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NOTES ON CRUSTACEA DECAPODA NATANTIA FROM SUBTERRANEAN WATERS IN NEW-ZEALAND

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In view of the recent world-wide enumeration of Natantia inhabiting subterranean waters (HOLTHUIS, 1956), it is considered useful to place on record three additional species which have recently been collected in underground waters — a habitat hitherto unrecorded in New Zealand. Thus, although there are no true troglobic Natantia in New Zealand, our only fresh-water species, *Paratya curvirostris*, occurs in the stream passing through the « Glow-worm Grotto », Waitomo Cave, while two intertidal species, *Alope spinifrons* and *Palaemon affinis*, are found in a coastal sea-cave near the Portobello Marine Biological Station, Dunedin.

Alope spinifrons belongs to the family Hippolytidae, a family which HOLTHUIS has shown to have a single troglobic member, *Barbouria cubensis* (von MARTENS), but which was unrepresented in the « list of Decapoda Natantia found incidentally in subterranean waters » (his Group II). As the species of troglobic Natantia (Group I) are apparently restricted to three families, the Atyidae, the Palaemonidae and the Hippolytidae, it is of interest to find that the species of Group II, with one exception, are similarly restricted to these same three families. The single exception is *Penaeus indicus* H. M.-Edw. (Family Penaeidae) from the East African coast.

Family ATYIDAE

Genus *PARATYA* [Miers, 1882]

Paratya (Paratya) curvirostris (Heller, 1862)

Restricted synonymy :

1903 *Xiphocaris curvirostris* Thomson, *Trans. Linn. Soc. London Zool.*, VIII (11) : 447, pl. XXIX B.
1917 *Paratya curvirostris* Kemp, *Rec. Ind. Mus.* XIII (5) : 301, fig. 4.

Subterranean occurrence :

Taken by dipnet from the Waitomo Stream, « Glow-Worm Grotto », Waitomo Cave, near Te Kuiti, South Auckland, by Dr Aola RICHARDS during February 1955 and again in February 1958. Also observed, but not collected, in June 1955.

The Waitomo Cave, with the nearby Ruakuri and Aranui Caves, all formed in limestone, comprise the famous Waitomo Caves tourist resort and have been described with plans and photographs by MARWICK (1946 : 21 and fig. 2). The same plans are also published with brief notes by HENDERSON and ONGLEY (1923 : 15 and facing p. 16). The Waitomo Stream rises in the hills about five miles from Waitomo Cave and flows for about 450 ft. through part of this cave system. About 100 ft. from its entrance to the cave, the stream, and the passage in which it is flowing, take an acute turn to enter what is referred to as the « Glow-Worm Grotto ». Here the walls and roof of the cave are crowded with the luminous larvae of the small dipterous fly *Arachnocampa luminosa* and, except for the insignificant light of these glow-worms, this part of the cave is in complete darkness. About 200 ft. further on, the passage in which the stream is flowing becomes impassable with siphons and mudbanks. The Waitomo Stream passes out of the cave after about another 150 ft. and later enters the Waipa River, itself a tributary of the Waikato River.

Paratya curvirostris was observed along the sides of the stream throughout the « Glow-Worm Grotto », i. e. from about 100 to 300 ft. from the upstream entrance. It was readily recognised by the reddish reflections from the eyes in artificial light. The stream in the grotto is deep (perhaps 40 ft.) and swift, and the temperature of the water in February was 15° C, about 0.25° C less than the air temperature in the cave. There is nothing to prevent the shrimps passing freely in and out, or even through, the cave. The presence of trout, eels, and a small native fish, *Gobiomorphus* sp., probably *G. stokelli* (1), in the grotto, indicates that there are no ecological or physiological barriers preventing normal New Zealand fresh-water animals from living for

(1) Identified by Mr. J.-M. MORELAND, ichthyologist, Dominion Museum, Wellington.

periods in the cave. In times of flood sheep carcases and other debris are washed into the cave and this is suggested as the most likely method whereby *P. curvirostris* enters the grotto.

Specimens of the northern New Zealand fresh-water crayfish, *Paranephrops planifrons* White (Parastacidae), were also collected by Dr RICHARDS in the Waitomo Cave. These were found in the pools of a trickle of water which, flowing down the passage connecting the main part of the cave with the « Glow-Worm Grotto », joins the Waitomo Stream alongside the grotto boat-jetty. The eyes in the preserved specimens of both *Paratya curvirostris* and *P. planifrons* are quite typical and show no sign of degeneration.

Distribution :

Paratya curvirostris is the only fresh-water natant in New Zealand and the Chatham Islands, where it is abundant in lowland streams throughout the country. It has also been recorded from Assam and Manipur Hills, India, by Kemp.

Family HIPPOLYTIDAE

Genus *ALOPE* [White, 1847]

Alope spinifrons (H. Milne-Edwards, 1837)

Restricted synonymy :

1903 *Alope palpalis* Thomson, *Trans. Linn. Soc. London Zool.* VIII (11): 440 pl. XXVIII B.
1914 *Alope palpalis* Kemp, *Rec. Ind. Mus.* X (2) : 89, pl. I, fig. 1, 2.
1947 *Alope spinifrons* Holthuis, *Siboga Exped.* XXXIX *a*8 : 7, 34.

Subterranean occurrence :

Taken in an intertidal sea-cave, near the Portobello Marine Biological Station, Portobello Peninsula, Otago Harbour, by Dr Elizabeth BATHAM on several occasions between 1951 and 1958 (see, Lebour, 1955); and by the author on the 21 st November 1952 and again in January 1957.

This cave is located at position 12 on the map of the Portobello Region, Otago Harbour, given in RALPH and YALDWYN (1956 : 59). It is open at both ends to the sea, but although only about 150 ft. in length, the central portion is in almost complete darkness due to changes in passage direction at both ends of the cave. At low tide, when there is only a few inches of water on the floor of the central part, large numbers of *A. spinifrons* of all sizes occur there, though they are not found near the better-lit ends of the cave. They are commonly found, above the water level, on the wet, vertical rockwalls of the cave (cf. occurrence out of water of *Macrobrachium cavernicola* referred to by

HOLTHUIS, 1956 : 61), but some occur on the sandy bottom, in the water, associated with *Palaemon affinis* (see below). When disturbed those on the walls drop into the water and swim further into the cave. In January 1957, the central portion of the cave also contained, in addition to many specimens of *Palaemon affinis*, a single *Jasus lalandei* (Palinuridae) and a few spider crabs (Majiidae, probably *Paramithrax* sp.).

A. spinifrons, in my experience, is characteristically a cryptozoic species, being found usually under rocks or overhanging ledges on open rocky coasts. In the laboratory *A. spinifrons* is negatively phototropic and when placed in a tank will orientate with the head away from the light if no shelter is available. Its normal method of progression is by walking forwards on the 3rd to 5th pereiopods and it can be induced to swim only with the greatest difficulty. The cave specimens were normally coloured, with bright, irregularly undulating, longitudinal green and red bands and similar in all respects to ordinary specimens, though some taken from the cave are the largest I know of in any collection. The presence of these prawns was first reported to me by Dr BATHAM, Director of the Marine Station, and neither she nor I are aware of any other records of this species from the Otago Harbour area (1), though it has been reported, as *A. palpalis*, from the coasts outside the harbour (THOMSON, 1913 : 240; THOMSON and ANDERTON, 1921 : 107; Dr BATHAM, personal communication, 10 dec. 1957 [2]). The incidental references to this species in Batham and McArthur (1956 : 9) and in RALPH and YALDWYN (1956 : 64) are based on its occurrence in this particular cave.

Distribution :

Alope spinifrons is a littoral species restricted to New Zealand and the Chatham Islands.

Family PALAEMONIDAE

Genus *PALAEMON* [Weber, 1795]

Palaemon (Palaemon) affinis (H. Milne-Edwards, 1837)

Restricted synonymy :

1950 *Palaemon (Palaemon) affinis* Holthuis, *Siboga Exped.* XXXIX *a*9 : 76, fig. 16.

1954 *Palaemon affinis* Yaldwyn, *Trans. Roy. Soc. N.Z.* 82 (1) : 169, 2 text-fig.

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(1) Dr. Batham informs me (personal communication, 10 déc. 1957) that she may have once seen an *Alope* at night under the small wharf at the Marine Station.

(2) « We also met several at dusk one evening among large boulders at Wickliffe Bay, on the outer coast, lower intertidal, 20 sept. 1953. »

Subterranean occurrence :

Taken with the above in the intertidal seacave, near Portobello Marine Biological Station, Otago Harbour.

P. affinis was found throughout this cave and was as common in the completely dark central portion as it was at either entrance. Specimens from the central portion had the same colour pattern of longitudinal rows of green, red and black chromatophores on a transparent background, and the same characteristic spot of bright orange and black laterally on the 6th abdominal segment, as that described for normal specimens (YALDWYN, 1954). *P. affinis* is found commonly throughout the Otago Harbour area, and at high tide can swim freely in and out of the cave.

Distribution :

P. affinis is restricted to New Zealand and the Chatham Islands and is the commonest littoral prawn throughout this area.

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