

ABOUT A COUPLE OF *THYSANOTEUTHIS RHOMBUS* (CEPHALOPODA, THYSANOTEUTHIDAE)  
FOUND IN THE STRAIT OF MESSINA (SICILY)

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**Abstract**

The capture of two large specimens of *Thysanoteuthis rhombus* in the waters of the Straits of Messina (Sicily) is reported. Body measurements and data on reproductive biology are given. *T. rhombus* seems unique among squids by its monogamy, where pairs consisting of a male and female of the same size remain together from their juvenile stage until death (probably the main function of this paired lifestyle is reproductive).

**Key-words:** *Cephalopods, reproduction, Strait of Messina*

The diamond-shaped squid *Thysanoteuthis rhombus* Troschel, 1857 is the only species of the family Thysanoteuthidae. This squid is a non-abundant epipelagic inhabitant of warm tropical and partially subtropical waters (water temperature >20 to 21°C, usually 23 to 26°C) of the World Ocean including the Mediterranean. The squid penetrates into the higher latitudes of subtropical and temperate waters (Japan Sea, waters of South Africa and America) with warm currents (the Tsushima, Kuroshio, Agulhas and Brazil Currents, and the Gulf Stream) (1, 2, 3). *T. rhombus* were sometimes found dying in near-shore waters or stranded at the outer limits of the species range (4-9). The present note reports the recovery of two adult specimens of *Thysanoteuthis rhombus* that were found on the beach in June 1993 in the falcate zone of San Raineri (Straits of Messina). The first specimen of *T. rhombus* was described by Troschel in 1857 from the same waters. Following these findings of juveniles of this species were cited (10) (11); but from 1857 to 1993 captures of mature adults not reported from this area. More recently two mature specimens of *T. rhombus* in the waters of Mazara del Vallo (Sicily) were described (12).

**Material and methods**

The two adult specimens of *T. rhombus* described here were caught a few metres from the shore of the falcate zone of San Raineri. The specimens were brought to the laboratory where the morphometric characteristics and the sexual determination were recorded.

**Discussion**

Diamond-shaped squid have rhomboidal fins as long as the mantle and relatively short arms, with a very well developed protective membrane. It can reach 100 cm in dorsal mantle length and 20 kg in weight (2). The measurement of the two *T. rhombus* examined are given below:

	Female	Male
Total length	1450 mm	1300 mm
Dorsal mantle length	780 mm	710 mm
Width across fins	670 mm	605 mm
Total weight	18 kg	14.5 kg

In these specimens the arms appear not very robust with respect to the conspicuous dimension of the animal. The apex of the tentacle club presents very small suckers, with four rows of greater stalked suckers having diameters up to 5 mm; other small suckers are situated close to the base of the club and a single row is in terminal position. Along the tentacular shaft, proximal to the club, a row of about 9-10 small suckers is present; distance between suckers varies from 10 mm to a maximum of about 28 mm close to the end. The gladius is horny with the typical "point of lance" shape, transparent and with longitudinal ribs.

The reproductive biology of *Thysanoteuthis rhombus* is poorly known. The structure of the sexual system has been analyzed mainly on the basis of immature specimens (13, 14, 4, 6, 15).

The reproductive biology of *T. rhombus* was reviewed and the morphology and anatomy of the sexual system of mature adults has been analyzed (16). It is characterized by rather primitive features with respect to gonad attachment and structure of the hectocotylus, and mostly secondary characters, including small oviducts and very large oviducal glands and ovary. Sex may be distinguished visually in animals greater than 100 to 120 mm in ML by the appearance of primordial nidamental glands in females, and a primordial spermatophoric gland in males.

In the ovary of mature females, oocytes were at various stages of ripening, thus exhibiting asynchrony in their development. It was possible to distinguish 6 size groups of oocytes that corresponded to the

following stages of oocyte development (17). Size group I corresponded to the second phase of previtellogenesis ("primary follicle"), oocytes were polygonal in outline, and the centrally situated nucleus was oval and large. Group II corresponded to the third phase of previtellogenesis ("simple follicle"), oocytes were either oval or goblet-shaped, and the cytoplasmic volume was increased in comparison to the preceding size group. Group III obviously corresponded to an intermediary period of oocyte development ("complicated follicle"); oocytes were leaf-like in outline, of dark color, with numerous shallow longitudinal grooves together with follicle cells that protruded into the grooves. The nucleus was not visible. Group IV corresponded to the first and second phases of trophoplasmatic growth ("vacuolization and vitelline accumulation"). Oocytes were covered with reticulate grooves, and were dark in color. Group V corresponded to the third phase of trophoplasmatic growth ("expulsion of follicles"); oocytes were rounded and yellow, the reticulate grooves having almost disappeared. Group VI corresponded to the fourth phase of the trophoplasmatic growth ("ripe oocytes"). Oocytes had a smooth surface and were oval and crimson-violet.

According to the above authors (18, 19), the testis of males <150 mm is a narrow, long strip hanging from the mesentery of the sexual coelom. In immature males <400 mm ML, the length of the testis varies significantly from 3-4 to 18-20% ML. In larger males, the relative length of the testis stabilizes at 10 to 16% ML. In mature males, the testis becomes broader and more robust in shape, like an elongate oval. Formation of the spermatophores in different parts of the spermatophoric gland (SG) is similar to that in other squid and cuttlefish. Spermatozoa enter into the first section of the SG from the spermatiduct and mix with its gelatinous secretions. The frequency of occurrence of developing spermatophores (% of the male squid samples that contain spermatophores in a given section of their SG) varies in different sections of the SG. The spermatophores of *Thysanoteuthis rhombus* are large, ranging from 60-70 mm in males of 420 mm ML to 95-100 mm in males of 850 mm ML. The number of spermatophores located in different parts of the SG does not depend on the length of males. Usually, in both the SG and the spermatophoric duct there are 3 developing spermatophores; in rare cases there were 2 or 4 spermatophores. The number of developing spermatophores also does not depend on the total number of ripe spermatophores in the Needham sac: in a male of 695 mm ML there were 15 spermatophores in the Needham sac and 3 developing spermatophores in the SG; in a male of 850 mm ML, 11 and 4, respectively; in a male of 770 mm ML, 6 and 3. The total number of spermatophores in the Needham sac varied from 5 to 10, commonly 8 or 9. Therefore, the total number of spermatophores located in both the SG and the Needham sac is low and does not exceed 15 to 17. Probably, males form 15 to 20 spermatophores between each mating. This assumption is supported by the total number of spermatangia found on the buccal membrane of females (no more than 20), which are the traces of the previous copulation.

Spawning grounds of *Thysanoteuthis rhombus* were identified as those areas in which egg masses, larvae and completely mature squid were found. All occurrences of *T. rhombus* egg masses, larvae and mature squid in peripheral regions corresponded with strong warm currents such as the Agulhas or Kuroshio (7, 15, 9). This squid does not reproduce in subtropical oligotrophic waters of the World Ocean, except in the Mediterranean Sea. *T. rhombus* spawns throughout the year in tropical waters. In peripheral regions such as in the Mediterranean (20) (21), near southern Japan (22) (23) and in the southeast Pacific (24), spawning takes place during the warm seasons (summer and early autumn).