

Redescription of *Stichopus naso* SEMPER, 1868 (Echinodermata, Holothuroidea, Stichopodidae)

by Claude MASSIN

Abstract

Specimens from Japan, Thailand, Papua New Guinea and Madagascar have allowed a complete redescription of *Stichopus naso* SEMPER, 1868. The species, with a wide Indo-Pacific distribution, is new to the fauna of Papua New Guinea and Madagascar. Similar to several other shallow-water holothurians it has the potential to reproduce by transversal fission. When disturbed, the body undulates in a typical fashion and it is capable of limited swimming movements.

Key words: *Stichopus naso*, distribution, Indo-Pacific, transversal fission, escape movement.

Résumé

Stichopus naso SEMPER, 1868 est redécrit en détail sur base de matériel provenant du Japon, de Thaïlande, de Papouasie Nouvelle-Guinée et de Madagascar. L'espèce qui a une large distribution Indo-Pacifique, est nouvelle pour la faune de Papouasie Nouvelle-Guinée et de Madagascar. *S. naso* a la possibilité de se reproduire par scission transversale comme d'autres holothuries littorales. Lorsqu'il est dérangé, il présente un mouvement natatoire par ondulation du corps.

Mots clés: *Stichopus naso*, distribution, Indo-Pacific, scission transversale, mouvement de retraite.

INTRODUCTION

Although *Stichopus naso* SEMPER, 1868 (non *S. naso* HAACKE, 1880 = *S. herrmanni* SEMPER, 1868) has always been considered a valid species and its

synonymy substantially determined (ROWE & GATES, 1995), its complete ossicle assemblage has never been fully described. SEMPER, (1868), MITSUKURI, (1912), and REYES-LÉONARDO (1984) only illustrated the body wall ossicles, excluding those from the papillae, tube-feet and tentacles.

Originally, *Stichopus naso* was considered an endemic of the Philippines (SEMPER, 1868; CLARK A.M. & ROWE, 1971; REYES-LÉONARDO, 1984). Its distribution has recently been extended to Australia (MARSH *et al.*, 1993; ROWE & GATES 1995), South East Asia and the China Sea (LANE *et al.*, 2000; PUTCHAKARN & SONCHAENG, 2000) and Sri Lanka (KUMARA *et al.*, 2005).

New voucher specimens from Japan, Thailand, Madagascar and Papua New Guinea have allowed a full redescription of the species and the establishment of its distribution map.

TAXONOMY

Order Aspidochirotida GRUBE, 1840
Family Stichopodidae HAECKEL, 1886
Genus *Stichopus* BRANDT, 1835
Stichopus naso SEMPER, 1868

Stichopus naso Semper, 1868 : 72, pls 18, 30, fig. 3a-c (non *Stichopus naso* HAACKE, 1880); LUDWIG, 1883 : 164 ; LAMPERT, 1885 : 107 ; THÉEL, 1886 : 192 ; LUDWIG, 1889-92 : 331 ; CLARK, 1922 : 68 ; CLARK, A.M. & ROWE, 1971 : 178 ; DANIEL & HALDER, 1974 : 423 REYES-LÉONARDO, 1984 : 151, pl. 10, fig. 2a-h ; REYES-LÉONARDO & COWAN, 1984 : 43 (colour plate) ; MARSH *et al.*, 1993 : 64; ROWE & GATES, 1995 : 325 ; LANE *et al.*, 2000 : 489 ; SAMYN, 2003 : 88 ; PUTCHAKARN & SONCHAENG, 2004 : 426 ; KUMARA *et*

al., 2005 : 25

Stichopus flaccus LIAO, 1980 : 118, fig. 6a-h ; LIAO, 1984 : 240, fig. 20(1-11) ; LIAO & CLARK, A.M. 1995 : 466, fig. 279a-b ; LIAO, 1997 : 152, fig. 88a-b ; LANE *et al.*, 2000 : 489.

Stichopus levis SLUITER, 1888: 198, pl. 1(6); CLARK, H.L. 1922: 50.

Stichopus laevis; LUDWIG, 1889-92: 331; CLARK H.L., 1922: 50.

Stichopus ohshimae MITSUKURI, 1912 : 171, fig. 30a-f ; CLARK, H.L. 1922 : 50; YAMANOUCHI, 1955 : 194 ; VERBIST, 1993 : 117 ; ? KOHTSUKA, 2006: 203 (2 colour plates).

Stichopus variegatus pallidus CLARK, H.L. 1938: 514.

Stichopus horrens; KOHTSUKA *et al.*, 2005: 23 (non *Stichopus horrens* SELENKA, 1867).

TYPE LOCALITY

Philippines (Bohol).

TYPE MATERIAL

Two according to SEMPER (1868); their whereabouts unknown according to ROWE & GATES (1995).

MATERIAL EXAMINED

- Two specimens (IRSNB IG 28679/30) from Madagascar (Tuléar, middle of the Grand Récif, internal slope, Station 20) collected by I. EECKHAUT, at low tide at 2-3 m depth on a sandy muddy bottom, November 1998.

- Two specimens (IRSNB IG 29142/42) from Madagascar (Tuléar, Belaza) collected by C. MASSIN in a sea-grass bed close to a mangrove at low tide, March 2000.

- Three specimens from Madagascar (Tulear, Belaza: 23°30'S- 43°45'E) collected by R. RASOLOFORINA in a sea-grass bed at low tide, March 2006.

- One specimen from Japan (Awaze, Okinawa Prefecture) collected by SHOGO ARAI at 10 m depth on a soft mud with fine sand, December 2004.

- Two specimens (IRSNB IG 27754/177 and IG 27754/178) from Papua New Guinea (Hansa Bay, Madang Province), collected by C. MASSIN at 7 m depth on

a muddy bottom with sparse sea-grass bed, October 1990.

- Microscopic preparations from four specimens (labelled I 1206, I 1207, I 1208 and I 1209) from Thailand (Gulf of Thailand, Kho Lan Islands) collected by S. PUTCHAKARN, May 2001.

DESCRIPTION

Small to medium holothuroid (10-20 cm long). Body quadrangular in cross section; trivium with well defined sole. Tube feet of trivium densely crowded in 4-6 rows along each of the ambulacra (fig. 1C); two narrow interambulacral zones devoid of tube-feet (fig. 1C). Mouth ventral, surrounded by 18 tentacles; anus terminal without anal papillae. Bivium with four more or less distinct rows of very large papillae (figs. 1A, B). Along the ventral lateral edges, between the bivium and trivium, a row of prominent papillae occurs (figs. 1A-C).

Dorsal body wall yellowish beige, mottled with brown, or uniform yellow brown (figs 1A, B) ; ventral body wall light beige with a brown line along central ambulacrum (fig.1C). Tip of podia and dorsal papillae deep brown; specimens from Madagascar with dorsally brown lines perpendicular to each other. Small specimens with grey patches or nearly uniform grey (fig. 1B). Body wall thick (3-5 mm). Polian vesicles 2-4, large (1/10 to 1/20 of body length), one contorted stone canal embedded in dorsal mesentery, ending in spherical madreporic plate (fig. 4A) located at the level of the calcareous ring. Tentacle ampullae very short (1/50 of body length). Calcareous ring well developed, stichopodid like, i.e. dorsal radial pieces with two posterior process and interradial pieces narrow, (1/2 of radial length) each with a prominent anterior tooth (fig. 2B). Longitudinal muscles well developed, wide, bifid, attached. Gonads absent in all specimens studied.

Ossicles of body wall comprise tables, rosettes and C-shape rods. Tables nearly all of similar size (disc 25 µm across, pillars 30 µm high); disc of table perforated by 4 central holes and 4-8 peripheral holes (fig.2C); disc of table smooth to spiny. Rosettes present, (fig. 2D) more numerous ventrally than dorsally. C-shape rods numerous, 90-180 µm long dorsally and gathered in heaps (fig. 2E); ventrally, C-shape rods 60-110 µm long. Tube feet with two types of tables: small ones similar to those of body wall (fig. 2F) and some larger ones with up to 20 peripheral holes (fig. 2G). Rods narrow, spiny, 200-400 µm long (fig. 2J) sometimes with forked extremities (fig. 4K). Rosettes numerous and irregular (fig. 2L). Close to end plate large perforated plates



Fig. 1. *Stichopus naso* SEMPER, 1868. A: Madagascar, Tuléar, Belaza; low tide, on sandy-muddy bottom with sea-grass beds (photo R. RASOLOFONIRINA); B: Papua New Guinea, Madang Province, Hansa Bay, 7 m depth on sparse sea-grass beds (photo C. MASSIN); C: Madagascar, Tuléar, Belaza, dorsal and ventral view (photo C. MASSIN).

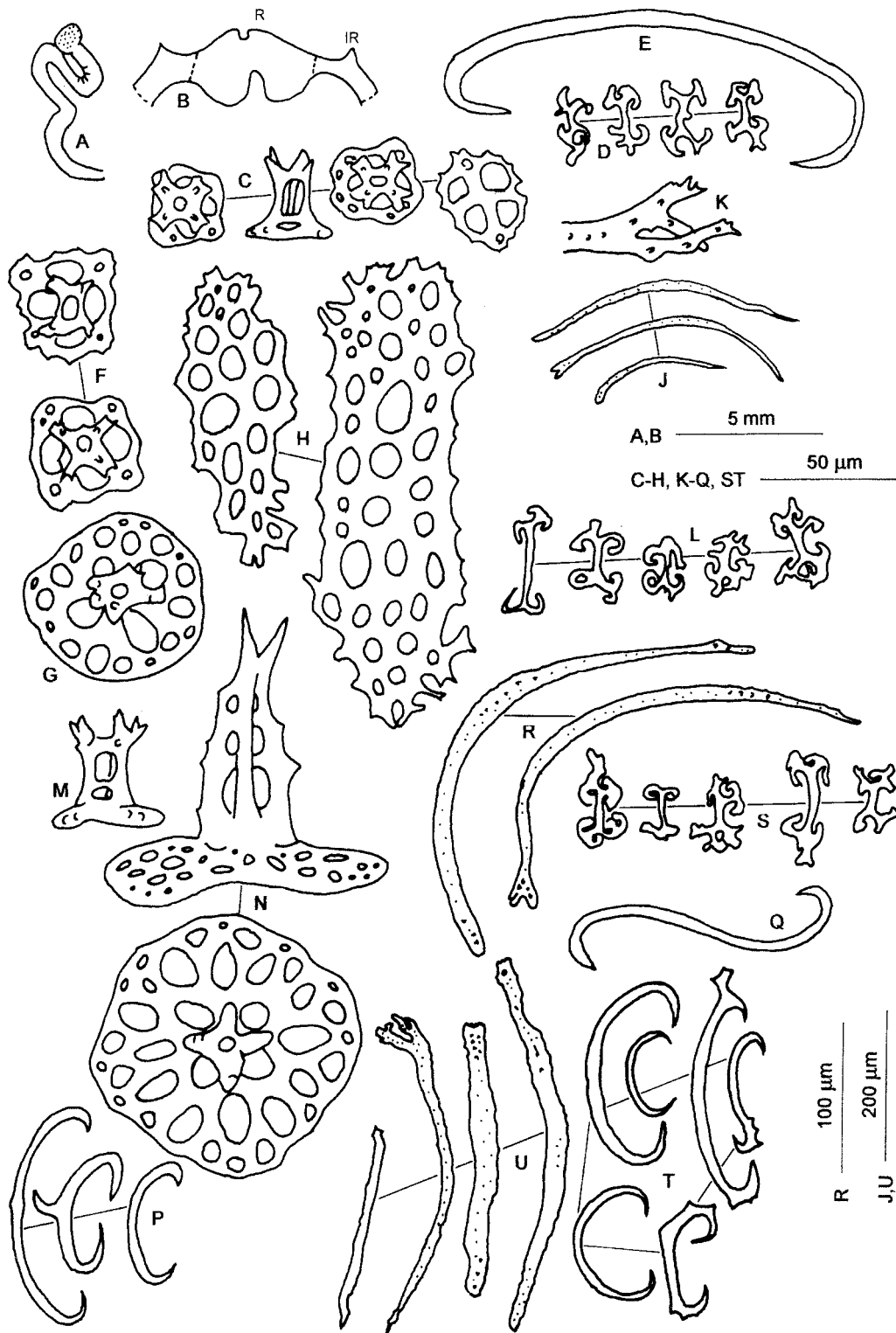


Fig. 2. *Stichopus naso* SEMPER, 1868, specimen from Papua New Guinea. A: stone canal; B.: calcareous ring (r: radial piece; ir: interradial piece); C: tables from dorsal body wall; D: rosettes from ventral body wall; E: C-shape rod from dorsal body wall; F: small table from tube feet; G: large table from tube feet; H: perforated plates from tube feet; J: rods from tube feet; K: forked extremity of a tube feet rod; L: rosettes from tube feet; M: small table from dorsal papillae; N: large tables from dorsal papillae; P: C-shape rods from dorsal papillae; Q: spiny rods from dorsal papillae; R: S-shape rod from dorsal papillae; S: rosettes from dorsal papillae; T: C-shape rods from tentacles; U: spiny rods from tentacles.

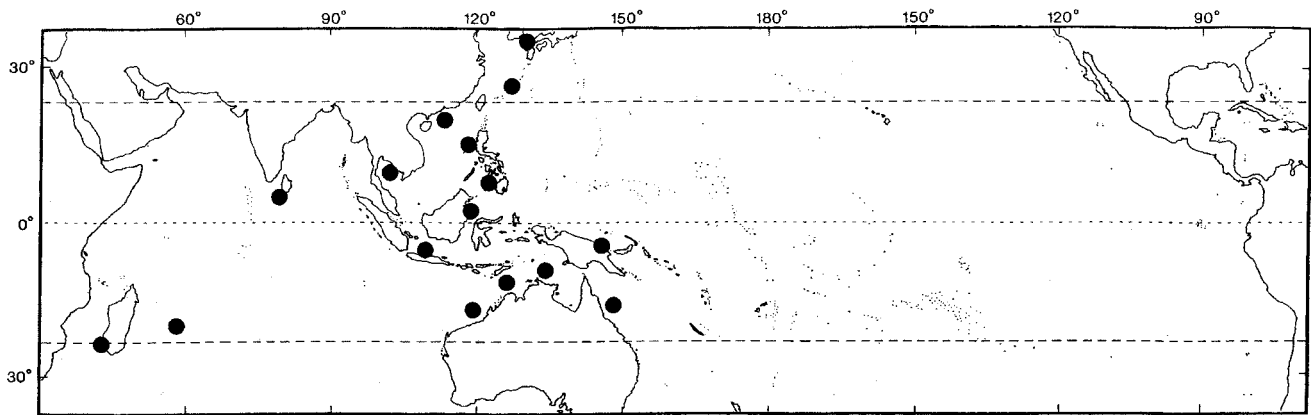


Fig. 3. *Stichopus naso* SEMPER, 1868. Distribution map.

present, 100-160 μm long with spiny edge (fig. 2H). End plate of the tube feet 300-600 μm across, made of several pieces. Dorsal papillae with tables, rosettes, large spiny rods and C- and S-shape rods. Two kinds of tables are present: small tables (disc 25-40 μm across) (fig. 2M) very similar to those of body wall and large tables (disc 80-120 μm across) with numerous peripheral holes (fig. 2N); last type tack like, with 4 spiny pillars ending into 2-4 spines; pillars united by 2-4 transversal beams (fig. 2N). Spiny rods similar to those of tube feet: narrow, up to 400 μm long, some with forked extremities (fig. 2R); C-shape rods 40-130 μm long (fig. 2P); S-shape rods rare (fig. 2Q). Rosettes numerous (fig. 2S). Tentacles with large spiny rods, 150-620 μm long, sometimes with forked extremities (fig. 2U), located in the shafts, and small C-shape rods, 25-65 μm long, regular or irregular (fig. 2T) located at base of tentacle.

ECOLOGY

Stichopus naso has a very wide Indo-Pacific distribution. It is now recorded not only from the Philippines (Bohol, Manila, Calatagan) but also from Madagascar (Tuléar), Mauritius, Sri Lanka, Thailand, Indonesia (Java), Borneo, Australia (NE coast, W coast, NW coast, Ashmore Reef, Timor Sea, N coast, QLD, WA, NT), South China Sea, China, Japan, and Papua New Guinea (Madang)(see fig. 3). The records from Madagascar and Papua New Guinea are newly recorded in this paper. Whatever the locality, *S. naso* has always been collected in shallow-waters (1-19 m) on sandy muddy bottoms (figs 1A, B) with or without sparse sea-grass beds. *S. naso* reproduces by transversal fission of the

body. When disturbed *S. naso* exhibits an undulatory movement of the body wall to escape. Because of this behaviour, local people from Madagascar call *S. naso* "the smurf holothurian" (EECKHAUT, pers. comm.).

DISCUSSION

Superficial examination shows that *Stichopus naso* and *S. horrens* SELENKA 1867 bear a lot of resemblance. However, they are easy to separate from each other in the field because of their colour pattern, and their behaviour. *S. horrens* lives most of the time on the reef flat, under large coral slabs or boulders during day time and is only active at night (see among others ROWE & DOTY, 1977; FÉRAL & CHERBONNIER, 1986; LIAO & CLARK, A.M. 1995; FORBES *et al.*, 1999; SCHOPPE, 2000; ROWE & RICHMOND, 2004; RASOLOFORINA, pers. Comm.). *S. naso* lives on sandy muddy bottom (SEMPER, 1868; REYES-LÉONARDO, 1984; KOHTSUKA *et al.*, 2005 (cited as *S. horrens*); present observations). *S. naso* reproduces by transversal fission. This kind of asexual reproduction is well known among echinoderms (EMSON & WILKIE, 1980) and particularly among holothuroids (HARRIOTT, 1985; CONAND, 1996; CONAND & UTHICKE, 1999; CONAND *et al.*, 2002; LANE, 2004; UTHICKE, 1997; UTHICKE *et al.*, 1999). Asexual reproduction by transversal fission has not yet been reported for *S. horrens*.

S. naso presents a behaviour observed in a few species of shallow-water stichopodid holothurians: the undulatory (swimming action: escape behaviour) movement of the body wall when disturbed (see GLYNN, 1965; PAWSON, 1966; MAUZEY *et al.* 1968; MARGOLIN, 1976). It is most probably related to the

presence of strong longitudinal muscles.

When comparing the ossicles, *S. naso* differs from *S. horrens* by the presence of spines on the pillars of the large tables from the dorsal papillae and by the size of the C-shape rods located in the body wall (90-200 µm long for *S. naso* and 45-100µm long for *S. horrens*)(see CHERBONNIER, 1980; CHERBONNIER, 1988; CLARK, H.L. 1922; CLARK, A.M. & ROWE, 1971; HICKMAN, 1988; LIAO; 1980, LIAO & CLARK, A.M.1995; MASSIN *et al.*, 2002).

The synonymy here presented follows ROWE (in ROWE & GATES, 1995). Moreover, the specimens collected by KOHTSUKA *et al.* (2005), identified as *Stichopus horrens* are in fact *S. naso* (personal observation). A doubt remains about the material identified by KOHTSUKA (2006) as *S. ohshimae*. Specimen size (250-360 mm long) and the type of bottom (rocky) do not fit with *S. naso*. Unfortunately, it was not possible to have this material on loan to check the ossicle assemblage. These synonymies together with the new collecting localities considerably widens the range of distribution of *S. naso*, which can no longer be considered endemic to the Philippines but a species with a very wide Indo-Pacific distribution.

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