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Four Species of Phyllosoma Larvae from the Mariana Waters*

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Abstract

Fifty specimens of gilled (final) - and late-stage phyllosoma larvae including a so-called giant phyllosoma were obtained from the Mariana waters, western tropical Pacific in May 1983 with obliquely hauled midwater trawl nets. These phyllosoma larvae are identified with four species: *Panulirus longipes* (Palinuridae) with three specimens, *Scyllarus bicuspidatus* with forty five, *Scyllarides squamosus* with one and *Parribacus antarcticus* (Scyllaridae) with one. These phyllosoma larvae are described with drawings of diagnostic features.

1. Introduction

Very little is known about fauna of the scyllarid (slipper) lobsters in the western tropical Pacific, while that of the palinurid (spiny) lobsters which have a high economic value is relatively well-known (GEORGE, 1972). Morphological features of phyllosoma larvae are made clear for about 40% of the scyllarid and palinurid species (SEKIGUCHI, 1986), and the occurrence of the larvae have been investigated in detail in the Indian Ocean (PRASAD *et al.*, 1975), the Western Australian waters (PHILLIPS *et al.*, 1981), the South China Sea (JOHNSON, 1971b), the Japanese waters (MURANO, 1971; SEKIGUCHI, 1986), the Hawaiian waters (JOHNSON, 1968a, b, 1971a), the eastern tropical Pacific (JOHNSON, 1971c), the New Zealand waters (LESSER, 1974, 1978), the southeastern Australian waters (MC WILLIAM and PHILLIPS, 1983), and the Caribbean Sea and western Atlantic (ROBERTSON, 1968a, d, 1969a, b, 1971).

These studies have contributed to make clear the distribution and larval recruitment processes of the lobsters (JOHNSON, 1971c; PHILLIPS *et al.*, 1981). It is also hoped that the description of the larvae found here will be of aid in further identification of larvae and distribution and relative abundance of adult lobsters in this and adjoining areas.

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2. Materials and Methods

Several oblique hauls of a midwater trawl of the R/V "Kaiyo-Maru" type (3m×3m square of the mouth, 5.6mm mesh-openings) were made in the Mariana waters, the western tropical Pacific, in May 1983. In two hauls, which were made in the morning of 17th and 30th of May (Table 1), fifty specimens of late-stage phyllosoma larvae were captured. They were identified with four species: *Panulirus longipes*, *Scyllarus bicuspidatus*, *Scyllarides squamosus* and *Parribacus antarcticus*. The following descriptions are made using the distinguishing features of the gilled (final) and/or latest-stage specimens preserved in good condition. All figures were drawn with the aid of a drawing tube. Body length was measured from the anterior tip of cephalic

Table 1. Data for sampling phyllosoma larvae in the Mariana waters.

Date	Time (LMT)	Position	Depth	Specimens
17 May 1983	08:00-08:30	23°14.7′N 150°16.0′E	0-199 m oblique haul	*Panulirus longipes* (3) *Scyllarus bicuspidatus* (45) *Parribacus antarcticus* (1)
30 May 1983	09:57-12:09	22°59.0′N 149°47.1′E	0-880 m oblique haul	*Scyllarides squamosus* (1)

* Numericals in parentheses indicate number of collected specimens.

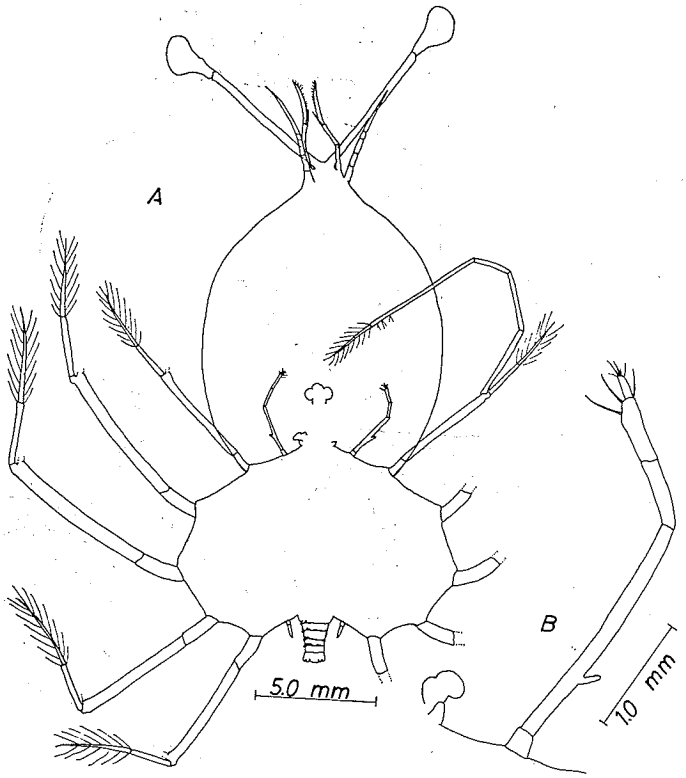

Fig. 1. *Panulirus longipes*.
A: ventral view, B: second maxilla and first and second maxillipeds.

shield to the posterior end of telson.

The present phyllosoma larvae will be deposited at the National Science Museum in Tokyo after the study will be accomplished.

3. Results and Discussion

Panulirus longipes (Fig.1)

Three specimens without gills were found. The description is made on the specimen (21mm body length) preserved in good condition. Body lengths of the other two specimens are 20 and 21mm respectively.

Cephalic shield oval, 15.3mm long and 10.0 mm wide, overlapping the bases of a pair of third maxilliped. Thorax 12.0mm wide. Peduncle of antennule two-segmented. Antenna elongate, cylindrical with five segments. Second maxilla and first maxilliped bud-like and uniramous. Second maxilliped five-segmented, slender with small bud of exopod. Third maxilliped six-segmented with natatorial exopod. All maxillipeds and pereiopods without gill buds and subexopodal and coxal spines. Fifth pereiopod bud-like, uniramous with two segments. Endopods of first to fourth pereiopods were found loose in the plankton sample in which the larva was found. Uropod and telson underdeveloped.

Remarks: Morphological features of the late-stage phyllosoma larvae of the *Panulirus japonicus* group except *P. pascuensis* have been described in detail (JOHNSON, 1968b, 1971b; MICHEL, 1969; MURANO, 1971; PRASAD *et al.*, 1975; INOUE, 1978; BRAINE *et al.*, 1979; SAISHO *et al.*, 1983). Based on these descriptions, the present and other two specimens belong to the *Panulirus japonicus* group. Identification of species by external morphology is very difficult for the larvae of the *P. japonicus* group except *P. japonicus* (CHITTLEBOROUGH and THOMAS, 1969; JOHNSON, 1971b; SEKIGUCHI, 1986). However, five species of the *Panulirus japonicus* group show a clearly segregated geographical

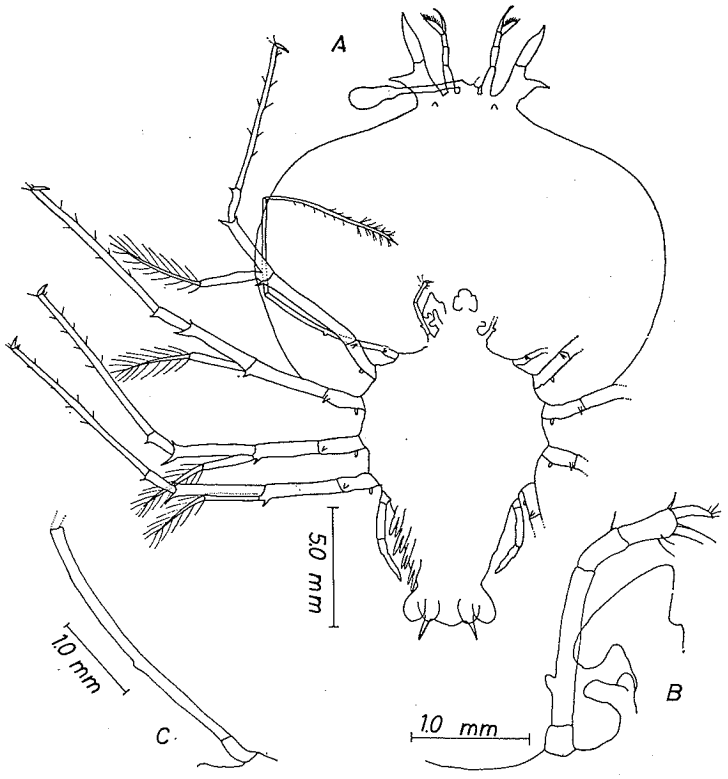

Fig. 2. *Scyllarus bicuspidatus*.
A: ventral view, B: second maxilla and first and second maxillipeds, C: third maxilliped.

distribution in the Indo-West Pacific (SEKIGUCHI, 1988a): *P. longipes* is widely distributed in the Indo-West Pacific, while other four species are found in marginal areas of the distribution of the *P. japonicus* group. Accordingly, the present phyllosoma larvae are identified with this species because the larvae were found within the geographical area of the adult *P. longipes* (SEKIGUCHI, 1988a).

Scyllarus bicuspidatus (Fig. 2)

Forty-five specimens including two gilled (final)-stage (23mm body length) and forty-three subfinal-stage ones (15–18mm body lengths) were found. The specimen described herein is in the gilled-stage bearing distinguishing features. Differences in external morphology were difficult to find between these two gilled-stage specimens with same body lengths.

Body length 25mm. Cephalic shield nearly elliptical, 14.3mm long and 25.0mm wide, overlapping the bases of a pair of 2nd pereiopods. Peduncle of antennule three-segmented. Antenna dorsoventrally compressed and comprises two segments, of which outer margin of basal segment bears lateral process with pointed tip. Second maxilla with developed scaphognathite lacking setae. First maxilliped bud-like and biramous. Second maxilliped five-segmented with small bud of exopod. Third maxilliped four-segmented and slender with small bud of exopod. Third maxilliped and all pereiopods except fifth one bear gill buds and ventrally directed coxal spines on the basal segment. Fifth pereiopod uniramous and bud-like with three segments. Dorsal spines present on thorax near the bases of first four pereiopods. Uropod rounded at tip and free of outer marginal spines. Telson extends beyond uropod and bears two prominent posteriorly directed lateral spines.

Remarks: Morphological features of the present gilled-stage phyllosoma accord well with those of *Scyllarus bicuspidatus* described by PHILLIPS *et*

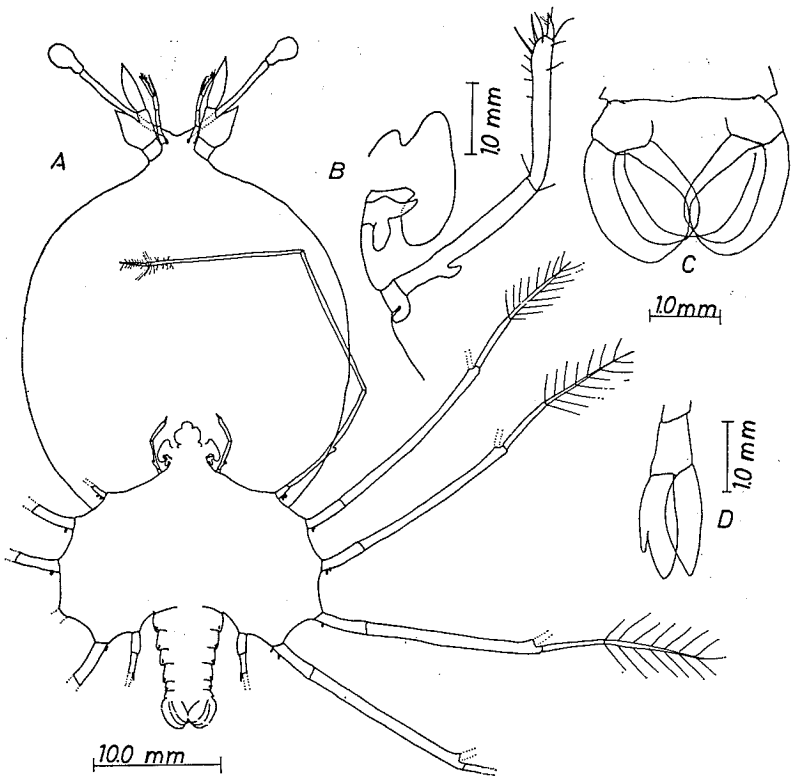

Fig. 3. *Scyllarides squamosus*.
A: ventral view, B: Second maxilla and first and second maxillipeds, C: uropod and telson, D: second pleopod.

al. (1981). Phyllosoma of this species has been reported from the western Australian waters (PHILLIPS *et al.*, 1981) and from the Japanese waters (SAISHO *et al.*, 1983; SEKIGUCHI, 1986). JOHNSON'S (1971b) *Scyllarus* sp. A, caught in the South China Sea, seems to belong to this species.

Scyllarides squamosus (Fig. 3)

One gilled-stage phyllosoma was found.

Body length 47mm. Cephalic shield oval, 45.2 mm long and 25.8mm wide, overlapping the bases of a pair of third maxillipeds. Peduncle of antennule two-segmented. Antenna dorsoventrally compressed and comprises three segments, of which outer margin of second segment has anteriorly directed process with pointed tip. Second maxilla with developed scaphognathite lacking setae. First maxilliped bud-like and biramous. Second maxilliped four-segmented with small bud of exopod. Third maxilliped five-segmented and slender with small exopod bud. Third maxilliped and first four pereiopods bear gill buds but not subexopodal and coxal spines. Endopods of first four pereiopods were found loose. Fifth pereiopod bears underdeveloped but segmented small bud with a conspicous spine, a distal half of fifth pereiopod was found loose. Posterior margin of thorax concave between a pair of fourth pereiopods. All pleopods biramous with short appendix interna on endopods. Uropod oval without outer marginal spines. Abdomen with a sharp spine on the mid-line of dorsal surface of fourth and fifth segments. Each of second to sixth abdominal segments bears a pair of downward pointing conical spines on ventral surface near posterolateral margin.

Remarks: The morphology of the present specimen accords well with that of *Scyllarides squamosus* described by MICHEL (1968) from the New Caledonian waters, by BERRY (1974) from

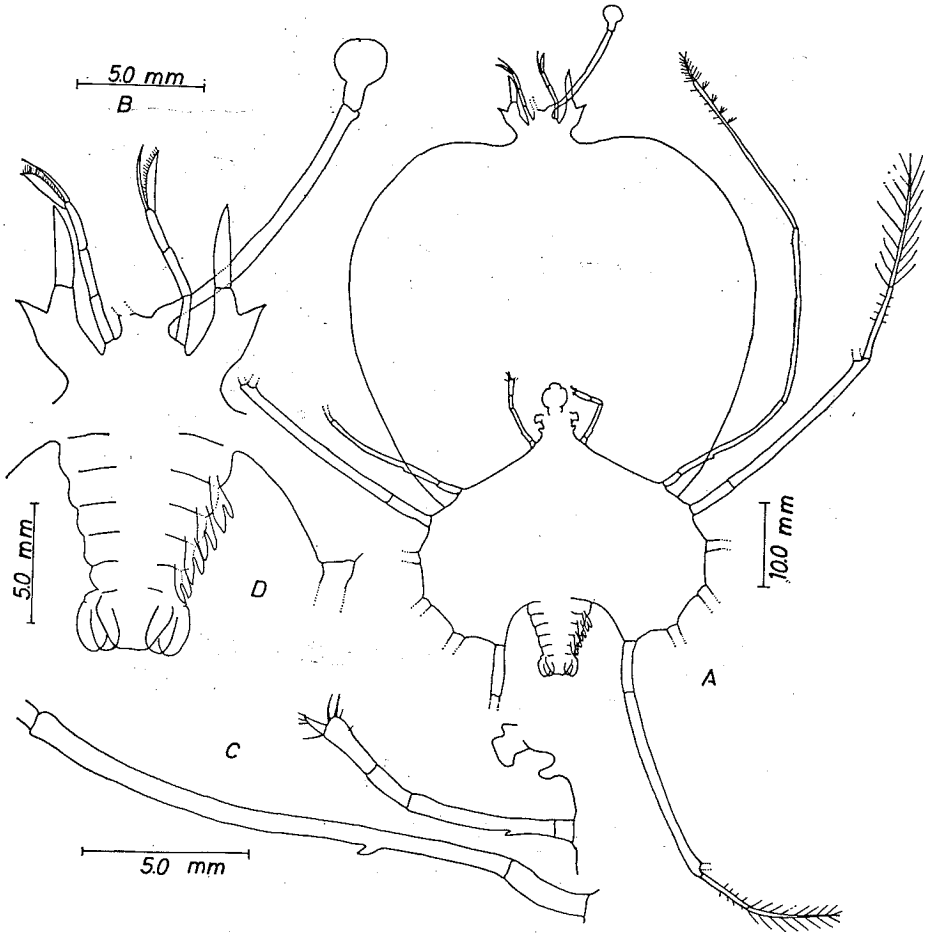

Fig. 4. *Parribacus antarcticus*.
A: ventral view, B: antennule, antenna and eye, C: second maxilla and first and second maxillipeds, D: abdomen, uropod and telson in ventral view.

the South African waters and by JOHNSON (1977) from the Hawaiian waters. Based on a conspicuous spine on fifth pereiopod, the present phyllosoma is distinguishable from the gilled-stage phyllosoma of *Scyllarides* sp. a (probably *Scyllarides haanii*) described by PHILLIPS *et al.* (1981) from the western Australian waters.

Parribacus antarcticus (Fig. 4)

One giant phyllosoma was found, but not in the gilled stage one.

Body length 68mm. Cephalic shield bilobed similar to two jointed kidneys, 51.1mm long and 48.8mm wide, overlapping the bases of a pair of third maxillipeds, has its greatest width about the central-line between buccal mass and anterior tip and narrows gradually toward the rounded anterior margins which do not project much anteriorly in the form of "shoulder". Peduncle of antennule three-segmented. Antenna dorsoventrally compressed and comprises two segments, of which outer margin of basal segment has anteriorly directed process with pointed apex. Second maxilla and first maxilliped bud-like and uniramous. Second maxilliped five-segmented with small exopod bud. Third maxilliped slender with small bud of exopod. Fifth pereiopod developed and bears setose exopod. Endopods of first to fifth pereiopod were found loose. No pereiopods bear gill buds, subexopodal and coxal spines. Posterior margin of thorax concave between the bases of a pair of fifth pereiopods. All pleopods biramous. Uropod oval and free of

outer marginal spines.

Remarks: The morphology of this phyllosoma accords well with that of *Parribacus antarcticus* reported from the Hawaiian waters by JOHNSON (1971a) and from the Caribbean Sea by ROBERTSON (1968b), but it is clearly different from the giant phyllosoma described by JOHNSON (1951) from the Marshall waters. Taxonomical position of the so-called giant phyllosoma larvae has been reviewed by ROBERTSON (1968b) and SEKIGUCHI (1988b). These phyllosoma larvae have been collected in the waters where the adults of this species are recorded (HOLTHUIS, 1985).

Acknowledgements

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マリアナ海域で採集された4種類のフィロゾーマ幼生

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1983年5月にマリアナ海域でおこなわれた中層トロールネットの斜め曳きによって，巨大フィロゾーマ幼生を含めて50個体の後期フィロゾーマ幼生が採集された。同定の結果，これらの幼生には4種類，イセエビ科のカノコイセエビ（3個体），セミエビ科のフタバヒメセミエビ（45個体），セミエビ（1個体）とゾウリエビ（1個体）が含まれていることが分かった。これらのフィロゾーマ幼生の中で，保存状態のよい最終期もしくはそれに近い後期フィロゾーマ幼生の主要な形態特徴を記載した。

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