

# Distribution and abundance of *Thelenota rubralineata* in the western Pacific: Some conservation issues

by David J.W. Lane<sup>1</sup>

## Introduction

*Thelenota rubralineata* Massin & Lane 1991 (Fig. 1), is a spectacular recent addition to the known tropical echinofauna of the archipelagic western Pacific and was first described from specimens taken in the late 1980s from reefs off northern Papua New Guinea (PNG) and Flores in Indonesia. However it had certainly been observed in Papua New Guinea waters prior to that, albeit rarely, in the early 1980s (Horseshoe reef, off Motopore Is. near Port Moresby, 1980: Marsh, pers. comm.; near Madang, 1981: Conand, pers. comm.) and had been photographed underwater even earlier (Halstead, 1977).

*T. rubralineata* is stated to be not uncommon at some Papua New Guinea locations (Halstead pers. comm.) and at New Britain (Massin, pers. comm.) but, more usually, sightings are of single individuals. At Laing island (PNG), near the type locality, the species has been reported only once during 1,200 dives (Claereboudt, pers. comm., in Massin & Lane, 1991). The virtual absence of this species from the beche-de-mer trade, both currently and historically, may in itself attest to low population numbers and densities, at least at depths normally harvested by fishermen in the western Pacific.

## Geographic distribution—update

Other and more recent collections and sightings have extended the known geographic range for *T. rubralineata* (see Figure 2 on next page). It has been collected at Guam, Micronesia, in 1992 (single specimen at about 60 m: Kerr pers. comm. & article in *Pacific Daily News*, 4 August 1992); at the Banda Islands (single specimen in Smithsonian museum, collected at 6–18 m by Hendler—Pawson, pers. comm.) and observed near the Loyalty Islands, New Caledonia (Conand, pers. comm.); in the Philippines at Bohol (Lobban, pers.

comm.) and Mindoro (Watkins, pers. comm.); at Gizo Island, Solomon Islands (Gosliner et al., 1996; photo Watkins); and in Indonesia, at Manado (Lane, in press) and Komodo Island (Watkins, pers. comm.). In the South China Sea it has been recorded in 1994 at Taiping Island (single specimen at 40 m); in the Spratly (Nansha) Islands (Jeng, 1998); and at Layang Layang (single 43 cm individual at 23 m) off the west coast of Sabah in May 1998 (unpublished observation of the author). The author has also received uncorroborated reports of its presence in Fiji and Palau. Figure 2 maps the known distribution for *Thelenota rubralineata*, together with the latitudinal and longitudinal limits for the two congeners, *T. ananas* and *T. anax*, in the Indo-Pacific. There are no reports of *T. rubralineata* in the Indian Ocean.

## Population at north Sulawesi

At the site near Manado (Bunaken-Manado Tua National Marine Reserve) in Sulawesi, a small population of *T. rubralineata* was located in 1977 and documented (Lane, in press). This sea cucumber was locally abundant at a Bunaken island site. A reef-face survey plot of area 3750 m<sup>2</sup> (depth range 14–30 m), characterised by alternating slopes and coral rock spurs, harboured 17 individuals, an

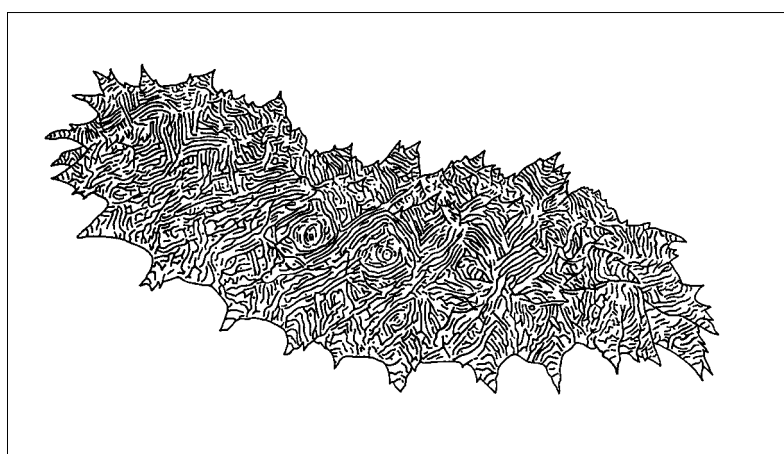
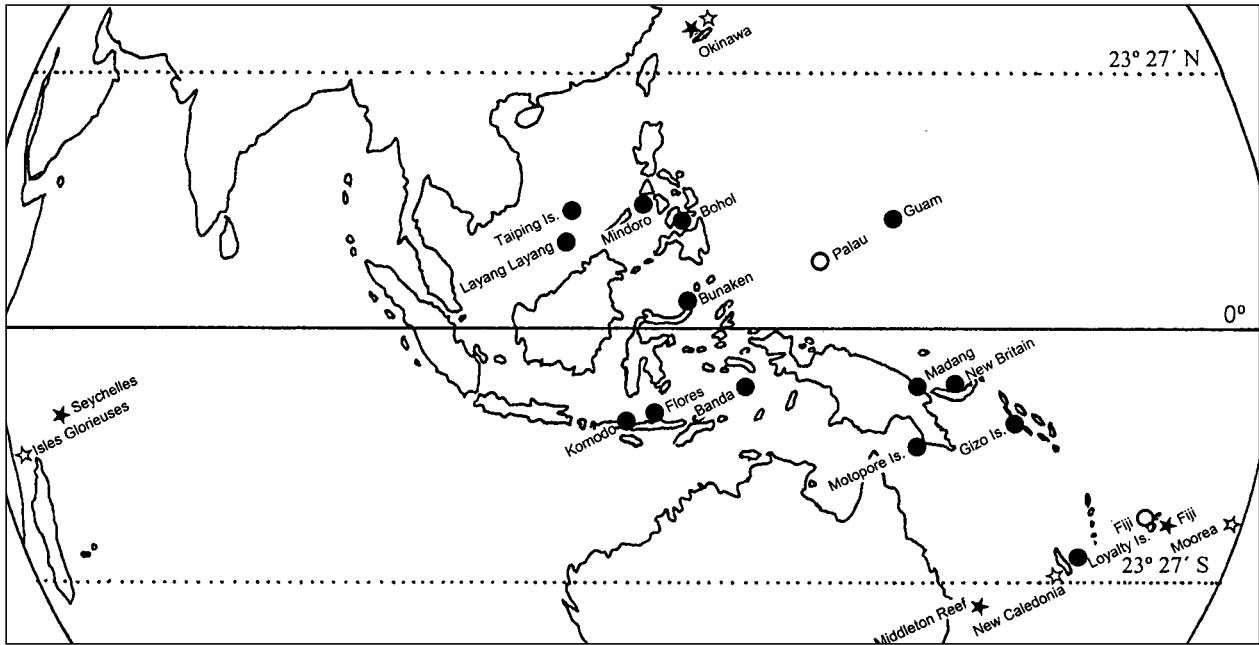


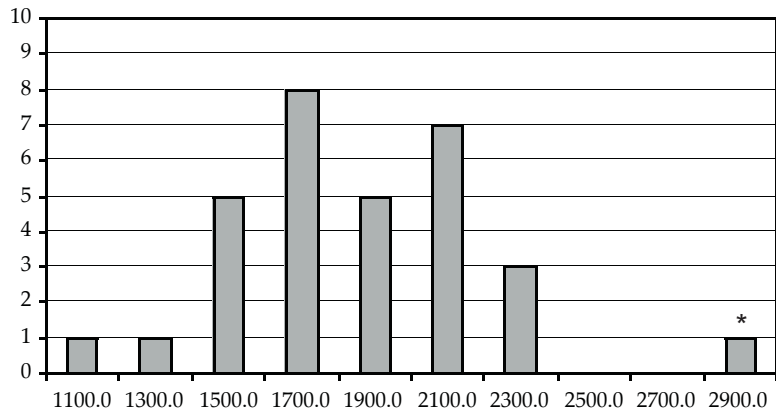
Figure 1: *Thelenota rubralineata* (from photograph taken at P. Bunaken)

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**Figure 2:** Known distribution of *Thelenota rubralineata*. Solid circles (●) represent published or otherwise reliable reports; open circles (○) represent uncorroborated reports. The latitudinal and longitudinal distribution limits of *Thelenota ananas* (☆) and *Thelenota anax* (★) are also indicated.

average density of 1 per 220 m<sup>2</sup> at this locality. A frequency histogram (Fig. 3) showing weight-class data for 31 individuals (collected then returned) suggests that all animals are at or near maturity. Juveniles were not recorded, the smallest individual found being 35 cm long and weighing in at 1150 g wet weight. There is a suggestion of a bimodal size distribution which, if real, might indicate repeated recruitment episodes, but the data are too limited to be certain.



**Figure 3:** *Thelenota rubralineata* size (wt.) frequency at Bunaken 3–5.9.97. One larger individual (\*) recorded on 21.5.97

Of interest is the recent appearance of *T. rubralineata* at the Bunaken marine reserve. This large and spectacular species has apparently not been sighted by local dive guides prior to 1997 despite the fact that the Bunaken area has been a major international SCUBA diving location for more than 20 years.

Other large stichopodid and holothurid sea cucumbers, including high-value commercial species such as *Thelenota ananas*, *Holothuria nobili* and *H. fuscogilva* are rare in the Bunaken area (unpublished observations of author), apparently due to intensive harvesting in earlier decades (Herlambang, pers. comm.). It is possible that *T. rubralineata* recruits are exploiting an unoccupied niche at this locality in Sulawesi.

The species may be increasing in numbers and/or geographic range in the western Pacific or, alternatively, individuals, in the Bunaken area at least, may be migrating vertically from adjacent deeper waters. The latter possibility at this northern Sulawesi location is suggested by the 'sudden' appearance of mature populations on shallow reef slopes (juveniles were seemingly absent) and supported by observations of the relatively rapid ambulatory behaviour of this species; moving individuals exhibited pronounced caterpillar-like undulations of the body. One animal, possibly due to handling stress, performed vigorous swimming flexures. An indication that coiling behaviour (Massin & Lane, 1991) may play a part in migration, at least horizontally, comes from an observa-

tion by B. Watkins (pers. comm.) of a tightly coiled individual rolling along the sea bed in a current near Komodo Island.

### Conservation issues

*Thelenota rubralineata* is a spectacular animal and perhaps one of the most beautiful macro-invertebrates in the tropical Pacific. If population numbers are increasing in the western Pacific, it could become targeted and ultimately overexploited by the beche-de-mer industry, as has happened for several high-value sea-cucumber species throughout the Indo-Pacific. Not one commercially traded echinoderm species, threatened sea cucumbers included, is currently listed under the CITES convention and only one echinoderm, an echinoid (*Echinus esculentus*), is on the IUCN Red List. There may be a good case for Appendix III listing of threatened beche-de-mer species (such as *Holothuria nobilis* and *H. fuscogilva*) and, perhaps, pre-emptive listing for *Thelenota rubralineata* in view of its rarity and vulnerability. At country level, *T. rubralineata* is deserving of at least localised protection, as at Bunaken, on the basis that its ecotourism value to the recreational diving industry, particularly as an attraction for underwater photographers, probably exceeds its value dried at market.

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## Recent developments in the commercialisation of the northern sea cucumber *Cucumaria frondosa*

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After 12 years spent as the subject of scientific research, market surveys, technological transfer and public-awareness campaigns, the sea cucumber, *Cucumaria frondosa*, distributed along the coasts of Quebec, eastern Canada, will officially begin a commercial career in Spring 1999.

Tonnes of *Cucumaria frondosa* are accidentally dredged daily by dozens of fisherman during the scallop harvest season along the St Lawrence Gulf and Estuary. At present, the sea cucumbers are returned to the sea, where a high proportion of them finds only death. Aside from a serious ecological disturbance, this situation represents a considerable economic loss for the fisheries industry, which is always searching for new ways to strengthen its activities in eastern Canada. Considering the decreasing availability of other sea products, this promising resource could give a new

life to dwindling seafood factories and unemployed fishermen.

Despite the great abundance of *Cucumaria frondosa* along the coasts of Quebec, the people involved in the commercialisation of the species are very keen to avoid a second Galapagos crisis. The extensive knowledge gathered on the general ecology, reproductive biology, spatial distribution and migration behaviour of *C. frondosa* in the past decade should be very helpful in developing an exemplary fisheries programme.

Considering the very slow growth rate of this species, which can take 10 years to reach the commercial size, great care must be taken to protect the resource and avoid rapid stock depletion. Luckily, many conditions favour a sustainable harvest in the St Lawrence Gulf and Estuary. Sea cucumbers are

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