

DISTRIBUTION PATTERN OF *MARTESIA STRIATA* (LINNAEUS)
IN ESTUARINE SYSTEMS OF THE EAST AND SOUTH
WEST COASTS OF INDIA

By

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(With 1 Text-figure and 1 Plate)

INTRODUCTION

Molluscs of the families Teredinidae and Pholadidae, which bore into wood and cause extensive damage to submerged structures in the sea have been studied in detail, in recent years in India. The teredinids are generally known to bore into wood whereas pholadids besides boring into wood have been reported from other structures like granite rock, lead, brickwork, sandstone, corals, concrete cement and compact clay. The genus *Martesia* Blainville, 1824 is represented by two species viz. *striata* (Linnaeus, 1758) and *fragilis* Verrill and Bush, 1890 in Indian Waters (Daniel and Srinivasan, 1956). The latter species has been reported from catamarans, fishing boats and floating wood, from the open sea and has not been commonly met with inside protected harbour areas and estuarine regions where *M. striata* abounds.

The distribution pattern of *M. striata* in the marine environment is well known and specimens from infested timber samples have been collected from all the Indian harbours, and on the east and west coasts of India (*vide* Daniel and Srinivasan, 1956 ; Nagabhushanam, 1958, 1962 ; Srinivasan, 1959 ; Nair, 1965 b ; Balasubrahmanyam, 1968 ; Purushotham and Satyanarayana Rao, 1971). In the estuarine environment, the occurrence and distribution of this species in Cochin backwaters, on the south-west coast of India, have been dealt with by Beeson (1936), Balasubrahmanyam and Menon (1963), Nair (1965 a) and Santhakumari and Nair (1975). However, on the east coast excepting for a few brief references or records of *M. striata* at Calcutta Port (Annandale,

1923), and in the estuaries of Mahanadi (Subba Rao, 1968), Godavary (Ganapathi & Lakshmana Rao, 1959), Krishna (Pampapathi Rao et al, 1957) and Adyar (Daniel, 1958 b) no information is available about the distribution and the extent to which it has penetrated into the estuarine systems. The objective of the present study was to investigate the distribution of this species in the various estuaries of the east and south west coasts of India, and the adaptations, if any, as a result of interaction of several factors prevalent in an estuarine environment.

A detailed study of the distribution of *M. striata* in various estuaries in India has therefore been made, based on surveys and collections made by the authors, collections available in the Zoological Survey of India, and all published records. This study has revealed the occurrence of *M. striata* in all the major estuaries, though the range of penetration appears to vary and its ability to bore into other types of substrate as well, in the estuarine region is well marked while in the marine environment it is typically a wood borer.

OBSERVATIONS

Hooghly-Matla Estuary : Annandale (1923) recorded the occurrence of this species in brickwork in Calcutta Port. We have examined young and adult forms (6 mm to 32.5 mm) from timber structures and wood from Sagar Island, Kakdwip, Diamond Harbour and Calcutta Port along the course of the main river Hooghly and at Port canning on the river Matla (Text-fig. 1). Specimens boring into brickwork in Calcutta Port have also been examined. According to Calcutta Port authorities, damage caused by this species, to submerged timber in service in this port is about 70 percent greater than the extent of destruction by teredinids. While specimens from Kakdwip-Sagar Island zone nearer the marine environment are usually, normally elongated, those encountered further inside are sometimes twisted at the siphonal ends. A comparison of the forms occurring in wood and in brickwork revealed that in the specimens from brickwork, the surface is mostly irregular and sculpture eroded. The shells are generally stronger and thicker than those found on wood. Some specimens from Calcutta Port area are stunted and distorted, although sexually mature. Stray specimens have been noticed by us in waters of very low salinity, 1 m below the lowest water mark near the Howrah Bridge.

Observations based on short term test-panel and test-pole studies at Kakdwip (nearer the marine environment) and Kidderpore docks (Calcutta Port) in the interior (Text-fig. 1) revealed that successful

settlement and boring occurred for the major part of the year excepting for the months from July to September, at both the stations, although the intensity of attack appeared to be greater during the period February-May, when the salinity records were high.

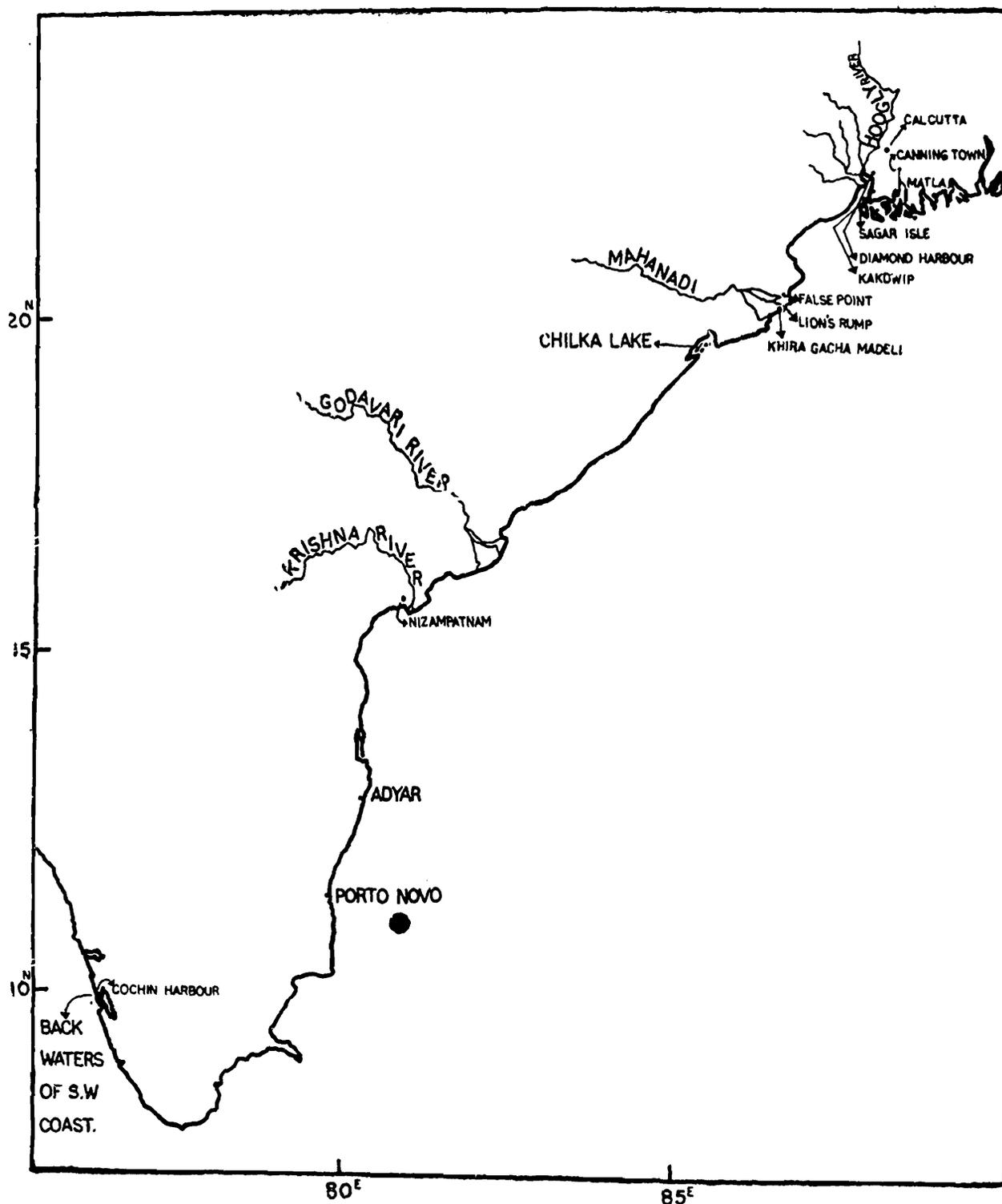
The ability of the species to bore into brickwork in Calcutta Port is noteworthy and is probably an adaptation in estuarine waters under considerable silting and turbid conditions. Further work is, however, required to elucidate this problem and to prove conclusively whether they breed successfully in the inner zones of this estuary or whether the recruitment of the larvae takes place successively from the populations inhabiting the estuarine zones nearer the marine environment.

Mahanadi Estuary : Subba Rao (1968) has recorded the occurrence of *M. striata* in large numbers along with other shipworms in Mahanadi Estuary. At Khira Gachha Madeli, (Text-fig. 1) the waters are somewhat turbid and silting occurs to some extent. Adult specimens occurring in the vicinity of the sea (Lion's Rump) ranged in size from 13 mm to 19.5 mm. whereas those from creek near khira Gachha Madeli measured 22 mm. specimens from False point (30 km. from the sea) measured 5 mm. to 11 mm. A comparative study of the size ranges reveals that bigger sized forms occur abundantly at Khira Gachha Madeli—about 10 km. from sea, whereas at regions near the sea and also those well within the estuary are smaller and not in abundance. Their abundant occurrence at Khira Gachha Madeli zone shows that this species has found favourable conditions for survival and rapid growth in this area and has established itself.

Chilka lake : The specimens from the outer channel of Chilka lake (Text-fig. 1) are all stunted and distorted forms which are twisted at the siphonal ends and dull in colour. It is probable that stray larvae from the marine zone are carried into the outer channel and find it possible to settle down and grow to some length without being able to survive for more than a few months. Annandale & Kemp (1916) while recording this species from "Chilka Lake" however commented on P. 356 that "the specimens probably came from a log that had drifted into the mouth of lake".

Godavary Estuary : (Text-fig. 1.) *M. striata* appears to be scarcely represented in this area and only very few specimens were collected from dead stumps. Ganapathi and Lakshmana Rao (1959) also encountered only 3 specimens of this species amongst the borers which were represented mainly by teredinids. Dead stumps and live mangrove trees were found to be honeycombed with the terednid borers and few specimens of *Martesia* were collected from dead stumps only. Probably,

M. striata can successfully settle and bore into dead stumps only, but not into living trees in this estuary. The few dead stumps on which they settle and bore probably become uprooted during strong gales and are carried away with the current resulting in very few living forms being found and collected during casual visits.



Text-fig. 1. Records of *Martesia striata* in the estuarine systems of the east and South-West coasts of India.

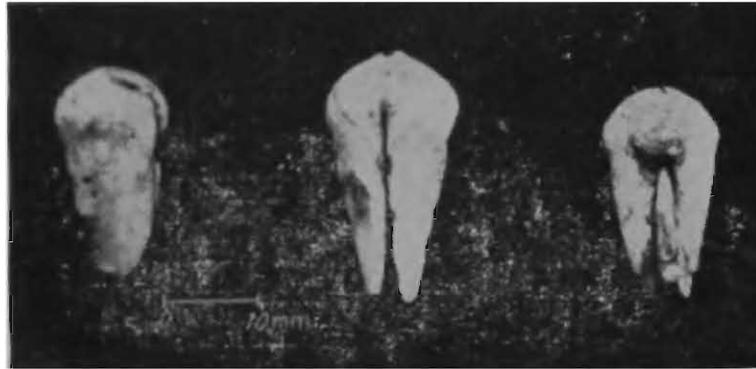
Krishna Estuary : During the surveys of areas in the Nizampatnam backwaters in the Krishna Estuary, (Text-fig. 1), specimens ranging in size

from 6 mm to 22 mm were collected from dead stumps. Since animals of varying sizes were collected, it appears to us, that in this environment, the occurrence of *M. striata* is regular and perhaps permanent, as had been suggested by Pampapathi Rao *et al.* (1957) in the main part of the river Krishna. It is of interest to note that while in the main part of the river this species has been recorded in soft compact clay on either side of the river mouth (*vide* pampapathi Rao *et al.*, 1957). our collections from the tributary are only from dead stumps, with the species penetrating to a greater extent in this part of the estuary. It is noteworthy, that its record in a substratum other than wood (*i. e.*, in soft compact clay) is remarkably again in an estuarine environment.

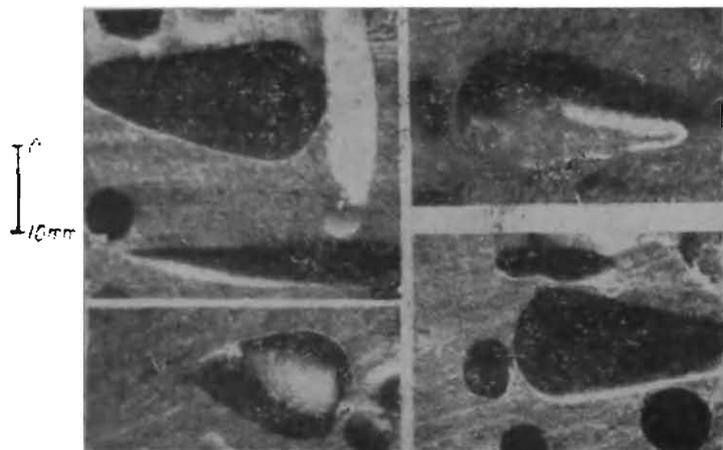
Adayar Estuary : In the Adayar river (Text-fig. 1) *M. striata* has been recorded at its mouth (Daniel, 1958 b). Test panel studies conducted intermittently during the years 1955-58 and 1971-79 have revealed that successful settlement and boring of *M. striata* occurred right through the year, though marked by seasonal intensity (Plate XI, Figs. 1 & 2—for young and old forms). It is probable, that during high tide, larvae are brought in from the sea and successfully settle there. Hence, in this region, *M. striata* may be considered as a tolerant or hardy marine species. It is noteworthy that when heavy fouling of barnacles occurred in the test panels, the infestation of *M. striata* was found to be very less at the places fouled by the barnacles, whereas in the "unfouled" regions there was heavy attack by *Martesia striata* (L.) (Plate XI, Fig. 3).

Porto Novo : Although this species has been recorded from Porto Novo (Srinivasan, 1959 ; Nair, 1965b) the exact locality records are not known and we are therefore unable to comment on its occurrence, in the estuarine habitat in this region.

Backwaters of South West Coast : Beeson (1936) observed the settlement of *M. striata* in the mouth of Beypore river from November to June. Erlanson (1936) while reporting this species from Cochin concluded that the activity of molluscan borers in Cochin harbour and vicinity is less than elsewhere, although Nair (1965b) comments that "Erlanson's tests were confined chiefly to the monsoon and post-monsoon periods (May to November).....when the breeding period of *Martesia*...was almost nearing completion." Balasubrahmanyam and Menon (1963) noted greater density of borer attack due to *Martesia* during the months extending from December to April. Nair (1965b) found at Cochin harbour that the premonsoon and postmonsoon periods were characterised by severe attack by *Martesia* which declined in numbers during the monsoon period, there being practically no attack



1



2



3

Martesia struata (Linnaeus).

1. Juveriles 2. Adults 3. Area heavily colonised.

during the major part of the monsoon and during part of the post-monsoon period. This, he attributes as being due to the great lowering of the salinity during these periods. Santhakumari & Nair, (1975) confirm the results of the earlier work of Nair (1965b).

REMARKS

An analysis of the distribution pattern of *M. striata* in the major estuarine systems studied shows that this species has become fairly well established in the Hooghly, Mahanadi and Krishna estuaries on the east coast, and also in the Cochin backwaters on the south west coast of India. In the Godavary estuary it appears to have not successfully established itself, while in Chilka Lake and Adyar estuary this may be considered as a tolerant marine species.

The observations made on the south west coast of India compare well with the settlement of this species in Hooghly estuary where also there appears to be an interruption in successful settling during the monsoon period, *i.e.*, July to September. However, it should be borne in mind that the speed of water currents, coupled with lowering of salinity, may be some of the major factors responsible for preventing the successful settlement of the borer (Daniel, 1958a ; Nagabhushanam, 1961).

The intensity and distribution of *M. striata* must depend upon many factors prevailing in an estuary, of which, salinity, temperature, water movement and availability of wood, or other suitable structures may have to be considered as important. The occurrence of this species in dead stumps or wood in Mahanadi, Godavary and Krishna estuaries and the absence of records from living trees in these areas are of some significance in determining the distribution pattern of this species in these estuaries.

Further it is seen that authentic records of *M. striata* from brickwork in Calcutta, soft compact clay in the mouth of river Krishna, in the Indian region ; and in argillaceous sand stone in the Irawady delta, Burma (Blanford, 1867) are from estuarine habitats. Similarly, records of attack on lead sheathing of power cables reported from Ortegán river, Jacksonville, and Lake worth in Florida waters are also from estuarine waters under turbid conditions ; and in Boeca Ciega Bay, St. Peterbourg, in turbid waters with considerable silting in the causeway area, wherein the salinity is usually moderately high, although much lower during the rainy season. (Springer and Beeman, 1960).

From these records it is sufficiently clear that the trend to bore into brickwork, soft compact clay, argillaceous sandstone, lead etc. is always

associated with the estuarine habitat. This offers a fascinating field for environmental adaptation studies and underlines the need for further investigation.

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