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A DEEP-SEA LOBSTER OF THE GENUS *PUERULUS* (CRUSTACEA: DECAPODA: PALINURIDAE) FROM TAIWAN[1]

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Tin-Yam Chan and Hsiang-Ping Yu (1989) A Deep-Sea Lobster of the Genus *Puerulus* (Crustacea: Decapoda: Palinuridae) from Taiwan. *Bull. Inst. Zool., Academia Sinica* **28**(1): 1-6. The occurrence of *Puerulus* lobsters (family Palinuridae) in Taiwanese waters is reported for the first time. One species is recognized, namely *Puerulus angulatus* (Bate, 1888). This deep-sea spiny lobster is rather rare and is caught off the north-eastern coast at the depth of 180-350 m together with *Metanephrops* lobsters by "baby" shrimp trawlers. A brief description and color illustration of this species are provided for its identification. The morphological differences between the sexes in this lobster is also discussed.

Key words: New record, Palinuridae, *Puerulus*, Taiwan.

The record of spiny lobsters of the Family Palinuridae in Taiwan has been two genera and nine species by Ho and Yu (1979). During the last few years of specimen collection for the Taiwanese decapod crustaceans survey, several specimens of another spiny lobster species were obtained at fish markets. This species belongs to the primitive lobster genus *Puerulus* Ortmann, 1897 (George & Main 1967). It differs from other spiny lobsters by having a prismatic carapace, a rather short antennulae, and with the supra-orbital horns far apart and almost situated laterally (see Holthuis 1946). The similarity of these characteristics to the young stages of other palinurids earns this genus the name *Puerulus*. Four extant species of this genus are known at present (see Berry 1969) and all are from Indo-West-Pacific. However, all of them are rather rare and therefore of almost no economic importance (Williams 1986). The record of *Puerulus* lobsters in Taiwan makes up the Taiwanese spiny lobsters to three genera and 10 species. Our specimens collected to date are all identified as *Puerulus angulatus* (Bate, 1888). The taxonomic status of this species is rather confusing in the literature (see Ramadan 1938, Holthuis 1966, Berry 1969, Harada 1980). Therefore, the morphological characteristic of the Taiwanese specimens is briefly described and its coloration is illustrated.

MATERIALS AND METHODS

The specimens were obtained at fish markets in fishing harbours. They were caught by "baby" shrimp trawlers and were said to be collected at depths of 180-350 m on sandy and muddy bottoms

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off the north-eastern coast of Taiwan. All the specimens are deposited at the Fisheries Department of National Taiwan College of Marine Science and Technology (NTCMST).

The measurements were taken as follows. Body length was measured dorsally from the rostral position (no rostrum is present in this species) to the distal margin of the non-calcified portion of the telson when the specimen fully stretched. Carapace length (cl.) was measured from the rostral position to the posterior border of the carapace. Pre- and post-cervical carapace lengths were measured dorsally along the line of rostral position. The measurements of pre-cervical width were taken between the posterior bases of the supra-orbital horns while those of post-cervical width were taken between the anterior extremities of the branchial keels. Total abdominal length was measured dorsally from the posterior border of carapace to the distal margin of the telson with the specimen fully stretched as when measuring total length. Abdominal length was measured as in total abdominal length but excluding the telson.

SYSTEMATIC ACCOUNT

Puerulus angulatus (Bate, 1888)

(Pl. I)

Panulirus angulatus Bate, 1888: 81 (type locality: north of New Guinea).

Puer angulatus—Ortmann, 1891: 37.

Puerulus angulatus—Calman, 1909: 442 (p. p.); Balss, 1925: 203; Holthuis, 1946: 110, 1966: 267 (p. p.); Berry, 1969: 247, 1971: 19; Harada, 1980: 243; Phillips, Cobb and George, 1980: 68; Miyake 1982: 78; Williams 1986: 25; Baba, 1986: 155.

Puerulus gracilis Kubo, 1939: 316.

? *Puerulus carinatus* [*non*] Borradaile, 1910—Ramadan, 1938: 133.

Puerulus carinatus [*non*] Borradaile, 1910—Postel, 1966: 401.

[not] *Panulirus angulatus*—Alcock, 1901: 185 (= *Puerulus sewelli* Ramadan, 1938).

[not] *Puerulus angulatus*—De Man, 1916:36 (= *Puerulus velutinus* Holthuis, 1963).

Material Examined: 1 ♂ cl. 56 mm, 1 ovigerous ♀ cl. 48 mm, 1 ♀ cl. 39 mm, 16 Mar 1985, Su-Aou, I-Lan County.

1 ovigerous ♀ cl. 44 mm, 16 May 1986; 5 ♂♂ cl. 38–48 mm, 2 ovigerous ♀♀ cl. 55 & 60 mm, 16 Apr 1988, Ta-Chi, I-Lan County.

Diagnosis: Body covered with distinct spines and tubercles. Supra-orbital horns, serrulated at dorsal margin, followed by 3 teeth which abruptly decreasing in size and with last tooth extremely small and sometimes represented by 2 minute teeth. Anterior margin of carapace slightly concave. Pre-cervical dorsal carapace with two rows of submedian teeth decreasing in size and converging towards subanterior. Post-orbital spine entirely lacking. Median keel behind cervical groove armed with 3 large gastric teeth and 2 (3 in the largest male) small intestinal teeth. Outer margin of antennal segment IV armed with 4 teeth (5 in the largest male) and that of segment V usually with 3 teeth (posterior one sometimes minute or even missing). Antennal flagella very long, unbroken one (n=4) about 3.5 times of body length. Pereiopod V only chelate in females. Abdominal sternites I and VI always armed with a transverse row of 4 strong and elongated spines (2 more transverse rows of smaller spines also present at that of VI in males and the smallest female). Eggs spherical and about 0.65 mm in diameter, becoming 0.9 mm when having eye spot.

The measurements and proportions of the various parts of the specimens are given in Table 1.

Coloration: Body generally yellow-orange and with ventral surfaces whitish pink. Bases of spinules and tubercles on dorsal carapace, bases of ridges at abdominal median keel, anterior margins of

Table 1

Measurements* of *Puerulus angulatus* (Bate, 1888) from Taiwan (in mm)

	Pre-cervical Carapace Length	Pre-cervical Carapace Width	Post-cervical Carapace Length	Post-cervical Carapace Width	Carapace	Abdomen	Total Abdomen	Body Length	Post-/Pre-Cervical Length	Carapace/ Pre-cervical Width	Carapace/ Post-cervical Width	Abdomen/ Carapace
Su-Aou, I-Lan County, 16 Mar 1985:												
♂	26	20	30	28	56	68	94	150	1.2	2.8	2.0	1.2
Ovig. ♀	21	18	27	26	48	66	91	139	1.3	2.7	1.8	1.4
♀	17	14	22	21	39	51	71	110	1.3	2.8	1.9	1.3
Ta-Chi, I-Lan County, 16 May 1986:												
Ovig. ♀	19	16	25	24	44	60	82	126	1.3	2.8	1.8	1 4
16 Apr 1988:												
♂	21	17	27	25	48	64	89	137	1.3	2.8	1.9	1.3
♂	17	14	21	20	38	50	71	109	1.2	2.7	1.9	1.3
♂	22	17	26	25	48	61	85	132	1.2	2.8	1.9	1.3
♂	18	14	22	21	40	51	73	113	1.2	2.9	1.9	1.3
♂	16	13	22	19	38	50	71	109	1.4	2.9	2.0	1.3
Ovig. ♀	25	21	30	30	55	74	101	156	1.2	2.6	1.8	1.3
Ovig. ♀	27	22	33	32	60	76	107	167	1.2	2.7	1.9	1.3
							n=11	Avg	1.3	2.8	1.9	1.3
								Max	1.4	2.9	2.0	1.4
								Min	1.2	2.6	1.8	1.2

* See Materials and Methods.

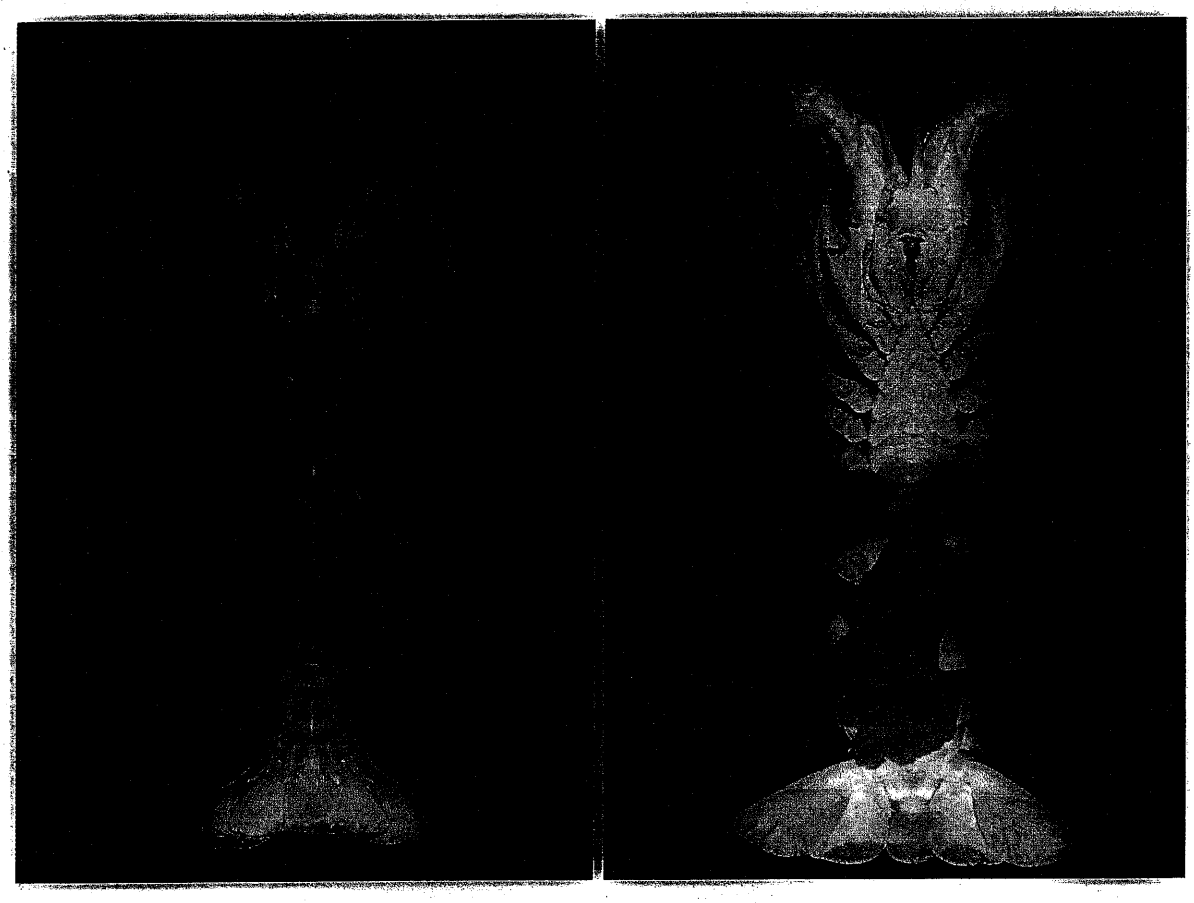

Plate I. *Puerulus angulatus* (Bate, 1888) a. Dorsal view of a 109 mm (body length) male. b. Ventral view of a 156 mm (body length) ovigerous female, showing reddish orange eggs.

abdominal pleura, oblique rows of tubercles and posterior margins of abdominal tergites orange-vermilion. Rostral position, posterior bases and dorsal margins of supra-orbital horns, tips of some strong teeth and spines, hinges at abdominal somites and spurs at abdominal pleura white. Setae of light grey color. Eyes black-brown and with golden reflections. Antennal flagella alternated with white bands. Eggs reddish orange, becoming pink when having eye spot.

Distribution: Indo-West-Pacific: Eastern Africa, Nicobar Islands, New Guinea, Philippines, Taiwan and Japan. Depths 180-536 m.

Remarks: The morphological features, and the proportions of the various parts, of our specimens conform closely with the extensive descriptions given by Kubo (1939), Holthuis (1966), Berry (1969) and Harada (1980). Only in one ovigerous female (NTCMST 1986 5 16-01) there is merely 2 teeth followed the left supra-orbital horn. Although no rostrum is present in this species, the rostral region in some specimens is slightly protruded making the anterior margin of the carapace not so concave. Berry (1969) described the color pattern of his South African specimens as basically dull white with dark red patches. The color pattern of our specimens, however, is basically yellow-orange with orange-vermilion patches (Pl. 1a). Unfortunately, we only have a photocopy of Berry's paper and

can not make a comparison of the color plate provided by him with our fresh specimens. The color descriptions and illustrations of *P. angulatus* from Japan (Harada 1980; Baba 1986) are almost identical with our specimens. As pointed out by Berry (1969), it may be necessary to compare specimens of *P. angulatus* from the different recorded localities in order to determine whether they are all belonged to one form.

The degree of spine development appears to be negatively correlated with size; with small specimens having better developed sharp spines while large specimens with their teeth and spines proportionally smaller or even flattened. In three large specimens, the dorsal margin of the supra-orbital horn is nearly smooth. The degree of development of spines and teeth is also different between the sexes. The spines and teeth on carapace, especially the infra-orbital tooth and gastric teeth, and the lateral spurs at abdominal pleura are better developed in females than in males. For the spiny projections at thoracic and abdominal sternites, they are more elongated in males than in females and with the pair of submedian spines at abdominal sternites II to V missing in ovigerous females (this difference is not so pronounced for the smallest female). In males, a large pointed fleshly protrusion is projected from the genital aperture at the coxa of the pereiopod V.

P. angulatus is uncommon in Taiwan and at present only recorded off the north-eastern coast. This deep-sea spiny lobster is occasionally found in a very small number within the catch of *Metanephrops* lobsters. Local fishermen can readily separate *P. angulatus* from the *Metanephrops* lobsters and selling the former with a higher price under a vernacular name "Dwarf Lobsters" (小龍蝦).

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臺灣海域產游龍蝦屬龍蝦之報告

陳 天 任　游 祥 平

本報告爲首次報導一種產於臺灣北部海域，屬於龍蝦科 (Palinuridae) 游龍蝦屬 (*Puerulus*) 之龍蝦，其學名爲 *Puerulus angulatus* (Bate, 1888)，中文名稱定爲「稜角游龍蝦」。此種游龍蝦偶而在臺灣北部近海蝦拖網漁船漁獲物中與海螯蝦類 (Nephropid lobster) 同時漁獲，產量稀少且爲不常見之深海龍蝦。棲息於 180～350 公尺水深之沙泥底質海域。

本文除討論此游龍蝦之一般外部形態體色及雌雄兩性之形態特徵差異外，並附彩色圖片供爲查定種之依據。