THE INDO-PACIFIC TRUMPET TRITON SNAIL, *CHARONIA TRITONIS* L.: MORPHOMETRICS OF A SPECIES ON THE VERGE OF LOCAL EXTINCTION

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ABSTRACT

A total of 144 trumpet snails, *Charonia tritonis* L. were counted and measured in shell shops on Phuket Island. Only 4 specimens had been collected in Thai waters. The other were imported from the Philippines. Average total length of the snails from Thai waters and the Philippines were 39.27 and 31.25 cm, respectively. Comparisons between total length and other morphometric characters are shown. A conservation scheme for the species in Thai waters is discussed.

INTRODUCTION

Marine invertebrate populations, in general, are able to withstand high levels of harvest by man, because of their high reproductive capacities and planktonic larvae with enable depleted localities to be recolonised from elswhere. However, there are many cases where populations have been depleted, particulary once collecting becomes commercialised. The trumpet snail, *Charonia tritonis* L., is such an example. The species is exploited throughout the Indo-West Pacific region. The snails are collected by specialists and amateur conchologists, as well as tourists and souvenir hunters because of its ornamental qualities. In some countries, *e.g.* Thailand, the species has been unable to withstand the current levels of exploitation and today the species is almost extinct.

In order to know the status of this snail in Thai waters, a survey was carried out on Phuket Island. The aim was to collect basic information of this snail since it is the second target species of the Tropical Marine Mollusc Programme (TMMP) in Thailand and Indonesia.

MATERIALS AND METHODS

Triton snails were studied in shell shops, and shell traders were interviewed on Phuket Island during January-September, 1993. Triton snails found in the shops were measured and counted. The measurement scheme is shown in Fig.1 and the definitions of measurements and counts are summarized in Table 1. Measurements were made with vernier calipers to the nearest 1 mm.

Table 1. Descriptions of measurements and counts.

TL	Total length measured from the apex to the distal end.
LS	Length of spire measured from the apex to the posterior edge of the shoulder of the body whorl.
LB	Length of body whorl measured from the posterior edge of the shoulder to the distal end of body whorl.
LA	Length of aperture measured from the posterior edge of the aperture to the junction of the aperture and the siphonal canal.
WB	Width of the body whorl measured across the body whorl.
nW	Number of spiral cords (ribs) along the whole shell including apex.
nWB	Number of spiral cords on the body whorl.

Statistical analysis followed the procedure described by Chantrapornsyl and Nateewathana (1992). The

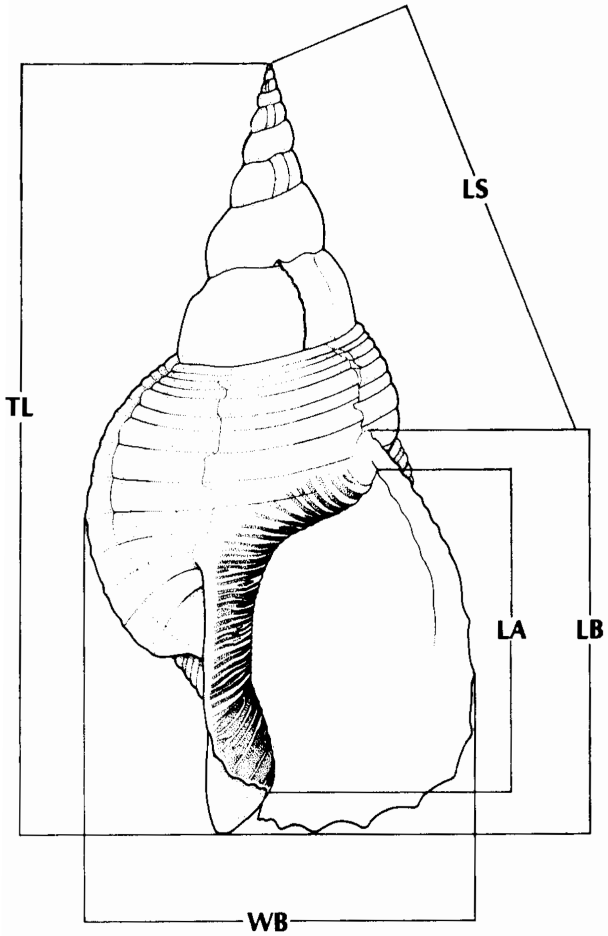

Figure 1. Measurement scheme of *Charonia tritonis* L.

linear equation y= a+bx was used, where : y = the predicted variable; a = y intercept, b = slope, x = TL (total length). Coefficient of determination (r^2) was calculated to detect correlation between total length and morphometric variables.

RESULTS

A total of 144 snails were measured. Of these, 140 were imported from the Philippines and only 4 snails were collected in Thai waters. Measurements and counts of the Thai snails are shown in Table 2. A snail collected by a sea gipsy from Ko Racha Noi, South of Phuket Island was donated to the PMBC Reference Collection (PMBC no 8025) on 20 April 1992. It is the largest specimen recorded in Thai waters during the study. Local fishermen in Phuket told that the triton also can be found at Ko Racha Yai, Ko Bon, in front of Rawai Beach and at Ko Similan. They live at about 10-20 m depth on corals or coral rubble.

Table 2. Measurements (in cm) and counts of *Charonia tritonis* in Thai waters.

Variable	N	Range	Mean	S.D.
TL	4	36.0-46.4	39.3	4.2
LS	4	18.6-25.6	20.4	3.0
LB	4	19.3-23.3	21.2	1.8
LA	4	16.8-19.9	18.3	1.3
WB	4	15.7-23.1	18.1	2.9
nW	4	7.0-11.0	9.0	1.0
nWB	4	11.0-14.0	12.0	1.0

Measurements (cm) and counts of triton snails imported from the Philippines are shown in Table 3. Since a large number of *C. tritonis* from the Philippines were examined, the morphometric data in Table 3 were used for regression analysis. Equations for the regression lines calculated for *C. tritonis* are shown in Table 4.

Total length was used as the independent variable. Calculations showed that all variables revealed strong positive linear correlations. Relationships between total length (TL) and length of spire (LS), length of body whorl (LB), length of aperture (LA) and width of body whorl (WB) are shown in Fig.2,3,4 and 5, respectively. The morphometric variables of triton snails are not as variable as found in the muricids (Chantrapornsyl and Nateewathana, 1992) since triton lacks spines.

Table 3. Measurements and counts of *Charonia tritonis* from the Philippines.

Variable	N	Range	Mean	S.D.
TL	140	12.8-41.9	31.3	5.8
LS	140	7.2-21.6	16.0	2.8
LB	140	5.6-23.4	16.5	3.5
LA	140	4.7-19.8	14.0	3.1
WB	140	4.2-20.5	13.8	3.0
nW	140	8.0-12.0	10.0	0.9
nWB	140	8.0-15.0	11.0	1.2

Table 4. Measurements and counts of *C. tritonis* from the Philippines. Regression analysis of variables. Coefficient of correlation = r^2, a = y intercept, b = slope.

Variable	N	r^2	a	b
LS	140	0.9612	+1.13	0.47
LB	140	0.9693	-2.22	0.60
LA	140	0.9556	-2.25	0.52
WB	140	0.9341	-2.70	0.53

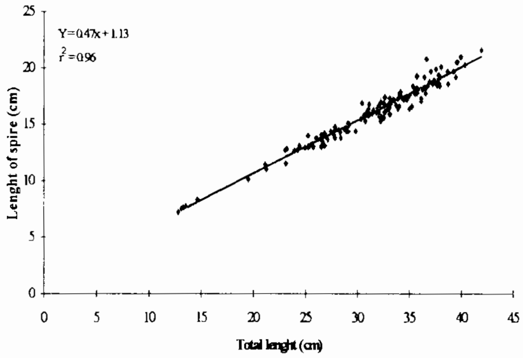

Figure 2. Relationship between TL and LS.

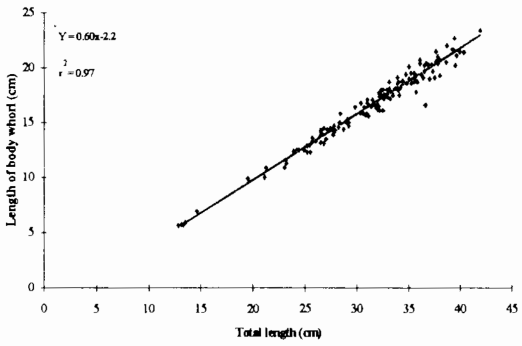

Figure 3. Relationship between TL and LB

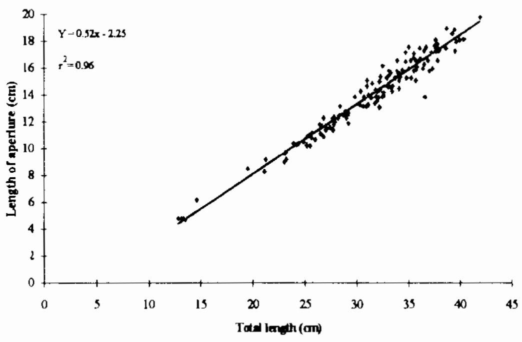

Figure 4. Relationship between TL and LA

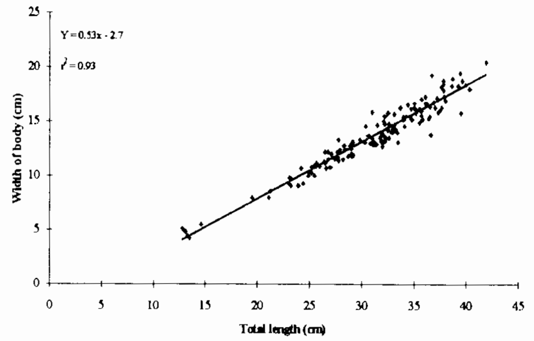

Figure 5. Relationship between TL and WB

DISCUSSION

Triton snails, *Charonia tritonis* L., belong to the largest gastropod shells in the world, with a shell length of approximately 45 cm (Dance, 1974). According to Kira (1965) the triton is the largest of all Japanese shells, reaching 40 cm in length. The largest specimen recorded from Thai waters in the present study measured 46.4 cm, and from the Philippines 41.9 cm. Average total length of the snails in Thai waters and the imported Philippines snails was 39.3 and 31.3 cm, respectively. Obviously most of the snails were captured when they reached a size larger than 30 cm. As observed with the muricid *Chicoreus ramosus* (Chantrapornsyl and Nateewathana, 1992) the smaller snails were collected in a small quantity. There is no doubt the snail is very rare in Thai waters, otherwise the local fishermen would collect many more triton snails. They do not pay attention to the size since all snails are highly priced in the market. It is possible that the young snails live in different habitats from the adults, such as under corals or hidden under crevices. At present, little knowledge has been obtained concerning the life history of the triton snail. The smallest snail came from the Philippines and had a total length of 12.8 cm.

It is known that triton snails live in or near coral reefs, feeding on echinoderms, including the crown-of-thorns sea star (*Acanthaster planci* L. 1758). *A. planci* is a carnivorous sea star found on reefs throughout the Indo-Pacific region. It is thought that continuous overcollecting of large species of tritons over the past decades may have contributed to the current proliferation of the crown-of-thorns sea star and the rapid destruction of coral reefs in certain regions of the Indo-Pacific.

Moran (1986) has reviewed the research on the *Acanthaster* outbreaks in coral reef ecosystem. He reported that during the course of outbreaks several other control methods have been suggested which include the use of electric barriers, electric guns and suction dredging. Biological control of outbreaks of the *Acanthaster* by using a predator, such as the triton snail, *Charonia tritonis* was also recommended. However, this idea is still controversial among the researchers. Moran found that careful consideration was needed if the biological method was to be applied. His concerns can be summarized as follows:

1) experience in other ecosystems has shown that methods involving biological control frequently fail, often producing many additional problems.
2) very little is known about the population dynamics of the target species. This information is needed in order to implement an effective biological control programme.
3) information from several studies suggests that *C. tritonis* is not the sole predator of *A. planci* nor is *A. planci* the only prey of *C. tritonis*. In reality there are practically no quantitative data concerning the interaction between *C. tritonis* and its prey.
4) it is not known what long-term effects this method would have on *A. planci* or the reefal communities with which it interacts.
5) as *C. tritonis* is generally present in low densities on reefs there may be an insufficient number of predators available for use as biological controls.

Obviously there is little knowledge concerning the triton snail. No matter what kind of control method is going to be used for the *Acanthaster* outbreaks, more research on the triton snails is needed. Moreover, Grigg (1992) mentioned that the *Acanthaster* might cause the extinction of scleractinian corals in the Pacific Ocean. However, many reefs were devastated by the sea star, but none are extinct, none have disappeared and many are in various stages of recovery. He pointed out that the widespread destruction of coral reefs by elevated surface temperatures of the sea water is a more severe problem.

Our aim for studying the triton snails in the second phase of TMMP is not only to obtain snails for a biological control of the *Acanthaster* population, but also to increase the number of snails in the sea since it is almost extinct, particuarly in Thai waters. The threat of extinction is severe for this gastropod.

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