Psychids as major pests of nursery plants of *Rhizophora mucronata,* an important mangrove species along the West Coast

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Mangroves are one of the most productive ecosystems of the world. Nurseries, plantations and natural forests of mangroves along the West Coast were surveyed to document the incidence and pest status of insects infesting seedlings and in nurseries and naturally-germinated, saplings in mangrove tracts. *Rhizophora mucronata* Poir is a true mangrove species dominant in the mangrove ecosystems in Goa, Karnataka and Kerala. The bagworms (Lepidoptera: Psychidae) were found to cause considerable damage to saplings of *R. mucronata* in nurseries. Three species of bagworms *Brachycyttarus* sp., *Pteroma plagiophleps*, and *Metisa* sp. were recorded; *Brachycyttarus sp.* being more prevalent. More than 60% of the saplings were found to be infested by these psychids. The larvae feed on the leaves and build up enormous populations giving plants a blotched appearance. The nature and extent of damage and the seasonal occurrence of these insects are recorded. Possible methods of control are also discussed.

Introduction

Mangroves are unique plant formations growing in the highly stressed habitat along tropical and subtropical coastlines. They are subject to high salinity in the substrate and periodical water flooding of root system during high tides. They are also stressed by the oxygen poor conditions of the substrate. Mangrove species are characterized by numerous anatomical and physiological adaptations to survive in this environment. In India, mangroves occur on both the Western and Eastern coasts and the Andaman and Nicobar Islands, covering in total about 4871 sqkm (FSI 1999). In many places, they are highly degraded and according to the status report on mangroves (Government of India 1987), India lost 40% of its mangrove area in the last century. In 1976, recognizing the importance of the mangroves, the Indian government established the National Mangrove Committee which has recommended areas for research and development and for management of the mangroves. The challenges to mangrove forests include both natural hazards and destructive human activities, the gravity of which varies from place to place.

Veenakumari et al. (1997), recorded several insect herbivores on mangroves in the Andaman and Nicobar Islands. But very few pests have been reported from mangroves along the Indian mainland (Kathiresan 1993; Santhakumaran et al. 1995). The effect and impact of the pests in this forest

ecosystem has not been worked out for any of the mangrove patches in India, in spite of their importance.

During a recent survey of the mangroves of the West Coast, many nursery plants and saplings in afforested mangrove patches were found to be heavily defoliated by bagworms (Lepidoptera: Psychidae). The psychid, *Pteroma plagiophleps* Hamps (Lepidoptera: Psychidae) was first reported from mangroves along the Goa coast in 1995 (Santhakumaran et al. 1995). More than 90% of the saplings were found to be infested to varying degrees. During the present study, two more species of bagworms were found to seriously damage mangrove seedlings.

The infestation has reached serious proportions in some of areas, posing a threat to the management of plantations established under afforestation programmes. In this context, a detailed survey and study were made in the mangroves along the west coast to gather information on the extent of infestation, the biology, and possible control of these defoliators.

Materials and methods

A sample survey of the mangroves including the nurseries and afforested areas along the coasts of Goa and Karnataka was conducted from 2000–2003. Though efforts on conservation and afforestation of mangroves are in progress in these two states, an organised form of maintenance of mangrove nurseries with different mangrove species is not in vogue. *Rhizophora* was the predominant seedling species in the nurseries. In many places, the propagules are allowed to germinate on their own and then used for afforestation in other patches.

Mangroves on Charao Island in Goa, and Jalady in Coondapur of Karnataka were chosen for the pest surveys. In addition, the afforested patches of mangroves along the banks of the river Mandovi in Goa and Kodi mangrove patch in Karnataka were surveyed to note the percentage of infestation. Field trips were conducted to Kodi mangroves during different seasons to collect the insects and to determine their seasonal occurrence. The number of seedlings and saplings infested and the number of the larvae feeding was recorded. The saplings surveyed were 2–3 years old. About 200–250 leaves were collected from the 10 saplings infested by each species, from which 100 leaves were selected at random to measure the percentage of leaf area damaged by each species. Loss of leaf area was assessed using a leaf area meter.

Adults and larvae collected from the field were brought to the laboratory to study the biology. The larvae were reared in separate plastic containers maintained at room temperature by providing fresh supply of *R. mucronata* leaves. The parasites emerging from the collected larvae and pupae were also collected, identified and preserved.

Results and observations

The field survey in the selected nurseries and afforestation sites of Goa and Karnataka revealed the presence of three species of bagworms on *R. mucronata*. These were *Metisa* sp., *Brachycyttarus* sp., and *P. plagiophleps*. Some of the seedlings were also found to be infested by the scale insect, *Aspidiotus* sp. (Hemiptera: Diaspididae).

Brachycyttarus sp.

This was the predominant species of bagworm causing defoliation of seedlings and saplings of *Rhizophora mucronata*. The larval bag was 1.4–1.6 cm in length and was made of combined pieces of vegetable matter. Females reared in the laboratory each laid 234–267 eggs, but the mortality rate of the larvae was very high under laboratory conditions. Whether the same is true under natural conditions is not known.

The larvae fed mostly on the tissues on the underside of the leaf leaving the characteristic brown blotches. The upper cuticle of the thick leaf was usually left uneaten and when it dried up and gave the characteristic brown colour to the leaf. Sometimes larvae were also feed on the bark of the plant.

The head capsules of the moulted larvae was attached to the head of the larval bag and a maximum of nine head capsules could be noted in a larva before the onset of pupation, suggesting the occurrence of nine larval instars. The seasonal incidence of this species is given in Fig. 1. The percentage leaf area destroyed was 0.08–67.95% of the total leaf area with a mean of 8.9%.

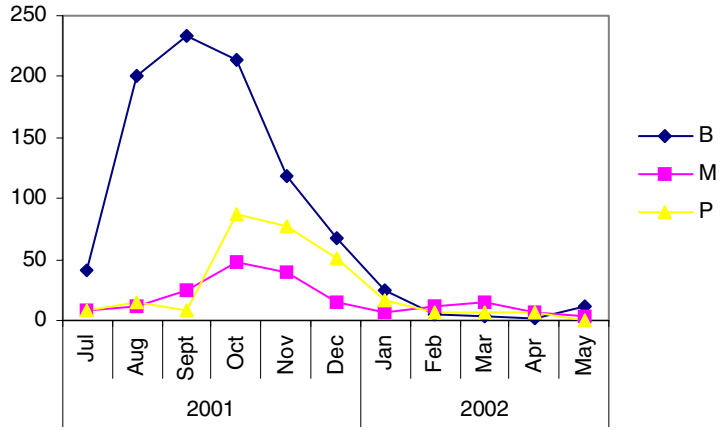

Figure 1. Seasonal incidence of bagworms on the saplings of *Rhizophora mucronata* in Kodi mangroves. B = *Brachycyttarus* sp.; M = *Metisa* sp.; P = *Pteroma plagiophleps.*

Pteroma plagiophleps Hampson

Many saplings of *Rhizophora* in Goa and Karnataka were infested by *P. plagiophleps* (Table 1). The infestation was greater for saplings in Goa. Each female lays 50–200 eggs. The larvae feed on the leaf mesophyll tissue and the epidermal layer shows brownish patches. During severe attack, the blotches look similar to that of *Brachycyttarus sp*. The larval period is 45–60 days. The pupal case hangs from a thick silk thread, which is attached to the leaf. Adults emerge after 19–21

Table 1. Percentage of *Rhizophora* seedlings and saplings infested by the three species of bagworms. B = *Brachycyttarus* sp.; M = *Metisa* sp.; P = *Pteroma plagiophleps.*

	Nursery Seedlings			Saplings		
Locality	B	M	P	B	M	P
Goa	30	20	-	40	-	40
Karnataka	50	-	20	40	20	20

days of pupation. The insect was found throughout the year (Fig. 1). An ichneumonid, *Sinophorous* sp. was found parasiting the larvae.

Metisa sp.

The feeding marks of this species were similar to that of *Brachycyttarus* sp. The larval case was made of cut-mixed vegetable matter. The length of the larval case was 2.1–2.6 cm. We were unable to determine the number of larval instars. The damage caused by this species was found to be less than that of other psychids, *Brachycyttarus* sp. and *P. plagiophleps*.

Management options

Though applying insecticides could be considered as management option, the risk of contaminating the marine environment has to be considered. Application of the insecticide Quinalphos at 0.1% is recommended for control of bagworms in isolated nurseries.

Parasitoids of the bagworms seem to be playing an important role in the control and management of the insects. Bagworms being polyphagous pests, silvicultural methods such as selection of other, non-susceptible species may help reduce the populations. Manual removal of the larvae feeding on the leaves can help to reduce the percentage of damage. Use of light traps to collect and destroy the adult moths is a feasible method of management.

Discussion

These psychids, *Brachycyttarus* sp., *Metisa* sp. and *Pteroma plagiophleps* destroy a large proportion of photosynthetic material thus impairing the growth of seedlings and saplings and deteriorating the health of mangrove stands. Though *Pteroma* has been reported as occurring on mangrove saplings in Goa (Santhakumaran et al. 1995), this is the first report of *Brachycyttarus* sp., from the mangroves. Besides seedlings and saplings, large trees were also found to be infested by these species, though the percentage of infestation was small. Considering the loss of mangrove area resulting from other biotic interferences, the conservation aspects gains importance and control of these bagworms are indeed necessary for the establishment of this unique ecosystem. The major hindrance seems to be the difficulty in using an effective insecticide as it can contaminate the neighboring marine environment. Biological and ecological control seems to be the best possibility as of now.

References

Government of India. 1987. Mangroves in India – status report, New Delhi, Ministry of Environment and Forests. p. 52–55.

Kathiresan, K. 1993. Dangerous pest on nursery seedlings of *Rhizophora*. Indian Forester 119: 1026.

Santhakumaran, L. N., Remadevi, O.K. & Sivaramakrishnan, V.R. 1995. A new record of the insect defoliator, *Pteroma plagiophleps* Hamp. (Lepidoptera: Psychidae) from mangroves along the Goa coast (India). Indian Forester 121: 153–155.

Veenakumari K., Mohanraj, P. & Bandyopadhyay, A.K. 1997. Insect herbivores and their natural enemies in the mangroves of the Andaman and Nicobar islands. J. Nat. Hist. 31: 1105–1126.