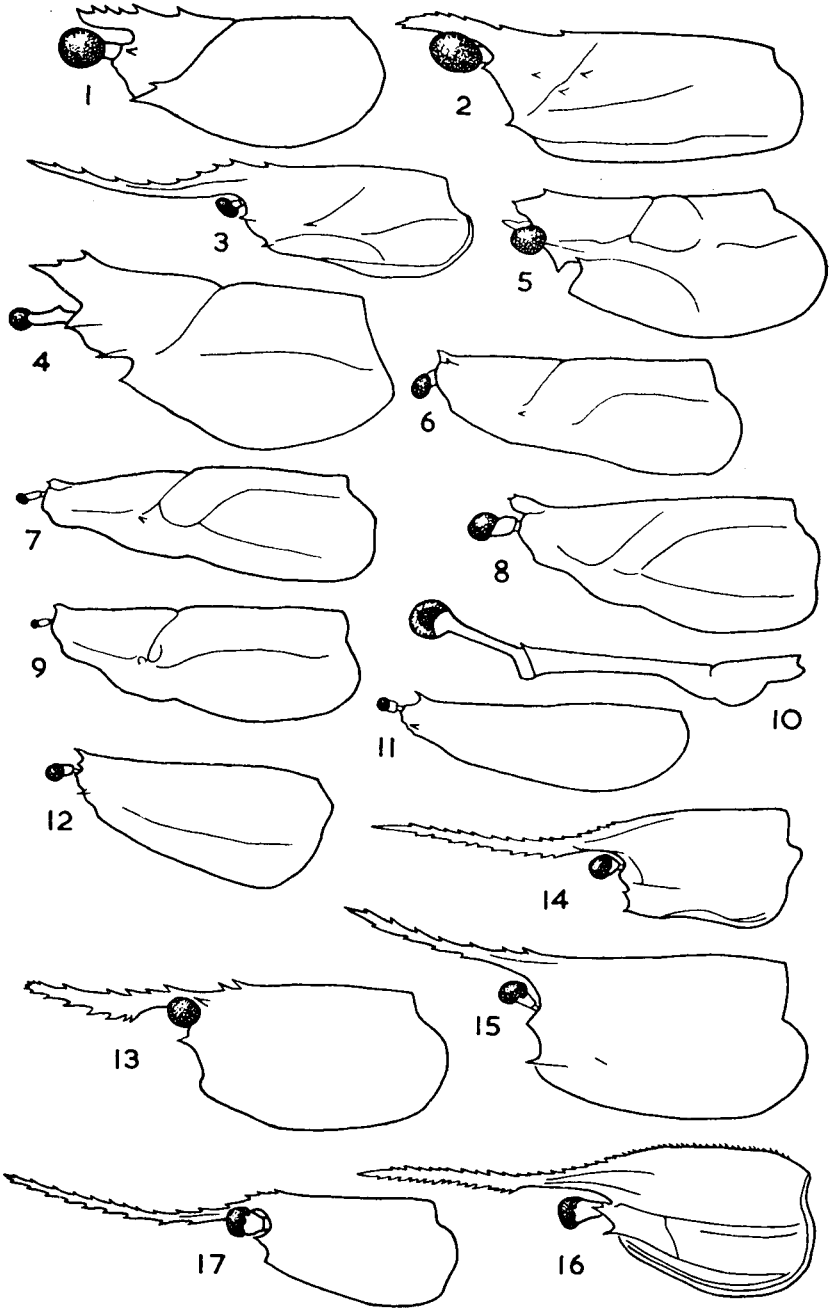
Several genera known, only one recorded from New Zealand. First legs non-chelate ; fourth and fifth legs both present and only 6-segmented ; 2 gills on

fourth leg. *G. Sergestes*. Bathypelagic forms.

- 1 (8) Body and appendages (when fresh) with scattered red chromatophores, not uniform red, transparent so that organs of Pesta (pigmented and luminous modifications of the gastrohepatic gland) visible; hepatic spine and usually supraorbital spine present. Subgenus *Sergestes* s.s. Relatively small species.
- 2 (3) The two distal segments of the fifth legs setose on only one margin; supraorbital spine present; third maxillipeds subequal with third legs; third segment of antennular peduncle shorter than first. *S. arcticus* Kroyer, 1855 (fig. 6). Relatively common between 50 and 600 fms. in our waters. Length up to 2.5 in.
- 3 (2) The two distal segments of the fifth legs setose on both margins.
- 4 (5) Supraorbital spine absent. * *S.* cf. *S. seminudus* Hansen, 1919 (fig. 7). A single damaged specimen very close to Hansen's species was recently taken in Cook Strait at about 400 fms. Length about 2.5 in.
- 5 (4) Supraorbital spine present.
- 6 (7) Third maxillipeds subequal with third legs. *S. disjunctus* Burkenroad, 1940. Taken in the Bay of Plenty at about 350 fms.
- 7 (6) Third maxillipeds greatly enlarged, considerably longer than third legs. *S. index* Burkenroad, 1940. Taken in Bay of Plenty at about 200 fms.
- 8 (1) Body and appendages (when fresh) uniform opaque red in colour; organs of Pesta absent; hepatic and supraorbital spines absent. Subgenus *Sergia*. Relatively large species.
- 9 (10) Exoskeleton rigid; rostrum acute anteriorly and with acute apical tooth; cornea considerably wider than peduncle; numerous purple lens-less photophores on body and appendages. * *S. potens* Burkenroad, 1940 (fig. 8). Found seasonally in large numbers in the stomachs of gopher and ling caught in Cook Strait at 30-60 fms. Recently taken in Cook Strait (? on bottom) at about 380-500 fms., length up to 4.5 in.
- 10 (9) Exoskeleton membranous; rostrum obtuse; cornea barely wider than peduncle; no dermal photophores. * *S. japonicus* Bate, 1881 (fig. 9). Taken in Cook Strait between 500 and 600 fms. Length up to 4 in. (In literature as *S. mollis*.) (*S. kroyeri* Bate, 1881, as above but with cornea considerably wider than peduncle and the latter bearing a median tubercle, taken off the Kermadecs in 500 fms., may also be found in our deep waters.)

FIGURES 1 - 17

Fig. 1, *Solenocera novaezealandiae*; fig. 2, *Hymenopenaeus sibogae*; fig. 3, *Aristaeomorpha foliacea*; fig. 4, *Benthescymus cereus*; fig. 5, *Gennades gi'christi*; fig. 6, *Sergestes arcticus*; fig. 7, *S.* cf. *S. seminudus*; fig. 8, *S. potens*; fig. 9, *S. japonicus*; fig. 10, *Lucifer typus*; fig. 11, *Pasiphaea* aff. *P. sivado*; fig. 12, *P.* aff. *P. pacifica*; fig. 13, *Paratya curvirostris*; fig. 14, *Oplophorus novaezealandiae*; fig. 15, *Acanthephyra pelagica*; fig. 16, *Notostomus* cf. *N. westergreni*; fig. 17, *Systellaspis debilis*. (Fig. 1, after Borradaile, 1916; fig. 2, after de Man; fig. 4, after Bate, 1888, and after Burkenroad; fig. 10, after Dakin and Colefax; fig. 17, after Kemp.) All figures are a lateral view of the carapace.



Caridea

There are twenty-two families of caridean shrimps and prawns grouped, probably artificially, into nine superfamilies. A key to these superfamilies is now given (mainly after Holthuis), based mostly on the form of the first two pairs of thoracic legs. Although these are remarkably constant in each of the nine major groups, it is felt that a systematic arrangement based on the size and shape of thoracic appendages, which in actual practice are often missing in the specimens to be identified, is not of much use to the general zoologist. For this reason all those families recorded from the New Zealand area are characterised in more general terms, when first introduced below.

Key to the Superfamilies of Caridea

- 1 (16) First pair of legs chelate or simple.
- 2 (3) Fingers of chelae of both first and second legs slender, their cutting edges pectinate (comb-like). **PASIPHAEOIDA** (p. 29)
- 3 (2) Cutting edges of fingers not all pectinate.
- 4 (13) Carpus of second legs entire; first legs always with well-developed chelae.
- 5 (6) Fingers of chelae extremely long and slender (more than half length of carapace); two distal segments of second maxilliped both originate from antepenultimate segment. **STYLODACTYLOIDA**
Only genus *Styloactylus* (F. **STYLODACTYLIDAE**) is a small aberrant group with long, heavily setose third maxillipeds and first and second legs, living, often at some depth, mainly in tropical regions. (Though not recorded from New Zealand waters, *S. discissipes* Bate, 1888, with rostrum, multidentate above and below, longer than carapace, and antennal scale, with outer margin entire, half length of carapace, has been recorded off the Kermadecs and may occur in our northern deep waters. Length up to 1.5 in.)
- 6 (5) Fingers of chelae not extremely long; two distal segments of second maxilliped normal.
- 7 (8) Chelae of first legs with both fingers movable. **PSALIDOPODOIDA**
Rare, deep-water, Indopacific forms with heavily spinose integument. Not yet known from our waters.
- 8 (7) Chelae of first legs with only one movable finger.
- 9 (10) First legs definitely stronger and heavier, though often shorter, than second. **BRESILIOIDA** (p. 29)
- 10 (9) First legs usually more slender than, rarely subequal to, second.
- 11 (12) Legs usually with exopods; if not, fingers of chelae with terminal brushes of long setae. **OPLOPHOROIDA** (p. 29)
- 12 (11) Legs without exopods; chelae without terminal brushes. **PALAEMONOIDA** (p. 31)
- 13 (4) Carpus of second legs usually divided into two or more sub-segments; if not, first legs non-chelate.
- 14 (15) Chelae of first legs well-formed, at least on one side. **ALPHEOIDA** (p. 34)

- 15 (14) Chelae of first legs absent, or if present, microscopic and imperfect.
PANDADOIDA (p. 37)
- 16 (1) First legs sub-chelate.
CRANGONOIDA (p. 38)

Key to the N.Z. Species of Pasiphaeoida

Single family (PASIPHAEIDAE) consisting of relatively large, often strongly compressed species, with rostrum short and sometimes arising behind the anterior margin, first and second legs longer and much stouter than others, and with exopods present on all legs. Bathypelagic. Several genera known. One in New Zealand: Rostrum arising behind anterior margin of carapace. *C. Pasiphaea*.

- 1 (2) Telson distally truncate; carapace but not abdomen dorsally keeled; merus of first leg armed with 2-3 spines, merus of second with 6-8. * *P. aff. P. sivado* (Risso, 1816), (fig. 11). Transparent, with scattered red chromatophores. Abundant in Cook Strait between about 50 and 150 fms. Length up to 3 in. (This apparently undescribed species is very similar to, but distinct from, the Atlantic *P. sivado*.)
- 2 (1) Telson distally bifid; carapace and second to sixth abdominal segments keeled; merus of first leg armed with 1-3 spines, merus of second with 12-13. * *P. aff. P. pacifica* Rathbun, 1902 (fig. 12). Body and appendages uniform red. Take in Cook Strait at about 500 fms. Length 3.5 in. (Appears to be conspecific with a South African species identified by Barnard as *P. pacifica*, but this cannot be Rathbun's species.)

Key to the N.Z. Species of Bresilioida

Bresilioida with rostrum prominently toothed, laterally compressed and movably articulated with the carapace; first legs with normal chelae, tips of fingers of first and second legs dark coloured; no exopods on legs. (F. RHYNCHOCINETIDAE.) Medium-sized, shelf or shallow water, brightly coloured with spots and linear markings. Only genus *Rhynchocinetes*.

Two teeth on carapace behind rostral articulation; rostrum with 3-6 teeth dorsally near apex and 10-13 ventrally; carapace and abdomen with fine but not conspicuous striae.

- 1 (2) Supraorbital spine strong. *R. balssi* Gordon, 1936. No blunt lobule on outer margin of endopod of first pleopod; no arthrobranches on second to fifth legs. Taken off North Cape in 40-70 fms. Length under 2 in. (In our literature as *R. typus*, *R. rugulosus*.)
- 2 (1) Supraorbital spine absent or represented by blunt nodule. * *Rhynchocinetes* n. sp. (fig. 25). No arthrobranches on third to fifth legs. Body and appendages light red with prominent white linear markings. Taken in Bay of Plenty at 80-120 fms. Length 2.5 in.

Key to the N.Z. Species of Oplophoroida

- 1 (2) Fingers of chelae of first and second legs with conspicuous terminal brushes

- of setae; legs with or without exopods, third to fifth not conspicuously lengthened. Exclusively fresh-water. (F. ATYIDAE.) Supraorbital spine present but pterygostomial absent; exopods on all legs. *Paratya curvirostris* (Heller, 1862), (fig. 13). Rostral teeth at least 10-19/3-8, the dorsal series irregularly spaced. Lowland streams and rivers throughout New Zealand down to tidal influence. Active at night. Transparent, speckled with dark pigment, males smaller than females and more sparsely pigmented. Length up to 1.5 in. Ovigerous from September to April. (In our literature as *Caradina*, *Xiphocaris*, *Xiphocaridina*, *Leander fluviatilis*.) (A closely allied Australian species recorded as *Xiphocaris compressa* and now believed to be *Paratya australiensis* Kemp, 1917, with rostral teeth 19-32/1-14, the dorsal series being regular, has been liberated several times in Otago and should be watched for in that area.)
- 2 (1) Fingers of chelae of first and second legs without terminal brushes of setae; legs with exopods. Exclusively deep-water.
- 3 (14) Third to fifth legs not conspicuously lengthened; carpus of these legs distinctly shorter than propodus. (F. OPLOPHORIDAE.) Relatively large, bathypelagic forms. Usually uniform red, photophores sometimes present.
- 4 (5) Exopods of at least third maxillipeds and first legs foliaceous and rigid; either second to fourth or third to fifth abdominal segments terminating dorsally in a long spine; rostrum prominent. Photophores usually present on body and appendages. Capable of ejecting a 'cloud' of luminous material anteriorly. *G. Oplophorus*. *O. novaezeelandiae* de Man, 1931 (fig. 14), with outer margin of antennal scale devoid of spines, taken from fish stomachs in Cook Strait and bathypelagically in Cook Strait and Bay of Plenty at 300-400 fms. Length up to 4 in.
- 5 (4) Legs lacking foliaceous or rigid exopods; abdominal segments do not terminate dorsally in long spines, but sometimes dorsal teeth may be present.
- 6 (13) At least third to sixth abdominal segments dorsally keeled.
- 7 (12) No longitudinal keel on lateral surface of carapace from orbit to hind margin along median lateral line; carapace never dorsally arched nor denticulate. *G. Acanthephyra*.
- 8 (11) Carapace not dorsally keeled on posterior half; rostrum prominent, toothed dorsally and ventrally; branchiostegal spine supported by only a very short keel; cornea wider than stalk; second abdominal segment keeled dorsally. '*A. purpurea*' group. Uniform scarlet.
- 9 (10) 7-11 pairs of dorsal spines on telson. *A. pelagica* (Risso, 1816), (fig. 15). Taken bathypelagically in Cook Strait and off southern Hawke's Bay from at least 600 fms. Length up to 5.5 in. (In our literature as *A. sica*, *A. haeckelii*.)
- 10 (9) 4 pairs of dorsal spines on telson. * *A. quadrispinosa* Kemp, 1939, with third-sixth abdominal segments dorsally toothed and a strong branchiostegal spine. Taken in Cook Strait from about 100 600 fms. (Relatively abundant between 300 600 fms.) Length up to 4.5 in.
- 11 (8) Carapace dorsally keeled for full length. (*A. eximia* Smith, 1884, in our

- literature as *A. brachytelsonis*, with second but not first abdominal segment dorsally keeled and distal half of rostrum unarmed dorsally, has been taken off the Kermadecs in 500-600 fms and may occur in our deep waters. Length up to 5 in.)
- 12 (7) At least two longitudinal keels on lateral surface of carapace from anterior to posterior margins; carapace arched dorsally and dorsal midline denticulate for almost entire length; all abdominal segments dorsally keeled. *G. Notostomus*. Large, uniform scarlet species. * *N. cf. N. westergreni* Faxon, 1893 (fig. 16), with 5 longitudinal keels on posterior half of lateral surface of carapace, has been found in fish and whale stomachs, and recently a 6.5 in. specimen was taken bathypelagically in Cook Strait at about 600 fms. (Species with these 5 lateral keels are in urgent need of revision; our specimens are almost definitely conspecific with South African material identified by Barnard as *N. auriculatus*.)
- 13 (6) Sixth abdominal segment rounded, never dorsally keeled; legs not compressed and not expanded; eyes large; telson distally acute. *G. Systellaspis*. * *S. debilis* (A. M.-Edwards, 1881), (fig. 17) with rostrum usually longer than carapace and finely toothed posterior margins on fourth and fifth abdominal tergites, recently taken in Cook Strait at about 100 fms. Photophores present on body and appendages. Length up to 3 in.
- 14 (3) Third to fifth legs delicate, many times length of body; carpus of these legs several times longer than propodus. (F. NEMATOCARCINIDAE.) Deep-water benthic forms. Single genus *Nematocarcinus* with many inadequately known species, mostly described from rostral characters, which are notoriously variable.
- 15 (18) Rostrum more than half length of carapace.
- 16 (17) Teeth on ventral margin of rostrum; rostral teeth at least 29/6 (rostrum broken in unique specimen). *N. hiatus* Bate, 1888 (fig. 18), taken with the following off East Cape in 700 fms. (Possibly a fragment of the widely distributed Indopacific *N. longirostris* Bate, 1888.)
- 17 (16) No teeth on ventral margin of rostrum; rostral teeth 32/0, *N. serratus* Bate, 1888 (fig. 19). Length 4 in. (Known from one specimen taken with the preceding.)
- 18 (15) Rostrum less than half length of carapace. (*N. undulatipes* Bate, 1888, with rostral teeth 7-15/1 and dactyli of third and fourth legs longer than propodi; and *N. gracilis* Bate, 1888, with rostral teeth 14-22/1 and dactyli of third and fourth legs shorter than propodi; taken together off the Kermadecs at 600 fms., may occur in our northern deep waters. Lengths about 3 in.)

Key to the N.Z. Species of Palaemonoida

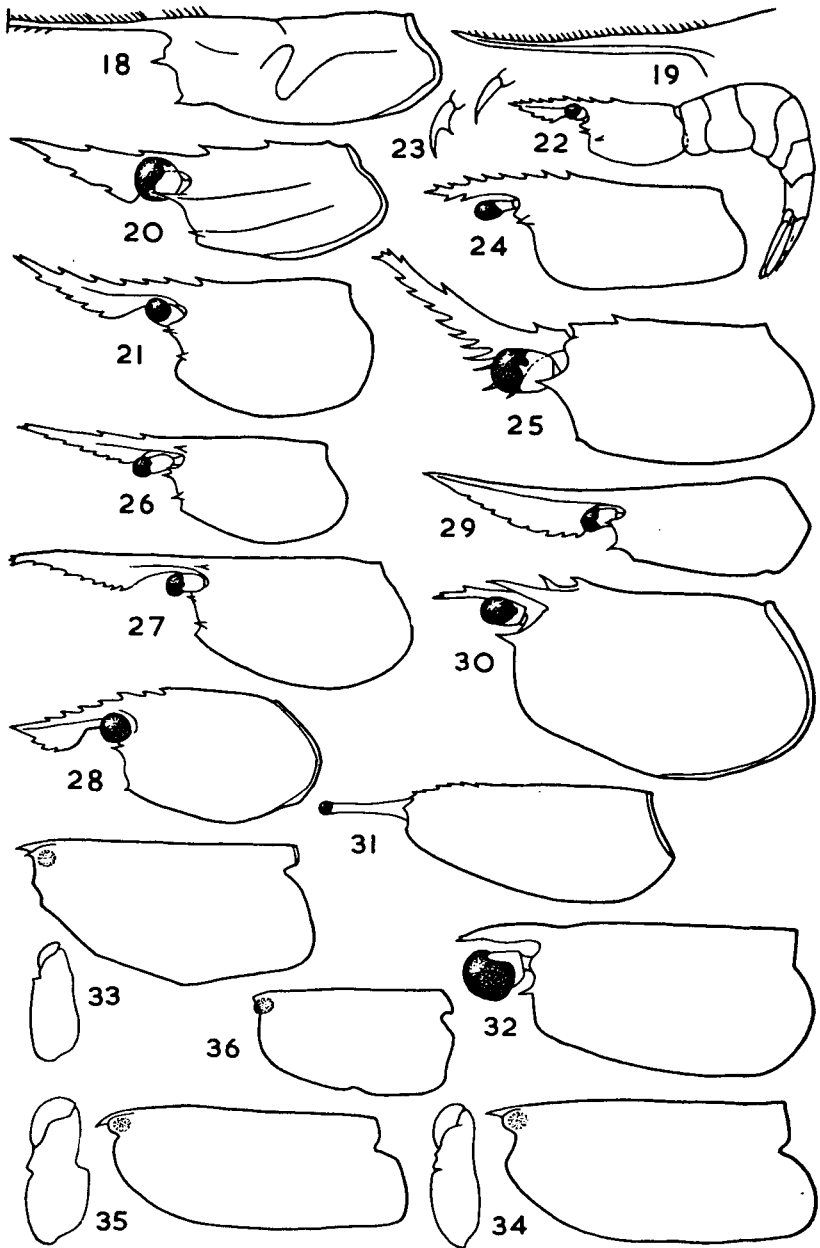
- 1 (2) Antennular exopod simple; arthrobranchs and epipods on first to fourth legs. (F. CAMPYLONOTIDAE.) Small-family of medium to large-sized, shelf and deep-water benthic forms. Two genera. One from New Zealand: Second pair of legs similar to each other; basal portion of rostrum with

not more than 5 dorsal teeth, the most posterior being behind the middle of the carapace. *G. Campylonotus*. * *C. rathbunae* Schmitt, 1926 (fig. 20), with prominent rostrum toothed 3-5/3-9, blunt tubercle on middle of dorsal surface of third abdominal segment and a posterodorsal spine on third, fourth and fifth segments, taken in Cook Strait, off Otago Peninsula and occurs abundantly on the Chatham Rise between 150 and 350 fms. Length up to 6 in. Colour pinkish-red.

- 2 (1) Antennular exopod bifid; legs without arthrobranches or epipods; third maxilliped not expanded and leaf-like. (F. PALAEMONIDAE.) A large group of intertidal and shallow-water forms (small to medium-sized) with some deep-water representatives, and fresh-water forms (often large and heavy-handed). Several subfamilies, the two in New Zealand with antennular exopod having 2 rami fused basally; no longitudinal lateral suture for whole length of carapace.
- 3 (4) Posterior margin of telson with 2 pairs of spines and 2 or more setae. (Subf. PALAEMONINAE.) Supraorbital spine absent but branchiostegal present; eyes large (mandible with palp). *Palaemon affinis* M.-Edwards, 1837 (fig. 21), with rostral teeth 5-10/2-5 and propodus of fifth leg with transverse rows of setae posterodistally, is our endemic, common, intertidal shrimp. Found throughout New Zealand, being extremely abundant in the brackish waters and mangrove swamps of the north. Transparent with longitudinal wavy red and green bands and a prominent diagnostic orange and black spot laterally on sixth abdominal segment. Length up to 3 in. Ovigerous from September to March. (In literature as *Leander*, *Palaemon quoianus*.) (*Leander tenuicornis* (Say, 1818) in our literature as *Palaemon* or *L. natator*, a circumtropic pelagic species associated with floating algae, especially *Sargassum*, has been reported from our waters and should be watched for in the north. Rostral teeth 8-14/5-7 with ventral teeth concealed by double row of setae and no rows of setae posterodistally on propodus of fifth leg. Length up to 2 in.)
- 4 (3) Posterior margin of telson with 3 pairs of spines. (Subf. PONTONIINAE.) Large group of small, secretive, often commensal forms, mainly Indopacific

FIGURES 18 - 36

Fig. 18, *Nematocarcinus hiatus*; fig. 19, *N. serratus*, rostrum only; fig. 20, *Campylonotus rathbunae*; fig. 21, *Palaemon affinis*; fig. 22, *Periclimenes (Harpilius) batei*, carapace and dactyl of third leg; fig. 23, *Periclimenes (Periclimenes)* sp., dactyl of third leg; fig. 24, *Periclimenaeus novaezealandiae*; fig. 25, *Rhynchocinetes* n. sp.; fig. 26, *Hippolyte bifidirostris*; fig. 27, *Hippolyte* n. sp.; fig. 28, *Nauticaris marionis*; fig. 29, *Tozeuma novaezealandiae*; fig. 30, *Alope spinifrons*; fig. 31, *Ogyrides* n. sp.; fig. 32, *Processa* n. sp.; fig. 33, *Alpheus socialis*, carapace and large chela; fig. 34, *A. novaezealandiae*, carapace and large chela; fig. 35, *Alpheus* sp. 'Edwardsi' group, carapace and large chela; fig. 36, *Betaeus aequimanus*. (Figs. 18, 19, after Bate, 1888; fig. 24, after Borradaile, 1916.)



in distribution. Many genera, those in New Zealand with rostrum compressed and toothed; all maxillipeds with exopods; pleura of first to fifth abdominal segments rounded or bluntly pointed; dactyli of third to fifth legs without basal protuberance (mandibular palp absent).

- 5 (10) Hepatic spine present and immovable; body slender. *G. Periclimenes*.
- 6 (7) Dactyli of third to fifth legs biunguiculate, i.e. two-clawed (fig. 23). Subgenus * *Periclimenes* s.s. A number of specimens of this subgenus have been dredged from the New Zealand shelf and continental slope recently. A form with an antennal spine has been taken at 32 fms. off Auckland and in Tasman Bay, while another without an antennal spine but with the hepatic projecting beyond the anterior border of the carapace has been taken with the former and also in a series of hauls from 75-300 fms. off Otago Peninsula. At least two species. Length up to 1.5 in.
- 7 (6) Dactyli of third to fifth legs simple (fig. 22). Subgenus *Harpilius*.
- 8 (9) Rostral teeth 7-10/3-7; chelae of second legs without teeth; the 2 pairs of dorsal telsonic spines clearly not placed at lateral margin. *P. (H.) batei* Holthuis, 1950 (fig. 22). Endemic, abundant throughout New Zealand in sheltered shallow harbours and on shelf from low tide to about 30 fms. Transparent, lightly scattered with green and red pigment. Length up to 1.5 in. Possibly ovigerous throughout year. (In our literature as *Palaemon* or *Brachycarpus audouini*.)
- 9 (8) Rostral teeth 6/3; chelae of second legs with 3 interlocking teeth proximally; telson with 2 pairs of dorsal spines very small and placed very close to lateral margin. * *P. (Harpilius)* sp. recently taken in the Bay of Plenty at 270 fms. and clearly different from the preceding. Length 1¼ in.
- 10 (5) Hepatic spine absent; first pair of legs subequal with undivided carpus; second pair of legs very unequal in size and shape, the larger with fingers bearing one large blunt tooth and up to 2 smaller teeth. *G. Periclimenaeus*. *P. novaezealandiae* (Borradaile, 1916), (fig. 24), with rostral teeth 8/2 and large hand longer than carapace, taken off North Cape in 70 fms. Length 1.25 in. (Known from two specimens. In literature as *Periclimenes*.)

Key to the N.Z. Species of Alpheoidea

- 1 (2) Only one of the first legs chelate, the other terminating in a simple claw-like dactyl (F. PROCESSIDAE). Small to medium-sized shelf or shallow-water forms. Two genera known. One in New Zealand: With exopod on first leg. *G. Processa*. * *Processa* ? n. sp. (fig. 32), with simple, non-dentate, bifid rostrum and 13 sub-segments in the carpus of the subequal second pair of legs, recently taken in the Bay of Plenty from about 30 fms. Length up to 1 in. (Very similar to *P. aequimana* Paulson from the Indian Ocean.)
- 2 (1) First legs both chelate.
- 3.(12) Rostrum toothed, usually compressed and prominent; eyes stalked, never covered by prolongation of carapace and never extremely elongate; first legs short, heavy but not swollen, and with tips of fingers usually dark-

coloured. (F. HIPPOLYTIDAE.) A large and diverse family of small to medium-sized forms, mainly intertidal and shallow-water, but some have been taken on the continental slope.

- 4 (11) Rostrum a large compressed blade with ventral, and usually dorsal, teeth.
- 5 (8) Supraorbital spine present; no arthrobranches on legs; carpus of second leg with 3 sub-segments (mandible without palp but with incisor process). **G. Hippolyte**. Small, shallow-water, brightly-coloured species prominently humped at third abdominal segment and usually associated with seaweed.
- 6 (7) Rostrum with teeth 2/3-6 and bifid tip. **H. bifidirostris** (Miers, 1876), (fig. 26). Endemic, found on seaweed from low water to about 20 fms. throughout New Zealand. Often attracted to light at night. Colour variable, from olive-brown to bright green, bright blue spots being sometimes present on carapace and abdomen. Length up to 1.5 in. Oviparous at least from January to August. (In our literature as **Virbius**.)
- 7 (6) Rostrum with teeth 0/4-9 and trifid tip. * **Hippolyte** n. sp. (fig. 27). Endemic, found on seaweed, intertidally and in shallow water, on rocky coasts. Probably occurs throughout New Zealand but taken only in Cook Strait area, in Dunedin Harbour and at Chatham Islands. Colour variable, transparent with wavy red or green lines, olive-brown, deep red-brown, bright green and any of these with transparent 'windows' or a longitudinal dorsal white band. Blue spots and pigmented bunches of setae are sometimes present on carapace and abdomen, and the live animal is capable of considerable colour change. Length up to 2¼ in. Possibly oviparous throughout year.
- 8 (5) Supraorbital spine absent.
- 9 (10) An obvious articulated plate at posterolateral angle of sixth abdominal segment; first to fourth legs each with an arthrobranch (mandible with palp but without incisor process). **G. Nauticaris**. **N. marionis** Bate, 1888 (fig. 28), with rostral teeth 6-11/2-3, no exopod on third maxilliped. Abundant as an intertidal and shallow-water species of the subantarctic islands, but taken on the New Zealand shelf and continental slope south of the sub-tropical convergence in 30-300 fms. Transparent with irregular bands of red. Length up to 2 in. (In our literature as **Hippolyte stewarti**, **N. stewarti**, **Merhippolyte australis**.)
- 10 (9) No articulated plate on sixth abdominal segment; rostrum with dorsal margin entire and weakly concave; no arthrobranches on legs (mandible without palp or incisor process); carpus of second legs with 3 sub-segments. **G. Tozeuma**. Relatively slender, attenuated, benthic forms. **T. novaezealandiae** Borradaile, 1916 (fig. 29), with 7-8 ventral teeth, taken in Cook Strait, off the subantarctic islands and off Otago, from about 20-100 fms. Irregularly patched and banded with red and blue. Length up to 2 in. (In our literature as **Angasia**.)
- 11 (4) Rostrum rod-like, pointed, armed only with dorsal teeth; supraorbital spine especially prominent (mandible with 3-segmented palp; arthrobranches absent from legs). **G. Alope**. Two intertidal and shallow-water, heavily-built species restricted to the Indopacific. Third maxillipeds become

- grossly elongate in mature males. *A. spinifrons* (M.-Edwards, 1837), (fig. 30), with supraorbital spine as long as eye and rostral teeth 3-5/0, is an endemic, crevice-haunting species found on rocky coasts throughout New Zealand. Often exposed in damp situations at low tide. Transparent, marbled with prominent irregular green and red bands. Length up to 3 in. Oviparous from October to February. (In literature as *Hippolyte*, *Merhippolyte*, *Alope palpalis*.)
- 12 (3) Rostrum absent, or if present simple, not compressed and never toothed ; tips of fingers of first legs not dark-coloured.
- 13 (14) Eyestalks extremely elongate, reaching almost to end of antennular peduncle ; first legs shorter than, but as robust as, second. (F. OGYRIDIDAE. Single genus *Ogyrides*. Small, slender and elongated, shallow-water burrowing forms. * *Ogyrides* n. sp. (fig. 31), with 7-8 dorsal carapace teeth and carpus of second legs with 5 sub-segments, dredged from Hawke Bay, Wellington Harbour and off the Chatham Islands in 2-16 fms. Transparent with irregular transverse red bands. Length up to 1 in.
- 14 (13) Eyestalk completely reduced, cornea wholly or partially covered by a prolongation of the carapace forming orbital hoods ; first legs much stronger than second, often very unequal and greatly swollen. (F. ALPHEIDAE.) Snapping-shrimps. Large family of relatively small, mainly intertidal and shallow-water, burrowing or crevice-haunting forms, characterised by the large size and asymmetrical development of the chelae of the first legs. The free finger of the larger hand bears a stout peg-like tooth fitting into a socket in the fixed finger. It is the violent closing of these fingers which produces the characteristic snapping noise of these shrimps, so similar to the abrupt cracking of breaking glass.
- 15 (22) Rostrum present ; eyes completely covered by carapace ; a cardiac notch present in the posterolateral margin of the carapace ; epipods present on legs. *G. Alpheus*. (*A. halesii* Kirk, 1887, with prominently ridged, entire-margined chelae, described from the coast of southern Hawke's Bay. The unique specimen is now lost and the species has not been recorded since. Possibly founded on a European specimen of *A. glaber* (Oliv) = *A. ruber* M.-Edwards.)
- 16 (19) Eye-hoods produced into small spines anteriorly.
- 17 (18) Dactyli of third to fifth legs biunguiculate. *A. socialis* Heller, 1865 (fig. 33), with margin of larger hand entire, occurs throughout New Zealand intertidally on rocky shores and on continental shelf and slope down to about 300 fms. Nowhere common. Body pale with pink markings, chelae bright orange-red with conspicuous white spots. Length up to 2 in.
- 18 (17) Dactyli of third to fifth legs simple. * *Alpheus* sp.† A small unidentified species dredged in the Cook Strait area at 20-110 fms. Body with

† Now recognised as a species of *Alpheopsis*, a genus of small, mainly shallow-water forms, characterised by a movably-articulated plate at posterolateral angle of sixth abdominal segment.

prominent alternate transverse white and red stripes. Length about 0.5 in., but mature at this length.

- 19 (16) Eye-hoods without anterior spines.
- 20 (21) Deep grooves between rostrum and eye-hoods; larger hand with entire sub-parallel margins. *A. novaezealandiae* Miers, 1876 (fig. 34). This Australian species has been taken in Auckland Harbour but its status in New Zealand is uncertain. Length up to 2 in.
- 21 (20) No grooves between rostrum and eye-hoods; larger hand bulbous with both margins emarginate. *Alpheus* sp. of the 'Edwardsi' group (fig. 35). Extremely abundant, burrowing in the mud of our northern mangrove swamps (i.e. north of about Opotiki on the east coast and Kawhia on the west). The characteristic snapping noises of these swamps are produced entirely by this alpheid and not by the abundant burrowing crab *Helice crassa*. Length up to 2 in. Ovigerous at least from December to January. (In our literature as *Crangon novae-zealandiae*.)
- 22 (15) Rostrum absent; eyes covered dorsally by carapace; telson broad and rounded; first legs never greatly swollen. *G. Betaeus*. Small, intertidal and shallow-water species. *B. aequimanus* Dana, 1852 (fig. 36), with a deep triangular emargination between eye-hoods, occurs littorally and intertidally under stones throughout New Zealand. Colour orange-yellow or dark green with dorsal light-coloured band. Often found in damp situations out of water and capable of jumping like a littoral amphipod. Length up to 1¼ in. Ovigerous from August at least to January.

Key to the N.Z. Species of Pandaloida

Pandaloida with rostrum laterally compressed, distinctly dentate and usually prominent; carpus of second leg undivided, chela small and slender. (F. PANDALIDAE.) Mostly small to medium-sized, deep-water, benthic (rarely bathypelagic) forms.

- 1 (8) Rostrum longer than carapace and immovable; carpus of second legs multiarticulate; no lateral keels on carapace; eyes not reduced.
- 2 (3) Dorsal rostral teeth (excluding subapical tooth) movable; third maxilliped without exopod; epipods on first and second legs; second legs subequal. *Pandalus magnoculus* Bate, 1888 (fig. 37), with rostral teeth 9-12/12-16 and eyes large and reniform, taken off both islands of New Zealand from about 30 to 335 fms., common on the Cook Strait commercial trawling grounds. Transparent with irregular patches of red on carapace and abdomen, eggs milky blue-green. Length up to 3 in. Possibly ovigerous throughout year. Revision of the generic position of this apparently endemic form is in press.)
- 3 (2) Dorsal rostral teeth fixed (rarely with some movable); third maxilliped with exopod.
- 4 (5) Epipods on first to fourth legs. *G. Plesionika*. * *P. martia* (A. M.-Edwards, 1883), (fig. 38), with rostrum at least twice carapace length, closely and evenly toothed ventrally almost to tip, but smooth dorsally beyond

- antennular peduncle, dredged in Cook Strait from about 150 fms. and from Bay of Plenty in about 400 fms. Known up to 6.5 in. in length. (Recorded in literature from off the Kermadecs at 500 fms. as *P. semilaevis*.)
- 5 (4) No epipods on legs. *G. Parapandalus*.
- 6 (7) Dorsal margin of rostrum with about 4 large teeth proximally and a large number of smaller teeth distally; ventral margin with many small, closely-spaced teeth. * *Parapandalus* sp. (fig. 39). This relatively large, commercially usable, long-legged prawn has been recently taken in numbers in the Bay of Plenty from mud bottoms at about 60-120 fms. It is well flavoured. Transparent, with red patches and milky-blue eggs. Length up to 6 in. (Almost definitely an undescribed species.)
- 7 (6) Dorsal margin of rostrum finely and regularly toothed with many small, closely-spaced teeth; ventral margin with fewer, more widely-spaced teeth. (*P. spinipes* (Bate, 1888) taken off the Kermadecs, may be found in our northern waters. Length up to 4 in. In literature as *Plesionika*.)
- 8 (1) Rostrum distinctly shorter than carapace and immovable; carpus of second leg with only 2 sub-segments; third maxilliped with exopod; no posterodorsal spine on sixth abdominal segment; apex of telson acute. *G. Chlorotocus*. *C. novaezealandiae* (Borradaile, 1916), (fig. 40), with rostral teeth 9-14/4-5 and with 4-5 of dorsal series behind orbit, taken off both islands of New Zealand from about 15 to 100 fms. Transparent, with patches of red pigment and eggs greenish-blue. Length up to 2.5 in. (In our literature as *Thalassocaris*.)

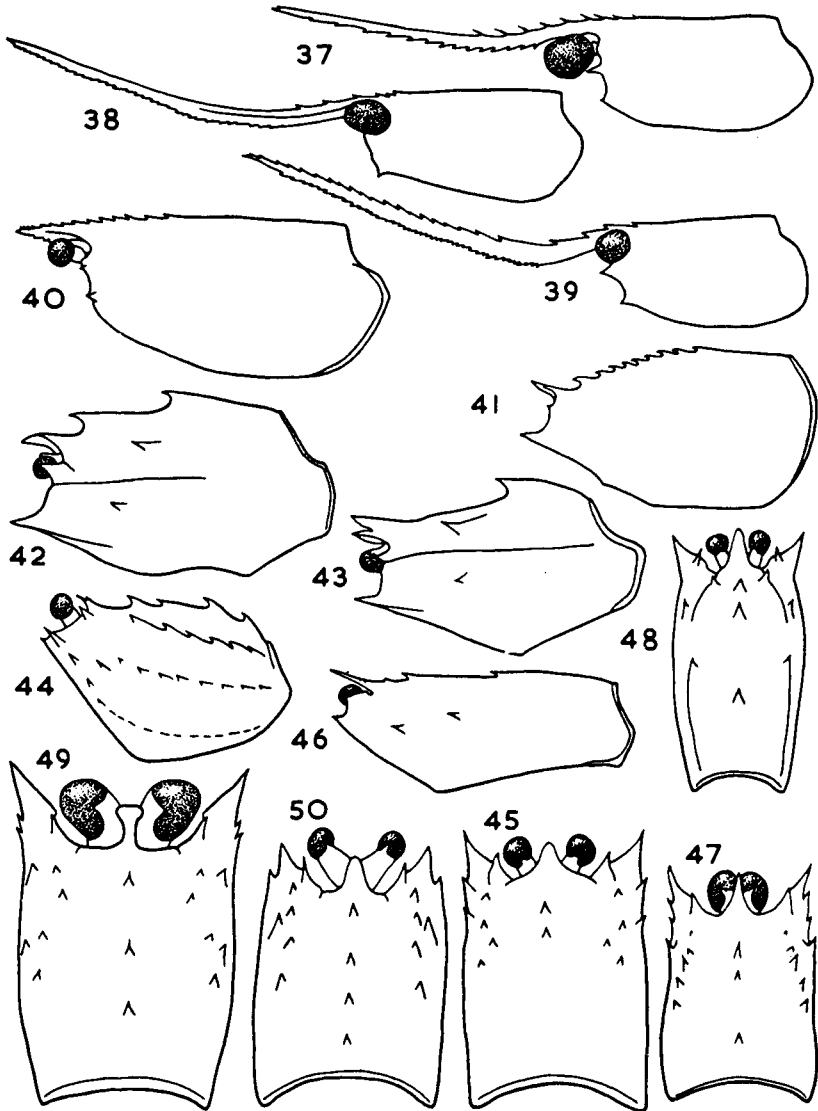
Key to the N.Z. Species of Crangonoida

- 1 (2) Rostrum well developed, long, dorsally flattened and laterally spinose; carpus of second leg multiarticulate; carapace sculptured and keeled; abdomen usually sculptured; telson strong and spine-like. (F. GLYPHOCRANGONIDAE.) A small family of heavily-built, deep-water and abyssal, benthic forms. Single genus *Glyphocrangon*. (A fragment of *G. regalis* Bate, 1888, length up to 3.5 in., taken off the Kermadecs in 600 fms.; this or other allied species may be found in our deeper waters.)
- 2 (1) Rostrum short and usually simple; carpus of second leg not subdivided; carapace and abdomen usually not sculptured; telson not spine-like but often acute. (F. CRANGONIDAE.) Large family of usually small-sized shallow to deep water, benthic forms.

FIGURES 37 - 50

Fig. 37, *Pandalus magnoculus*; fig. 38, *Plesionika martia*; fig. 39, *Parapandalus* sp.; fig. 40, *Chlorotocus novaezealandiae*; fig. 41, *Prionocrangon* n. sp.; fig. 42, *Sclerocrangon* n. sp.; fig. 43, *Sclerocrangon* n. sp.; fig. 44, *Pontocaris lacazei*; fig. 45, *Pontophilus australis*; fig. 46, *P. indicus*; fig. 47, *Pontophilus* n. sp.; fig. 48, *P. challengerii*; fig. 49, *Pontophilus* n. sp.; fig. 50, *Pontophilus* n. sp. (Fig. 38, after Holthuis; fig. 45, after Kemp; fig. 48, after Bate, 1888.)

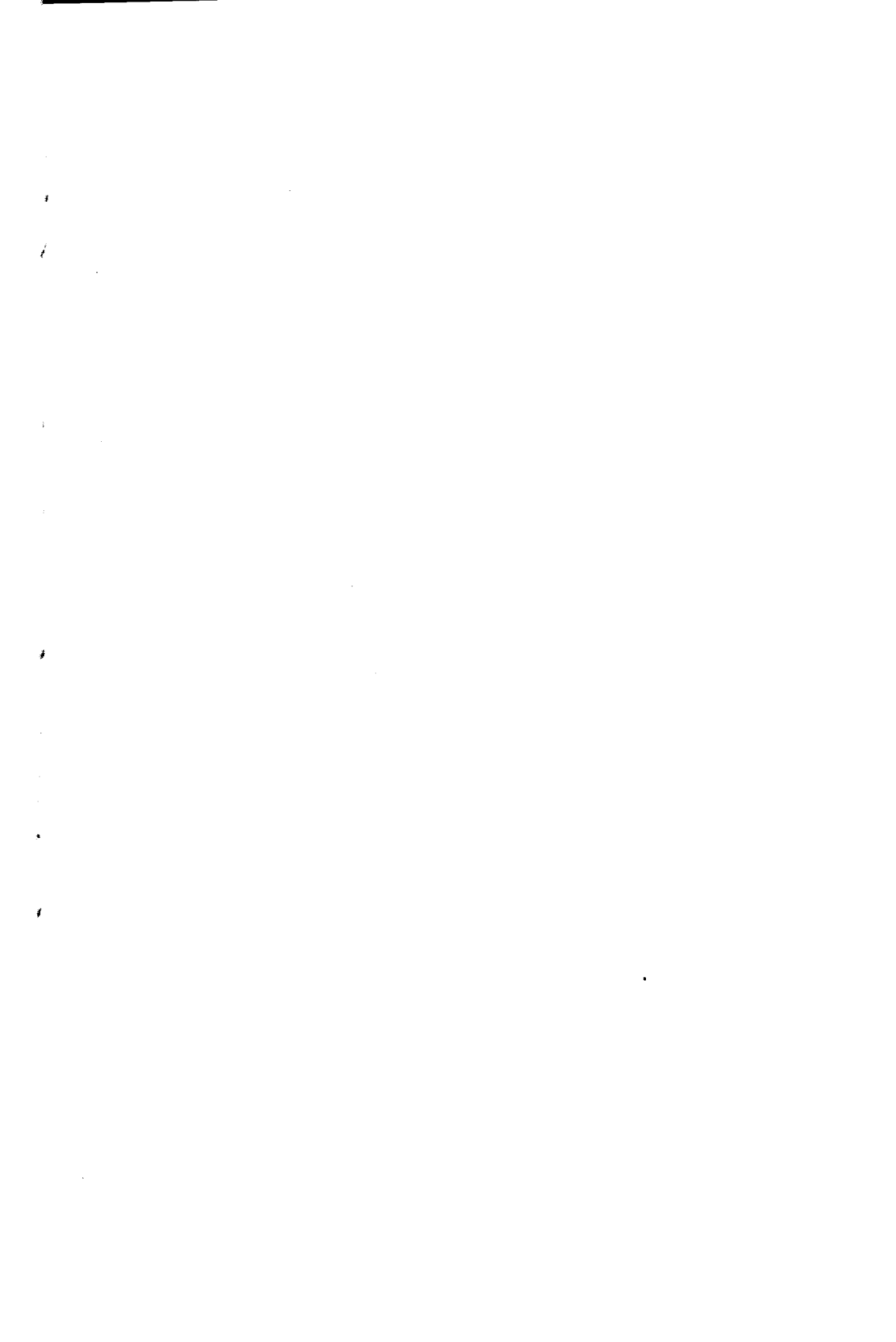
- 3(4) Eyestalks reduced to small pointed processes, cornea absent; second leg non-chelate. *G. Prionocrangon*. Rare, deep-water, totally blind, white crangonids. * *Prionocrangon* n. sp. (fig. 41) with rostrum longer than the reduced eyestalks, taken on the Chatham Rise at 200-300 fms. Length up to 1¼ in. Pure white, eggs large and yellow.

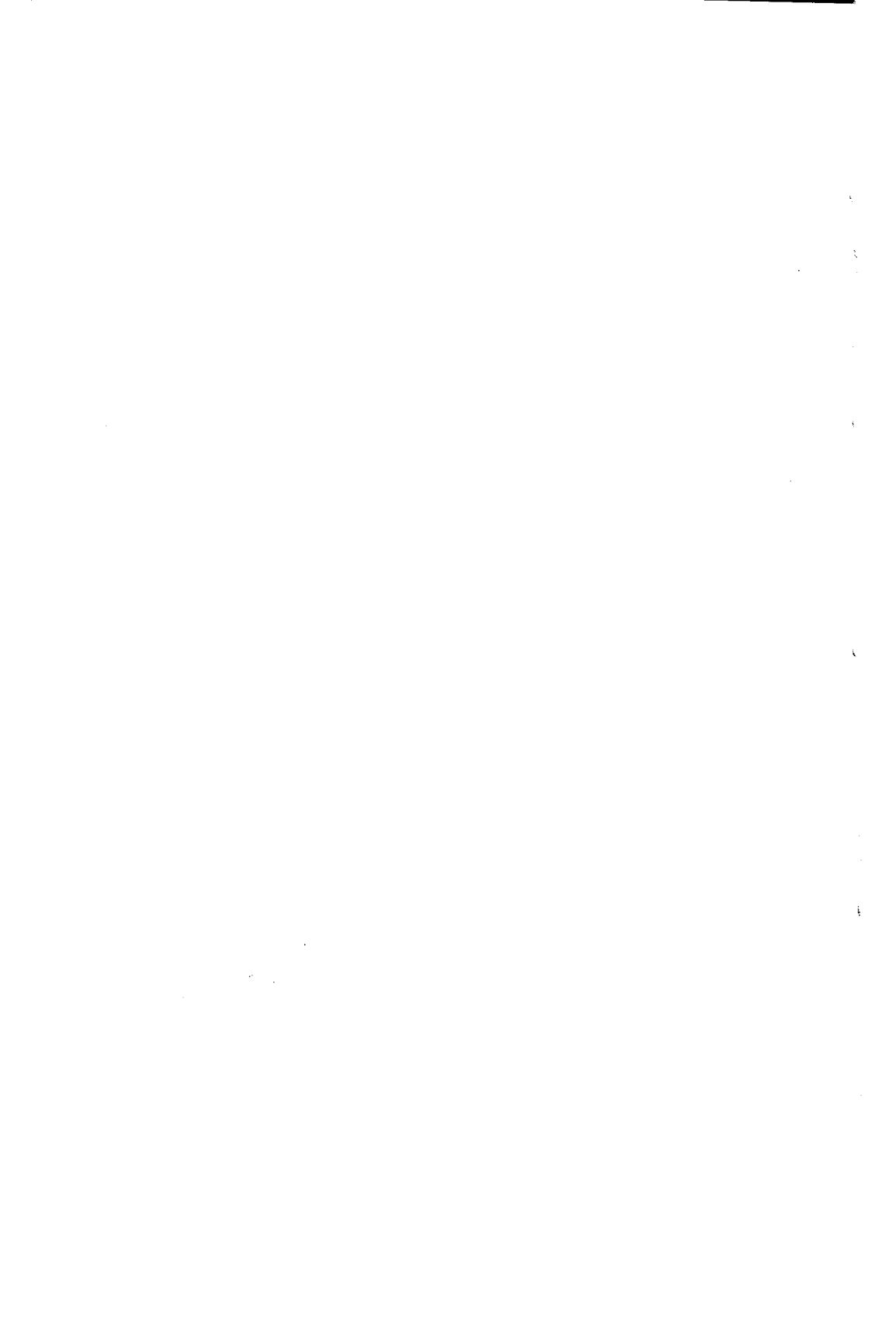


- 4 (3) Eyes normal, cornea present; second leg chelate; dactyl of third to fifth legs not expanded and flat.
- 5 (6) Second leg subequal in length with other legs; carapace dorsally keeled and prominently spined (third maxilliped without arthrobranch, i.e. only 5 gills per side); *G. Sclerocrangon*. Broad and heavily-built shrimps, mainly Arctic. Two new species, each with two dorsal carapace spines, recently taken in our deep waters. One, **Sclerocrangon* n. sp., with the postrostral spine extending anteriorly as far as the tip of the rostrum and the mid-dorsal spine especially prominent and hooked, from the Chatham Rise at 150-330 fms. (fig. 43); and another, **Sclerocrangon* n. sp., with both dorsal spines subequal and the postrostral well behind, not reaching to base of rostrum, from Cook Strait at 550 fms. (fig. 42). Lengths about 1.5 in.
- 6 (5) Second leg much shorter than other legs; carapace not dorsally keeled.
- 7 (8) Ventral apices of gills directed anteriorly (this visible through carapace), (8 gills on each side); extravagantly spinose on both carapace and abdomen. *G. Pontocaris*. The cosmopolitan *P. lacazei* (Courret, 1888), (fig. 44), with a dorsal and 3 lateral keels on carapace and with outer margin of scaphocerite concave, taken off North Auckland and in the Bay of Plenty at about 30-270 fms. Length about 1.5 in. (In our literature as *Aegeon cataphractus*.)
- 8 (7) Ventral apices of gills directed posteriorly (less than 8 gills on each side); carapace may be more or less spinose but abdomen relatively smooth. *G. Pontophilus*. A large genus of small to medium-sized benthic shrimps, represented in New Zealand by at least 9 species.
- 9 (14) 2 mid-dorsal spines on carapace; 5 to 6 spines on lateral surface of carapace; shallow-water species.
- 10 (11) Dorsal spines placed close together on anterior third of carapace; rostrum narrow; pair of dorsolateral keels on sixth abdominal segment. *P. australis* (Thomson, 1879), (fig. 45), abundant throughout New Zealand on sandy bottoms between low tide level and about 11 fms. Buried in sand by day, active at night. Usually a general sandy colour, but prominent dark patches may be present. Probably ovigerous throughout year. Length up to 1¼ in. (in our literature as *Crangon*.)
- 11 (10) Dorsal spines not close together, posterior spine at about mid-point of carapace; rostrum broad; no dorsolateral keels on sixth abdominal segment.
- 12 (13) Rostrum bluntly rounded distally; 6 spines on lateral surface of carapace. *P. chiltoni* Kemp, 1911, not common, found throughout New Zealand between low-tide level and about 9 fms. Length up to 1 in.
- 13 (12) Rostrum truncate distally; 5 spines on lateral surface of carapace. **Pontophilus* n. sp., not common, taken between low-tide level and about 50 fms. from Cook Strait to Stewart Island.
- 14 (9) More than 2 mid-dorsal spines on carapace (anterior may be very small).
- 15 (24) 3 mid-dorsal spines on carapace.
- 16 (23) Dorsal spines unevenly spaced, 2 close together in anterior half and 1 in posterior half.

- 17 (20) At least 7 spines on lateral surface of carapace.
- 18 (19) Rostrum bluntly rounded; shallow-water and shelf species. *P. pilosoides* Stephensen, 1927, taken off both islands of New Zealand and off the sub-Antarctic islands between about 9 and 100 fms. Length about 1.5 in.
- 19 (18) Rostrum acute; continental shelf and slope species. * *Pontophilus* n. sp. (fig. 47), very similar to *P. pilosoides*, taken off both islands between about 47 and 400 fms. Length about 1.5 in.
- 20 (17) Only 2 spines on lateral surface of carapace; anterior mid-dorsal spine small or microscopic; deep-water species.
- 21 (22) 1 pair of small spines laterally on rostrum (not shown in fig. 48, after Bate). *P. challengerii* Ortmann, 1893 (fig. 48), taken off southern Hawke's Bay in 1,100 fms. Known up to 2.5 in. in length. Status and relation to following species uncertain. (In our literature as *P. gracilis*.)
- 22 (21) 2 pairs of small spines laterally on rostrum; integument very smooth and rigid. * *P. indicus* de Man, 1918 (fig. 46), with rostrum inclined dorsally and longer than eye, recently taken in Bay of Plenty at 400 fms. Length about 2 in.
- 23 (16) Dorsal spines evenly spaced and subequal. * *Pontophilus* n. sp. (fig. 49). A small species with especially prominent dorsal spines, taken off North Auckland and in Cook Strait from 20 to about 50 fms. Length about 0.5 in., but mature at this length.
- 24 (15) 4 mid-dorsal spines evenly spaced on carapace. * *Pontophilus* n. sp. (fig. 50). A small species taken off North Auckland at 32 fms. Length about 0.5 in.









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