

**STUDIES ON THE ECOLOGY OF THE SALT MARSH SNAIL  
*PYTHIA PLICATA* (GRAY)**

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**ABSTRACT**

Studies on the distribution pattern, submergence, salinity tolerance and desiccation limit of a salt marsh snail *Pythia plicata* were carried out. The survey of this snails from February 1984 to January 1985 revealed that the percentage of occurrence was high in place where there is a thick vegetation and low salinity and low where there is less vegetation and high salinity. In general the areas of mangroves near the freshwater connection is distributed with this snail and the areas of more neritic influence or in the seaward side these snails are less in their occurrence. When the submergence and salinity tolerance was tested in 12 different salinities from 2.2 to 30.4 ppt, the snails survived for 3 days in lower and higher salinities but 5 days in medium salinities. Mortality of 20% after 24 hours, 50 to 75% after 48 hours and 70 to 90% after 96 hours were recorded in the 12 salinities tested. It is evident that *P.plicata* has a tolerance in varying salinities with a preference towards low salinities. Fifty per cent mortality due to desiccation was noted after 9 days at room temperature (27 to 30° C).

**INTRODUCTION**

THERE is little information on the ecology of the pulmonate molluscs and hence in the present study the ecology of a salt marsh snail, *Pythia plicata* is attempted. Experiments were also conducted to find the tolerance limit of the species.

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**MATERIAL AND METHODS**

The atmospheric and the surface water temperatures were recorded using a thermometer. The salinity was estimated following the method of Strickland and Parsons (1968) and the dissolved oxygen was estimated by the Winkler's method.

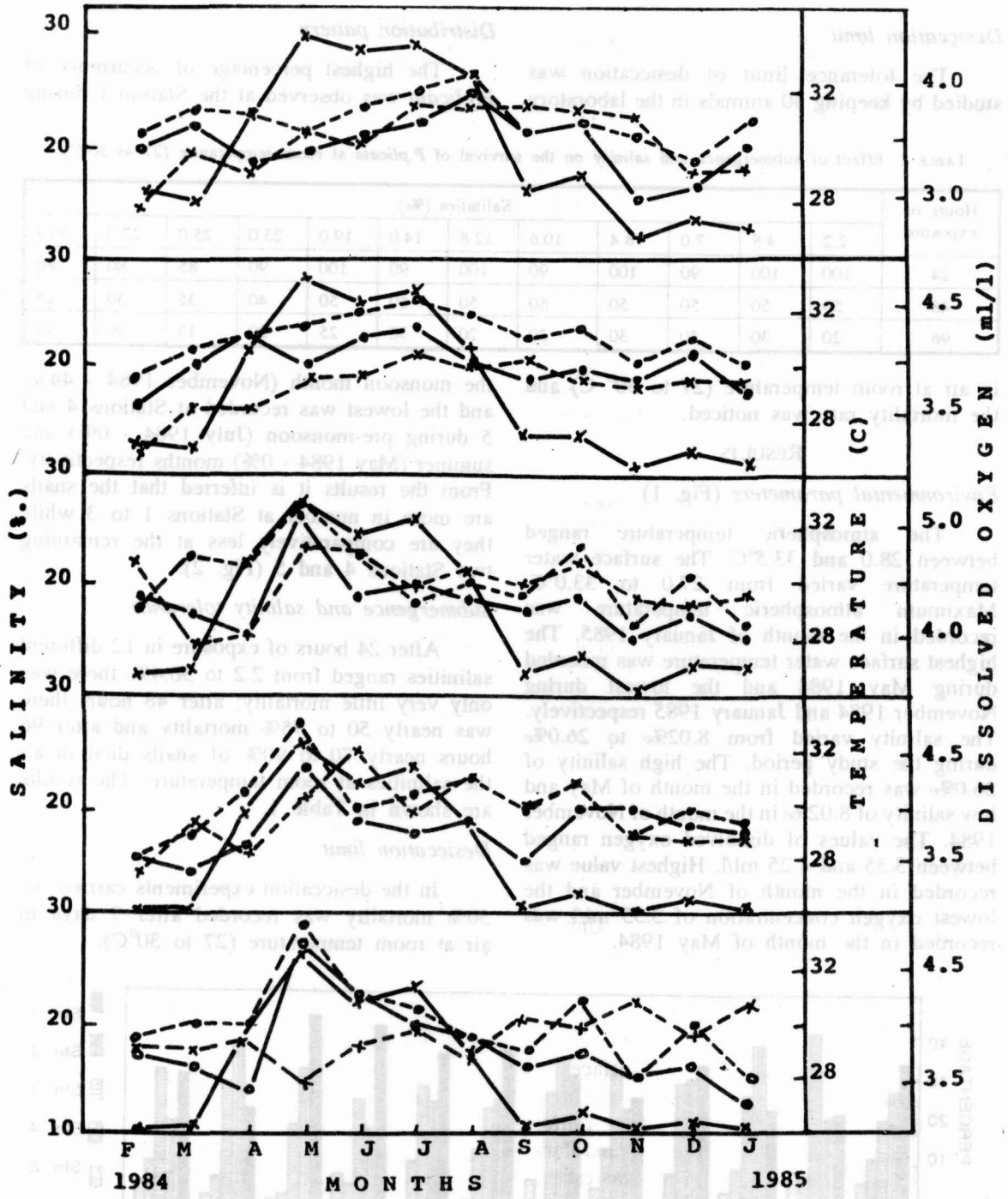
The snails collected by hand picking for the experimental purposes from the field were maintained in the laboratory upto 50 days by feeding them with carrots and filter paper.

*Distribution pattern*

In order to understand the distribution pattern of *P.plicata* a survey was made in an area of 5 square km after fixing up 5 sampling stations in such a way so as to cover the gradient of salinity i.e., low saline and high saline areas. Samples were collected at monthly intervals from each station.

*Submergence and Salinity tolerance*

To study the submergence and salinity tolerance of *P.plicata* at room temperature the procedure of Mane (1981) was followed. The collected specimens were acclimated at an ambient salinity of 27.21‰ for 24 hours. Samples of 10 specimens were kept in 12 different salinities ranging from 2.2‰ to 30.4‰ at room temperature in small glass troughs. The mortality was recorded at the end of 24 hours, 48 hours, 72 hours and 96 hours. The animals attached to the wall of the glass troughs after the above said periods were taken as live and the snails unable to attach on to the walls were considered as dead. The experiment was repeated 3 times for concurrent results.



x ——— x Salinity x - - - - x Dissolved oxygen  
 • ——— • water temp. • - - - - • Atm. temperature

FIG. 1 Showing the monthly values of the environmental parameters in the 5 stations, Atmospheric temperature, Dissolved Oxygen, Salinity and Surface water temperature.

**Desiccation limit**

The tolerance limit of desiccation was studied by keeping 50 animals in the laboratory

**Distribution pattern**

The highest percentage of occurrence of *P.plicata* was observed at the Station 1 during

TABLE 1. Effect of submergence and salinity on the survival of *P.plicata* at room temperature (27 to 30°C).

Hours of exposure	Salinities (‰)											
	2.2	4.8	7.0	8.4	10.6	12.8	14.0	19.0	23.0	25.0	27.0	30.4
24	100	100	90	100	90	100	90	100	90	85	80	80
48	50	50	50	50	60	50	60	50	40	35	30	25
96	20	30	30	30	30	20	30	25	20	15	10	10

in air at room temperature (27 to 30° C) and the mortality rate was noticed.

**RESULTS**

**Environmental parameters (Fig. 1)**

The atmospheric temperature ranged between 28.0 and 33.5°C. The surface water temperature varied from 27.0 to 33.0°C. Maximum atmospheric temperature was recorded in the month of January 1985. The highest surface water temperature was recorded during May 1984 and the lowest during November 1984 and January 1985 respectively. The salinity varied from 8.02‰ to 26.0‰ during the study period. The high salinity of 26.0‰ was recorded in the month of May and low salinity of 8.02‰ in the month of November 1984. The values of dissolved oxygen ranged between 3.55 and 4.25 ml/l. Highest value was recorded in the month of November and the lowest oxygen concentration of 3.55 ml/l was recorded in the month of May 1984.

the monsoon month (November 1984 - 44%) and the lowest was recorded at Stations 4 and 5 during pre-monsoon (July 1984 - 0%) and summer (May 1984 - 0%) months respectively. From the results it is inferred that the snails are more in number at Stations 1 to 3 while they are comparatively less at the remaining two Stations 4 and 5 (Fig. 2).

**Submergence and salinity tolerance**

After 24 hours of exposure in 12 different salinities ranged from 2.2 to 30.4‰ there was only very little mortality; after 48 hours there was nearly 50 to 75% mortality and after 96 hours nearly 70 to 90% of snails died in all the salinities at room temperature. The results are shown in Table 1.

**Desiccation limit**

In the desiccation experiments carried out 50% mortality was recorded after 9 days in air at room temperature (27 to 30°C).

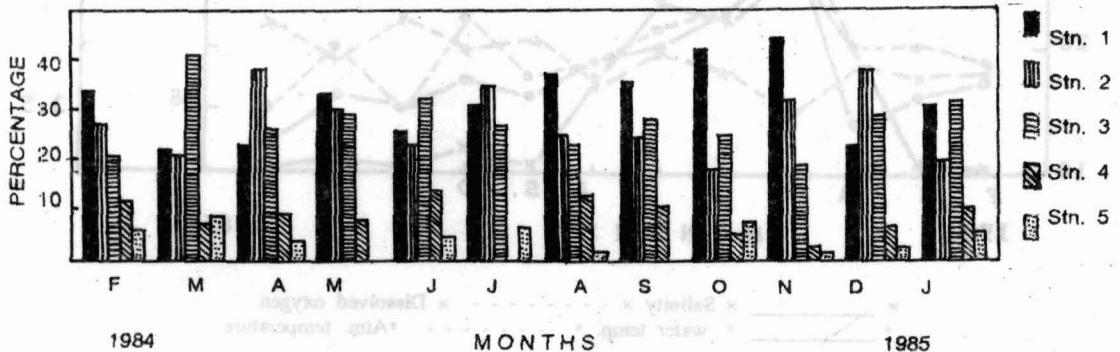


Fig. 2. Distribution pattern of *Pythia plicata* in the 5 stations.

## DISCUSSION

The ellobiid snail, *P.plicata* inhabits the holes and crevices in the mangrove trees of Pichavaram as observed by Subba Rao *et al.*, (1983) at Namkhana. Berry (1975) also found another allied species, *P.scarabaeus*, on the mangrove trees in west Malaya at Selangor. Specimens of *P.plicata* were recorded on the ground and also upto 2 m high from the ground level on the mangrove branches and leaves. They tend to move down towards the ground during neap tide but climb up the trees with rising tide. More number of *P.plicata* could be collected on the day after rainfall (personal observation).

From the salinity tolerance experiments, it was found that after 96 hours of exposure to the salinities ranging from 2.2‰ to 30.4‰ nearly 10 to 30% of the snails were alive in all the salinities at room temperature (27 to 30°C). From the monthly collections made during the study period (February 1984 to January 1985), it was found that *P.plicata* preferred low saline area (Fig. 2) as observed by Radhakrishna and Janakiram (1975) in the molluscs of the mangroves distributed in the Godavari and Krishna estuaries.

From the results, it would be obvious that *P.plicata* has a high tolerance of submergence, preference for low salinity and a tolerance to desiccation.

*P.plicata* inhabits the area beyond high tide levels which foreshadows the evolution of the purely terrestrial existence of the advanced stylommatophorans. For the successful existence of *P.plicata*, it has acquired morphological, reproductive and behavioural adaptations (Duncan, 1975; Berry *et al.*, 1967; Hubendick, 1978). Similarly the higher pulmonates (Stylommatophora and Basommatophora) are also preadapted for their successful non-marine life (Russell-Hunter, 1979).

It has been suggested that among the 22 genera of the family Ellobiidae, only two, *Carychium* and *Zospeum* have evolved a totally terrestrial mode of existence (Hubendick, 1978). *C.tridentatum* occurs far inland in deciduous forests, but *P.plicata* exists in the moist, humid, more shadowed forest and leaf litter floor (Boycott, 1934). *P.plicata* has terrestrial gelatinous egg mass, a benthic veliger and a free-swimming veliger as adaptations for inhabiting the area beyond the high tide level of the intertidal regions of salt marshes.

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