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BIOGEOGRAPHICAL NOTES ON THE NORTHWARD EXTENSION OF THE KNOWN LATITUDINAL RANGE FOR THE TROPICAL STICHOPODID SEA-CUCUMBER, *THELENOTA ANAX* H. L. CLARK (ECHINODERMATA: HOLOTHUROIDEA)

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ABSTRACT. - The very large tropical stichopodid sea-cucumber, *Thelenota anax*, is reported for the first time in Japanese waters at the Kerama Islands near Okinawa in the Ryukyus Archipelago at a latitude of 26° N.

INTRODUCTION

Three species of sea-cucumber are recognized in the stichopodid genus *Thelenota*: all are large, conspicuous and non cryptic, at least as adults, and they inhabit shallow, oceanic reef biotopes in the tropical Indo-west Pacific, usually on coarse coral sand or sandy rubble. *Thelenota ananas* (Jaeger) has the widest distribution and is found on reefs throughout the Indo-west Pacific. *Thelenota rubralineata* Massin & Lane, recently described and observed in the Indo-Malayan Archipelago (Massin & Lane, 1991), is apparently rare with a restricted distribution, although both authors of the above cited paper have recently received verbal reports of this unmistakable species occuring in the central Philippines and near the Loyalty Islands.

Thelenota anax H. L. Clark ranges widely in longitude from the Iles Glorieuses near Madagascar in the western Indian Ocean (Cherbonnier, 1979, 1988) to the Society Islands in the central Pacific (Lamberson, 1978). The literature reports its latitudinal range extending as far as 22° S at New Caledonia in the southern hemisphere (Cherbonnier & Féral, 1984) to 17° N of the equator at the Paracel Islands (Liao, 1975). This communication reports the discovery of specimens of *Thelenota anax* in Japanese waters in the central part of the Ryukyus Archipelago at a latitude of 26° N.

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OBSERVATIONS

Thelenota Brandt, 1835

Thelenota anax H. L. Clark, 1921

Two holothurians, recognised as *Thelenota anax* H. L. Clark, were found during April 1991 on sand at 10 m near the NE side of Aka Jima in the Kerama Islands (26°11' N, 127° 15' E), part of the Okinawa group in the Ryukyus Archipelago. Both specimens were photographed in situ: one was collected and is deposited in the Zoological Reference Collection (ZRC) at the National University of Singapore under catalogue no. ZRC 1992.4996. Colour slides are stored in the archives of the author under numbers ECH.028.22-24 and ECH.029.1-11.

Description .- Both sea-cucumbers were large. Collected individual 75 cm length and 10-12 cm width in living, uncontracted state. Body trapezoid in transverse section with pronounced, mid-lateral, longitudinal constriction demarcating distinct ventro-lateral zone from more rounded dorsum. Ventro-lateral part of body increases in width ventrally to form broad base of trapezoid sectional profile. Ventro-lateral boundary of flattened sole or bivium bears continuous row of multipapillate protuberances which appear to enhance traction during the caterpillar-like mode of locomotion. Mouth directed ventrally, anus dorsally. Podia cover entire sole but are more crowded in a median longitudinal band 4-5 cm wide. Numerous small, yellow-tipped papillae cover body dorsally and laterally. Fleshy protruberances distributed irregularly on dorsal and dorso-lateral aspects. Overall body colour creamy white, profusely speckled with minute greenish yellow spots and red spots. Mixed aggregations of these spots, occuring mainly on the protruberances, and occasional larger dorsal or dorso-lateral aggregations give appearance of brownish patches when seen from a distance. ZRC specimen has discontinuous, irregular red line along mid-lateral longitudinal constriction. Photographs of the other specimen show, in addition, a short broken red line located anteriorly along the mid-dorsal line.

Ossicles from the dorsal body wall include abundant oval or nearly spherical miliary granules and slender, dichotomously branched rods, some of which are spiny (Fig. 1).

The above information and details of specimens recorded by Clark (1921) and Lamberson (1978) indicate that the Okinawa specimens are *Thelenota anax* H. L. Clark,1921. Tentacular ossicles (anastomosing plaques, nodulose rods, x-shaped bodies) are similar to those in specimens from New Caledonia (Cherbonnier & Féral, 1984), Xisha (Paracel) Islands (Liao, 1975) and near Madagascar (Cherbonnier, 1979, 1988). The ossicles generally show little variation over the geographical range but large plaques, of the type illustrated by Cherbonnier (1979: Fig. 5M; 1988: Fig. 64E) for the anal tegument, were not noted in the Okinawa material.

BIOGEOGRAPHICAL NOTES

The discovery of *Thelenota anax* in the central region of the Ryukyus Archipelago extends the known northern limit for this species from 17° N to 26° N of the equator. Many components of the tropical reef fauna of southern Japan undoubtedly owe their existence at 'high' latitudes to the Kuroshio Current which flows generally northward along the Ryukyus island arc chain,

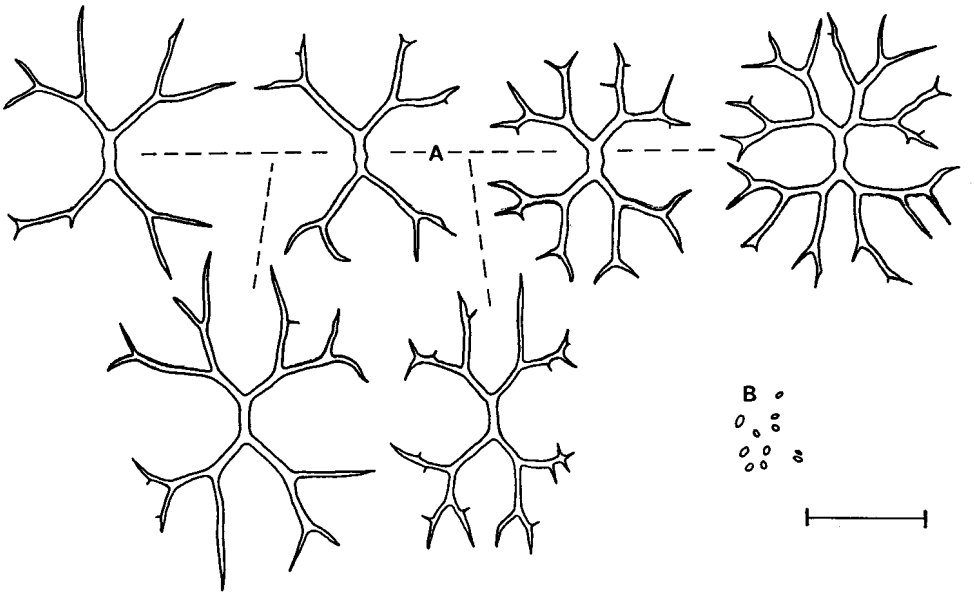

Fig. 1. *Thelenota anax* (specimen from Kerama islands - catalogue no. ZRC 1992.4996). Dichotomously branched rods (A) and miliary granules from the dorsal body wall. Scale bar = 50 μm.

bringing warmer water and larval recruits from further south. For example, it has long been recognised that several tropical echinoderm species show a general northward extension of their range in Japanese waters (Utinomi, 1962).

Populations at the limits of their range may not persist. Hermatypic corals, for example, exhibit high diversity in southern Japan as a whole (Veron, 1992) but the diminishing influence of the Kuroshio further north probably accounts for the reported dramatic northward decline in coral species (Veron, 1992) and may be a factor contributing to the rare or geographically restricted (and therefore vulnerable) status reported for about one third of the species inventory (Veron, 1992). The transitory nature of regional populations has been noted in particular for the coral predator, *Acanthaster planci*. Populations of this sea-star are persistent at the Amami Island group in the northern Ryukyus but show variability of outbreaks and persistency further north which may be related to a temperature gradient and/or fluctuations in the path of the Kuroshio influencing larval transport (Yamaguchi, 1987).

It is possible that *Thelenota anax* is similarly experiencing a transitory Kuroshio mediated recruitment phase in the central Ryukyus. However, given the large size of the specimens found and the slow growth rates reported by Connand (1988) for the related species, *Thelenota ananas*, such a recruitment phase may have occurred more than a decade previously.

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LITERATURE CITED

Cherbonnier, G., 1979. Description d'*Actinopyga flammea* nov. sp., et données nouvelles sur deux espèces connues d'Holothuries Aspidochirotes (Echinodermes). *Bull. Mus. natn. Hist. nat., Paris*, (4)**1**(A1): 3-12.

Cherbonnier, G., 1988. *Faune de Madagascar*. Echinodermes: Holothurides. Editions de l'ORSTOM no. 70, Paris.

Cherbonnier, G., & J.-P. Féral, 1984. Les holothuries de Nouvelle-Calédonie. Deuxième contribution. 2ème partie (Stichopodidae, Cucumariidae, Phyllophoridae et Synaptidae). *Bull. Mus. natn. Hist. nat., Paris*, (4)**6**(A3): 827-851.

Clark, H.L., 1921. The echinoderm fauna of Torres Strait. Publs. *Carnegie Instn. (Marine Biol.)* **10**: viii +223 pp., 38 pls.

Connand, C., 1988. Comparison between estimations of growth and mortality of two Stichopodid holothurians: *Thelenota ananas* and *Stichopus chloronotus* (Echinodermata : Holothuroidea). *Proceedings of the 6th International Coral Reef Symposium*, **2**: 661-665.

Lamberson, J.O., 1978. Notes on the morphology, ecology and distribution of *Thelenota anax* H.L. Clark (Holothuroidea; Stichopodidae). *Micronesica*, **14**: 115-122.

Liao, Y., 1975. Echinoderms of Xisha Islands. I. Holothuroidea, Guangdong Province, China. *Studia Marina Sinica*, **10**: 199-230.

Massin, C. & D.J.W. Lane, 1991. Description of a new species of sea cucumber (Stichopodidae, Holothuroidea, Echinodermata) from the Eastern Indo-Malayan Archipelago: *Thelenota rubralineata* n. sp. *Micronesica*, **24**(1): 57-64.

Utinomi, H., 1962. Recent evidence for the northward extension of the range of some tropical echinoderms in Japanese waters. *Zool. Mag. (Tokyo)*, **71**: 102-108 (in Japanese).

Veron, J.E.N., 1992. Conservation of biodiversity: a critical time for the hermatypic corals of Japan. *Coral Reefs*, **11**: 13-21.

Yamaguchi, M., 1987. Occurrences and persistency of *Acanthaster planci* pseudo-population in relation to oceanographic conditions along the Pacific coast of Japan. *Galaxea*, **6**: 277-288.