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# Newly Hatched Larvae of the Genera *Gastroptychus* and *Uroptychus* (Crustacea, Decapoda, Galatheidea) from New Zealand Waters

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*Abstract*

THE newly hatched first larval stage of an undescribed species belonging to each of the genera *Gastroptychus* Caullery and *Uroptychus* Henderson (family Chirostylidae) is figured and described, and the larval affinities discussed. Development is partially abbreviated in both species and their larvae hatch at a stage morphologically equivalent to a normal fourth or fifth stage zoea larva of the Galatheidae.

## INTRODUCTION

IN recent years, a number of adult specimens belonging to the genera *Gastroptychus, Uroptychus* and probably *Chirostylus* (see note p. 195) have been trawled from deep water in the New Zealand region. The presence of these "squat-lobsters" in New Zealand waters has been known for several years, and one of us (R.B.P.) in collaboration with Dr J. C. Yaldwyn is at present preparing an account of all species of the families Chirostylidae and Galatheidae so far obtained.

A number of specimens of a new species of *Gastroptychus,* first obtained in 1963, were caught during January, 1969, at various eastern North Island localities between Poor Knights Islands (lat. 35° 30′, long. 174° 40′) and Mayor Island (lat. 37° 20′, long. 176° 20′). These specimens were collected by Mr R. D. Cooper of Victoria University, Wellington, while acting as biologist on a prawn investigation organised by the Fishing Industry Board of New Zealand. Most of the females were ovigerous at this time, and the greatest number of eggs carried by any one female was fifty. The eggs were large and measured 1.6 × 1.5mm in the early gastrula stage and 1.8 × 1.7mm when ready to hatch. One female (carapace length including rostrum 15mm) trawled from 180–260 fathoms north-east of Mayor Island, Bay of Plenty (lat. 37° 12′, long. 176° 20′), 9/1/69, still retained six unhatched eggs. From these it was possible to reconstruct and describe the first zoeal stage after removing the larvae from the eggs.

One adult female *Uroptychus* (carapace length including rostrum 6.5mm) was taken by the author (R.B.P.) from 105 fathoms, 14 miles east of White Island (lat. 37° 35′, long. 177° 40′), 3/4/1963, during the course of a New Zealand Marine Department prawn survey of the Bay of Plenty. This specimen is closely related to *Uroptychus maori* Borradaile, 1916, and *U. politus* Henderson, 1885. It differs from both these species in having only one very small spine distally on the ischium of the first pereiopod, and in the absence of a ventral row of spines on the

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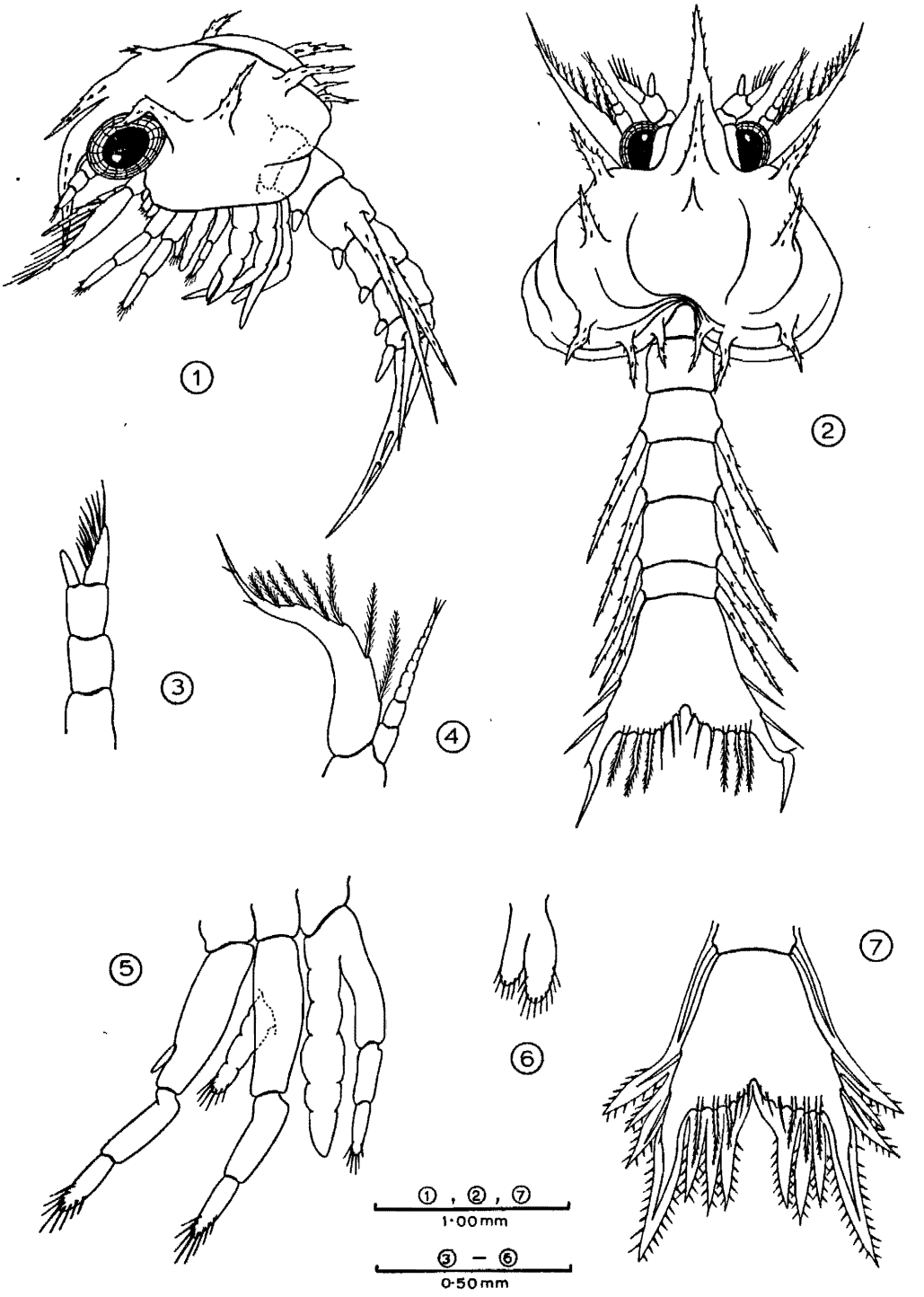



*Uroptychus* cf.*politus*. Fig. 1.—Newly hatched zoea larva: lateral view. Fig. 2.—Newly hatched zoea larva: dorsal view. Fig. 3.—Left first antenna of zoea larva: ventral view. Fig. 4.—Left second antenna of zoea larva: dorsal view. Fig. 5.—First, second, and third maxillipeds of zoea larva. Fig. 6.—Left pleopod from fifth abdominal segment of zoea larva. Fig. 7.—Telson of pre-zoea larva: dorsal view.

propodus of each of the second to fourth pereiopods. Both *U. maori* and *U. politus* have been recorded from waters between the Three Kings and Kermadec Islands to the north of New Zealand. For the purposes of this paper the present specimen is referred to as *Uroptychus* cf.*politus*. *U.* cf.*politus* carried about 15 mature eggs measuring 1.4 × 1.2mm. Several larvae were partially hatched at the time of capture, and it has been possible to record the more important diagnostic characters of the pre-zoea and of the first zoea larval stage.

This is the first description of any larva from either of the genera *Gastroptychus* and *Uroptychus* and affords an opportunity to assess their larval affinities.

Drawings and descriptions are based on three larvae from *Gastroptychus* n.sp. and five larvae from *Uroptychus* cf.*politus*. The larvae of *Gastroptychus* n.sp. were all dissected from the egg membrane, while two larvae of *Uroptychus* cf.*politus* had already hatched and were therefore in a later stage of development. In all progeny, the larval carapace was not fully dilated and its final shape could not be determined. As morphological detail is more completely formed and more clearly visible in the larva of *Uroptychus* cf.*politus*, this larva has been described first as fully as possible, while that of *Gastroptychus* n.sp. is compared to it in lesser detail.

Larval terminology and measurements follow those employed by Pike and Williamson (1960).

The parent female of both species together with unhatched eggs and dissected larvae are deposited in the Dominion Museum, Wellington: *Gastroptychus* n.sp. (Z. Cr. 1858); *Uroptychus* cf.*politus* (Z. Cr. 1859).

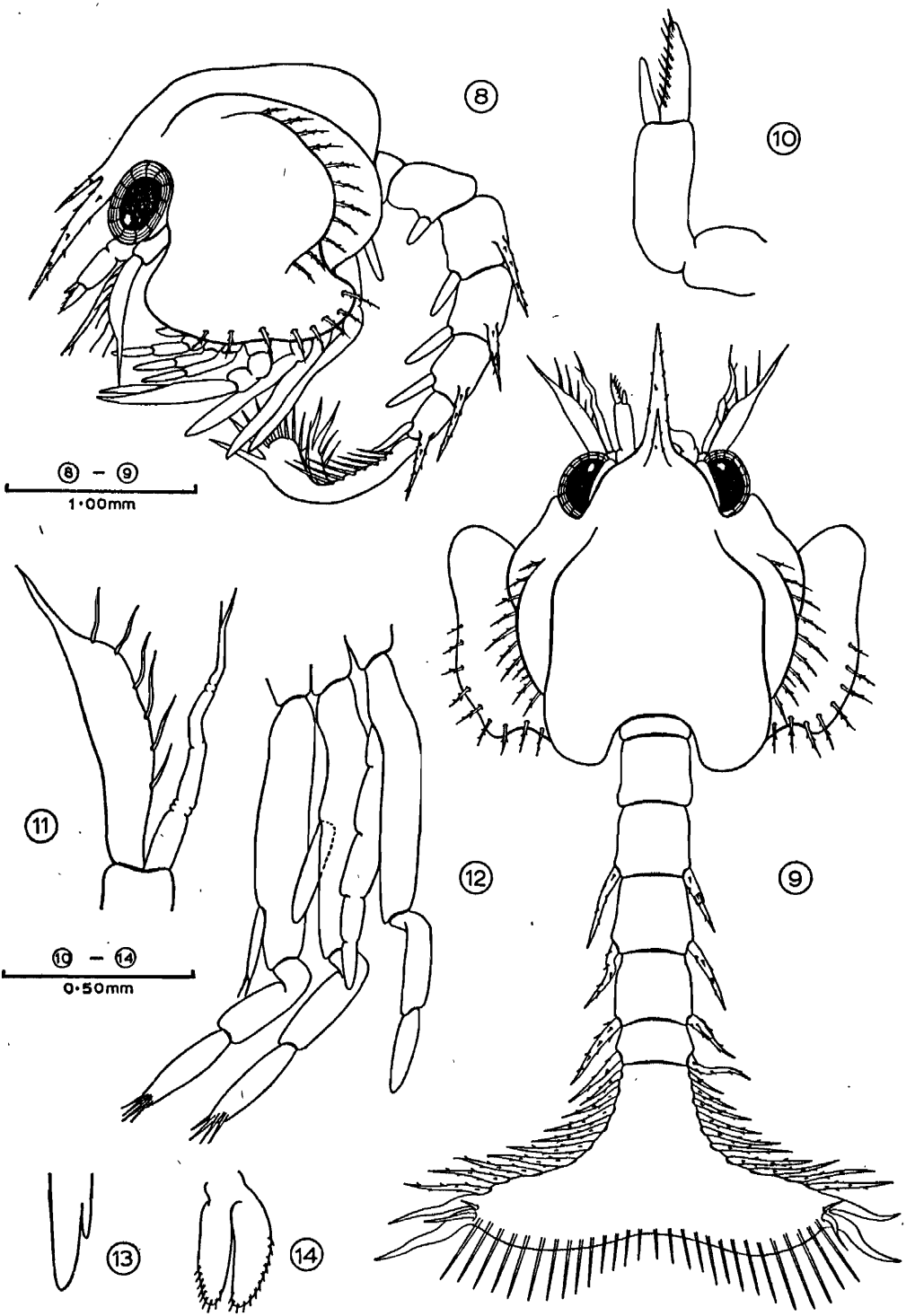
Uroptychus cf.politus Henderson, 1885

THE PRE-ZOEA LARVA: Newly hatched larvae are surrounded by a thin cuticle representing a "pre-zoeal" stage in development (Gurney, 1942). On the telson this cuticle is produced into seven pairs of armed processes as is usual in the Decapoda (Fig. 7). Similar processes occur on the first and second antennae, but it was not possible to observe detail.

THE FIRST STAGE ZOEA LARVA: Length of larva 3.8mm. Carapace deeply cleft in the posterior midline and broadly rounded posterolaterally with smooth margins —not produced posteriorly into a serrated spine on either side as in the Galatheidae (Gurney, 1942: 254). Tip of rostrum to posterior extremity of carapace 1.8mm. Rostrum almost as long as carapace (Figs. 1, 2), not flattened, and tapering to a point with six or seven spinules on each side. Carapace (Figs. 1, 2) with an unpaired median spine in the frontal (interorbital) position, and a much smaller spine arising from the cardiac region just behind the frontal spine. A pair of large spines arise from each of its lateral postorbital, branchial, and posterolateral regions, and two pairs are situated in a more medial posterior position, but these spines are inset and are not marginal. All carapace spines armed with small spinules.

Eyes well developed and stalked. Peduncle of first antenna (Fig. 3) three-segmented; inner ramus an unarmed segment; outer ramus also divided from the peduncle and bearing a large number of inner and terminal aesthetascs. Second antenna (Fig. 4) with a squamous exopod extending forwards almost to the tip of the rostrum; exopod with eight inner marginal plumose setae and with its acicular tip bearing two small outer spines; segmented or partially segmented endopod about half the length of the exopod, and with three small terminal setae. The mandible has a small palp. The number of marginal setae on the first and second maxillae and their respective endopod segmentation could not be determined.

First and second maxillipeds (Fig. 5) with tips of exopods bearing eight rudimentary setae; third maxilliped with exopod bearing six such setae. Endopod of first maxilliped unsegmented, unusually small, and arising subterminally from the basis; endopod of second maxilliped slightly more than half as long as the exopod,




*Gastroptychus* n.sp. Fig. 8.—Newly hatched zoea larva: lateral view. Fig. 9.—Newly hatched zoea larva: dorsal view. Fig. 10.—Left first antenna: dorsal view. Fig. 11.—Left second antenna: dorsal view. Fig. 12.—First, second, and third maxillipeds of left side. Fig 13.—Left pleopod from fifth abdominal segment. Fig. 14.—Left uropod from sixth abdominal segment.

incompletely divided into four segments, and arising about midway along the basis; endopod of third maxilliped as long as the basis and exopod combined, incompletely divided into five segments, and arising from near the proximal end of the basis as is usual in the Anomura (Gurney, 1942: 140).

Pereiopods (Fig. 1) well developed, indistinctly segmented, but not functional; first pereiopod chelate; fifth pereiopod rather smaller than the rest and concealed behind the third and fourth pereiopods; all pereiopods without exopods.

The abdomen (Figs. 1, 2) comprises six segments and a telson. Extremely long (about 0.7mm) and spinulose spines occur laterally on segments 3 to 6; short uniramous pleopod buds occur on segments 2 to 5; a pair of biramous uropod buds comprising an endopod and slightly larger exopod each bearing rudimentary marginal setae (Fig. 6) arise from segment 6.

Telson (Figs. 2, 7) subtriangular, with a small but deep median posterior cleft with ten setae arranged on each side: first seta smooth and arising from the posterolateral margin; second seta lacking but represented in the pre-zoea by an empty process (Fig. 7); third seta smooth and arising posterior to the first seta and near the level of the posterior margin of the telson; fourth seta strongly developed to form the telson fork, smooth, fused with the telson plate, and bearing a small lateral spine midway along its length; fifth to eleventh setae arising from the posterior margin within the fork of the telson, fifth to seventh setae plumose and about half as long as the fourth; eighth to eleventh (inner) setae smaller and nonplumose.

**Gastroptychus** n.sp.

THE PRE-ZOEA LARVA: A pre-zoeal cuticle surrounds the newly hatched larva and all appendages, but the cuticle is not produced into armed telson processes. It was not possible to determine presence or absence of such processes on the first and second antennae.

THE FIRST STAGE ZOEA LARVA: Length of larva 4.8mm; tip of rostrum to posterior carapace margin 2.3mm; rostrum considerably shorter than carapace. Carapace (Figs. 8, 9) with a crescent-shaped cleft in the posterior midline, and with its lateral regions extensively folded and produced ventrally into a prominent lobe on each side; armed accessory carapace spines less prominent than in *U.* cf.*politus* and restricted to one frontal spine and two rows of more slender lateral spines on each side.

Peduncle of first antenna (Fig. 10) incompletely divided into two segments. Second antenna (Fig. 11) with its incompletely extended endopod unsegmented and almost as long as the squamous exopod; exopod with six inner marginal setae and with its acicular tip lacking spines.

First, second, and third maxillipeds (Fig. 12) similar to those of *U.* cf.*politus*, but differ in details of setation: exopods of first and second maxillipeds each with four partly formed terminal setae; endopod of first maxilliped bearing two such setae; endopod of second maxilliped and both rami of third maxilliped lacking setae.

Abdomen (Figs. 8, 9) with third to sixth segments each bearing a pair of spinulose lateral spines about 0.25mm long; second to fifth segments with short biramous pleopod buds (Fig. 13), the inner ramus being rudimentary; endopod and exopod of uropods (Fig. 14) partly divided from protopod.

Telson (Fig. 9) 1.0mm long and 2.0mm wide; width formed by two broad posterolateral lobes; median posterior indentation shallow and poorly defined. There are 28 pairs of marginal telson processes: the first ten setae are strongly developed, sparsely toothed, and occur laterally on each side, followed by two large unarmed processes not articulating with the telson, and two much smaller setae arising from the posterolateral angles; 14 pairs of incompletely extended setae, decreasing in length medially, fringe the posterior telson margins. It is probable that the more anterior of the large lateral processes is homologous with the first true telson seta of

other decapod larvae, the somewhat larger and more posterior process being equivalent to the normal fourth seta, and the two much smaller setae arising from between these two are the normal second and third telson setae respectively. Hence there are 18 pairs of true posterior telson setae. All setae arising anterior to the first true setae are considered to be accessory.

## DISCUSSION

The first reference to larval development in the family Chirostylidae is that of Bouvier (1892) who described the embryo of *Uroptychus nitidus* A. Milne Edwards and of *U. concolor* A. Milne Edwards. Milne Edwards and Bouvier (1897: 116) suggested that the small number of large eggs of *U. nitidus* measuring 2.0 × 1.7mm may hatch in the adult form. In *U. nitidus* the diameter of the eggs is about one-eighth the female carapace length of 14.0mm inclusive of the rostrum (Milne Edwards and Bouvier, 1897: 138). Kemp (1910: 414) recorded two females of *U. bouvieri* Caullery bearing eggs about one-fourteenth the carapace length.

The eggs of *Uroptychus* cf.*politus* are about one-fifth the female carapace length including the rostrum. This proportion is greater than that recorded for other species, and is in fact a higher egg size to carapace length ratio than that noted by Gurney (1942: 55) for any other decapod crustacean. The eggs of *Gastroptychus* n.sp. are about one-ninth the female carapace length. However, in both these New Zealand species the eggs hatch at an advanced stage equivalent to a normal fourth or fifth stage galatheid larva. It is therefore unlikely that the relatively smaller eggs of *Uroptychus nitidus* and *U. concolor* hatch in the adult form as suggested by Milne Edwards and Bouvier (1897), but rather that development is partially abbreviated and comparable to that of the present species with at least one free-swimming larval stage.

Anachronism, which is normally associated with abbreviated development (Gurney, 1942; Wear, 1967) is not strongly marked in the first zoea of *Uroptychus* cf.*politus* and *Gastroptychus* n.sp. The only real evidence of anachronistic development lies in the segmentation of the first antennal peduncle and in the development of the antennal endopod in *Uroptychus* cf.*politus*. These characters, together with the well-developed and partially segmented pereiopods in both species, and biramous pleopods (*Gastroptychus*) suggest that the larvae described here are the only zoea larval stages of their respective species. They probably remain near the bottom in deep water from the time of hatching until metamorphosis into the post-larval or juvenile form.

In most characters the larvae of *Uroptychus* cf.*politus* and *Gastroptychus* n.sp. appear related. The most important characters by which they differ are in the armature of the carapace and the shape and armature of the telson. The shape of the telson in *Gastroptychus* is unique, and unlike that of any other described decapod larva.

Larval characters shared by *Uroptychus* cf.*politus* and *Gastroptychus* n.sp. which differ from those common to the galatheid genera *Munida* and *Galathea* (Lebour, 1930: 177; Gurney, 1942: 254) are:

1. Reduction in the number of zoeal stages (partially abbreviated development).
2. Carapace lacks posterolateral spines and the posterior carapace margins are without serrations; carapace with a number of accessory spines which are not marginal.
3. Peduncle of first antenna segmented or partly segmented.
4. The point of endopod attachment to the basis of the first maxilliped is distal, but this point progresses proximally on the second and third maxillipeds.
5. Posterior dorsal margins of the abdominal segments are not visibly toothed.

6. The extreme development of armed lateral abdominal spines on segments three to five.
7. The presence of long lateral abdominal spines on segment six.

These larvae are undoubtedly anomuran in type. Their affinities are with larvae of the family Galatheidae to which they are most closely related. The form of the telson places *Uroptychus* closer to the Galatheidae than can be suggested for *Gastroptychus*. However, the list given above shows that larvae of the family Chirostylidae are distinct from those of the Galatheidae. Perhaps the most striking of these features is the nature of the carapace and its armature which is to some extent similar to that in larvae of the Dromiidae and Homolidae.

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*Note*: In this paper we have followed the opinion of Miyake and Baba (1968) who consider that the genus *Chirostylus* Ortmann should be divided into the two original genera *Chirostylus sensu stricto* and *Gastroptychus* Caullery. Our new species is being described by Baba as *Gastroptychus* n.sp.

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