OCCURRENCE OF THE COMMON SPIDER SHELL, *LAMBIS LAMBIS* (L.) (GASTROPODA: STROMBIDAE) IN THE INTERTIDAL ZONE OF KARATUNG, SANGIHE ISLAND, INDONESIA

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ABSTRACT

A population study was carried out in March 1993 on Sangihe Island, Indonesia. *Lambis lambis* (L.) were found in seagrass meadows and at reef edges at densities of about 24 individuals per 1200 m^2. The range of shell lengths was 8.5 to 16.4 cm. The shells were colonized by various organisms such as algae (98.3%), echinoderm juveniles (98.3%), vermetids (81.6%), and *Patella* spp. (36.6%). There was a poor relationship between individual numbers of fouling organisms and shell length. On dry conditions at low tides *L. lambis* was able to survive for 44 hours. The critical period was found to be between 45 to 58 hours.

INTRODUCTION

Six *Lambis* species have been regognized in Indonesian waters: *L. truncata, L. chiragra, L. crocata, L. millepeda, L. scorpius,* and *L. lambis* (Dharma, 1988). The common spider shell *L. lambis* is widely distributed throughout the Indo-Pacific. It is a herbivore inhabiting sandy and muddy intertidal reef flats where there are sufficient algae on which they feed (Coleman, 1991). In North Sulawesi the species has been intensively harvested for food throughout the year by local people. The physical environment in the intertidal zone is characterized by at least three factors: temperature, desiccation and salinity (especially during the rainy season). The aim of this study was to investigate the abundance and distribution of *L. lambis* on a reef flat and to estimate survival at desiccation.

MATERIALS AND METHODS

Sampling was carried out in March 1993 in Karatung, Sangihe Island, about 45 miles north of Manado. Specimens were collected from 3 transects, an area of 300 x 4 m, by hand, in the intertidal zone. Desiccation treatment was carried out immediately after collection. Animals (36 individuals) of various sizes were put on the sandy beach surface and their behavior observed during the treatment. The surviving individuals were recorded every hour and the dead individuals were preserved in 10% formalin and brought to the laboratory for measurements of shell lengths and weights as well as identification of fouling organisms associated with the shells. Occurrence of fouling organisms on 72 ind. is presented in percent (F%). The relationship between number of fouling organisms and shell lengths were treated statistically. However, the fouling organisms with an occurrence of less than 50% were ignored.

RESULTS AND DISCUSSION

The major factors limiting the upward distribution of marine invertebrates in the intertidal zone are resistance to desiccation in consequence of increasing aerial exposure, temperature tolerance, diminishing feeding time (Clark & Griffiths, 1990), and salinity reduction, especially during the rainy season in tropical regions.

At the studied location, *L. lambis* was mainly found buried in seagrass meadows and on reef edges in the intertidal zone. It is a night active animal. The ranges of shell length and thickness (columella edge) were found to be 8.5-16.4 cm and 0.3 - 1.1 cm, respectively. Size classes peaked at 9.5-10.4 cm length (Fig.1). It is likely that the fishing activities by local people has affected the the occurence of large sized snails.

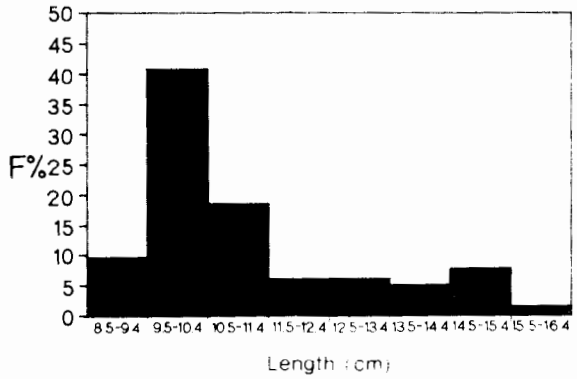

Figure 1. *Lambis lambis* length frequency distribution. N=72.

The density was 24 ind./1200 m^2 in the study area. The shells were colonized by various organisms, but due to problems of identification only a few have been recognized at the species level. By providing a secondary substratum, the spider shells support a large number of species.

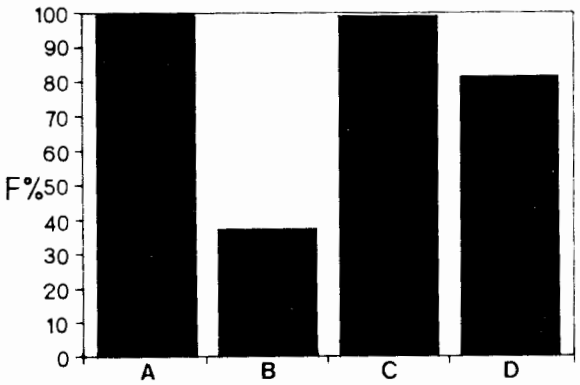

Figure 2. Frequency of occurence of fouling organisms. N=72. A= algae, B = *Patella* sp., C = echinodrm juveniles, D = vermetids.

Fig. 2 shows the frequency of occurrence (F%) of fouling organisms found on the shells. Shell worms (vermetids) occur at F = 81.6% and *Patella* at F = 36.6%. Echinoderm juveniles had the same frequency of occurrence as algae *viz*., F = 98.3%. Algae occupied almost entirely the dorsal shell surface. It is possible that the juvenile echinoderm associates with the algae to obtain shelter or for the reason of feeding. Coverage of barnacles were not recorded since only a few were found. There is, however, no linary relationship between numbers of organsims occurring on the shell surface and shell length. R-values were: echinoderm juveniles r = 0.2626 and vermetids r = 0.0011. This suggests that numbers of fouling individuals were not controlled by the shell space available.

The desiccation test was carried out on a sandy surface as soon as specimens were collected. *L. lambis* have the capability to escape from exposure by means of closure of the shell by aid of the operculum. During the first day the shells seemed healthy, moved actively, and if turned around, they were able to return to the normal position. During the second day, the snails became inactive and produced mucus. During the third day they died successively. L_{50} was reached after approximately 52 hours. Temperature fluctuations very likely to influence the mortality rates.

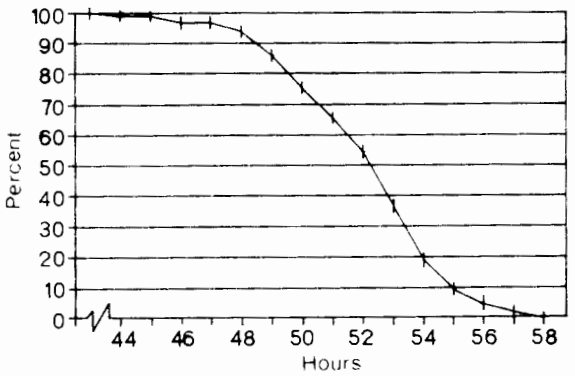

Figure 3. Motality rate of *Lambis lambis* on dry condition (N=36).

Fig. 3 shows the survivorship curve of desiccated *L. lambis*. The mortality rate increased dramatically after 48 hours of exposure. In many cases it was difficult to distinguish between temperature and desiccation effects. Physiological activities such as respiration and metabolism may increase as a function of increasing temperature.

Regarding the capability of the species to persist in the tropical intertidal zone, there are at least four adaptive mechanisms involved: 1) brightness of the shell reflecting solar radiation; 2) the sculpture which may reduce light intensity and increase the surface area; 3) allometric growth pattern (growth of shell is not always correlated with growth of soft body), and 4) occurrence of fouling organisms on shell may reduce absorbtion of solar radiation. However, to separate these effects more data are required.

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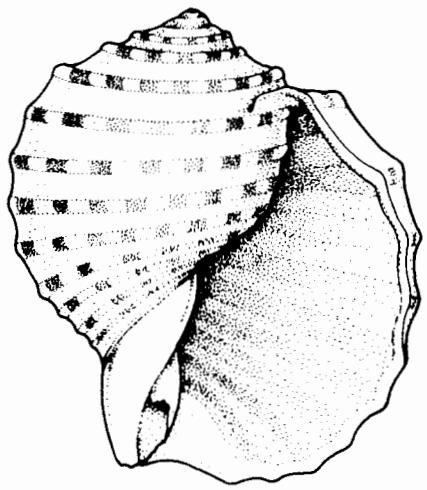

Tonna dolium (L., 1758). PMBC 9149.
Drawing by Patairat Singdam.