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Diversity of some insect fauna in different coastal habitats of Tamil Nadu, southeast coast of India

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ABSTRACT

We investigated the biodiversity of some insect fauna in different coastal habitat of Tamil Nadu, Southeast coast of India and also tried to clarify the relationship between surrounding coastal environmental ecosystem of three coastal habitats (station-I estuarine complex, station-II mangrove area and station-III sandy beach), in order to, eventually, contribute to biodiversity conservation as well as to management of coastal habitat in India. Insect were collected from the three sites, from January 2008 to December 2008. Studies regarding diversity of insects available on coastal environments are very few. A total of 929 insects belong to 23 families and 6 orders were recorded from the 3 sites. Among them, 487 species are from station-II 259 species from station-I and 183 species are from station-III were recorded. Statistical tools PRIMER (Ver. 6.1.11) were employed to find the species diversity, richness and evenness were calculated.

Introduction

Biological diversity means the variability among the living organisms from all sources including terrestrial, marine, and other aquatic ecosystems (Harper and Hawksworth, 1994). This includes diversity within species, between species, and of ecosystems. Biological diversity refers to the entire body of organisms, their ecological complexity within the environment, and all the ecological processes in relation to these systems (Primack, 1993; Liu, 1999). Approximately 30 million species are found worldwide, of which about 1.4 million have been briefly described; of these, about 750,000 are insects. Insects now comprise > 75% of all described animal species and exhibit not only a rich variety of form, color, and shape, but also a range of ecological adaptations unexcelled by any other group (Cheng, 1976).

Insects such as *Halobates* are recorded in the open ocean, thousands of kilometers from land; they spend their lives on the sea surface, and no marine insects remain submerged throughout their life cycle (Edwards, 1926; Tokunaga, 1932). Insects occur in different ecological niches of mangrove forests. They may be permanent residents or only transient visitors. They are either harmful or beneficial, and play an important role in the ecology of mangrove systems. Most insect species in mangrove habitats are only temporal visitors, and they do visit many other habitats. As a result, the insects provide a linkage between the mangal and other environments (Balasubramanian et al., 2005).

Insects that feed on dead trees or wood (saproxylic insects) or decaying organic material (saprophagous insects) play an important role in nutrient cycling in forests. Termites and wood borers (usually the larvae of beetles or moths) form the majority of saproxylic insects, and a relatively characteristic assemblage occurs in mangroves. A large number of ground-dwelling saprophagous insects can also be found in the mangrove habitat, and many have specialized adaptations for survival in the intertidal zone. Collembola (springtails) are diverse among the roots of mangrove plants and in the leaf litter that accumulates on the ground (Murphy, 1965). Among the number of biodiversity measures developed recently, four indices based on taxonomic relatedness between the species or individuals (Warwick and Clarke, 1995) are rated as the most promising for biodiversity assessment. Freshwater habitats have received less attention than terrestrial and marine ecosystems (Boyero, 2002). However, insects have a better chance of finding suitable habitats, shelter, or food over the course of a season in a mosaic for different coastal ecosystems. However, little is known about the changes in beach wrack quality in relation to the activity of beach organisms on Polish coasts. Stranded debris may provide

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food and shelter for both aquatic and terrestrial animals. Because of the insects and other organisms that are attached to it, this beach wrack is an important foraging area for shorebirds (Brown and McLachlan, 1990). Seasonal variation in the abundance of tropical insects is a common phenomenon (Wolda, 1988; Pinheiro et al., 2002). A sharp reduction in abundance during the dry season seems to be restricted to tropical habitats that have a severe dry season (Janzen and Schoener, 1968; Janzen, 1973a,b; Wolda, 1977). The present studies were directed toward the task of clarifying insect fauna from the different coastal habitats of Tamil Nadu, southeast coast of India, in the hope that the result would offer distinctive information for the biodiversity conservation as well as management of southeast coastal habitats in India.

Material and methods

Sampling sites

This study was conducted in Parangipettai (Lat. 11°24′ N; Long. 79°46′ E), Pichavaram (Lat. 11°27′ N; Long. 79°47′ E), and Nagapattinam (Lat. 10°48′0″ N; Long. 79°50′24″ E), representing the coastal environments of the southeast coast of India (Figure 1). In this study, we conducted 1 day per month sampling of six insect orders (Lepidoptera, Coleoptera, Hemiptera, Diptera, Hymenoptera, and Heteroptera). The survey work was conducted from dawn to dusk at each site for 1 consecutive year (January–December 2008).

Sampling procedure

Hemiptera were collected with aerial nets (in flight) and sweeping nets (mangrove vegetation), and beating of shrubs using long sticks and a cloth on the ground to collect the falling insects. Sweeping or beating was performed five to six times per hrs. The collected materials were kept in 70% alcohol for identification. Hymenoptera and Coleoptera were collected by beating and sweeping. The parts of the plant infested with these insect groups were beaten with a stick, wherein downward strokes were used to free them. This was done at least four to five times. Sweep nets were also used to trap the larger flying hymenopterans. The collected specimens were either kept in vials with 70% alcohol or killed in killing bottles.

Species identification

The collected insects were identified based on Merritt and Cummins (1988), Dominguez et al. (1992), Trivinho-Strixino and Strixino (1995), and Cheng and Hashimoto (1978).

Data analysis

Different statistical tools were used to determine the diversity indices, richness, and evenness using the biodiversity software, PRIMER (Ver 6.1.11) (Primer-E Ltd., Plymouth, United Kingdom). Biodiversity indices were calculated following the standard formulas; species diversity was calculated using the following formula (Shannon and Wiener, 1949):

$$H' = -\sum pi \ln p_i,$$

where p_i is the proportion of individuals of each species belonging to the ith species of the total number of individuals. Species richness (D) was calculated using the formula given by Simpson (1949):

$$D = 1 - C; \; C = \sum p_i^2; \; p_i = n_i/N.$$

Evenness or equitability (S) was calculated using Pielou's (1966) formula:

$$J' = H'/Jns$$

or

$$H'/\log_2 S.$$

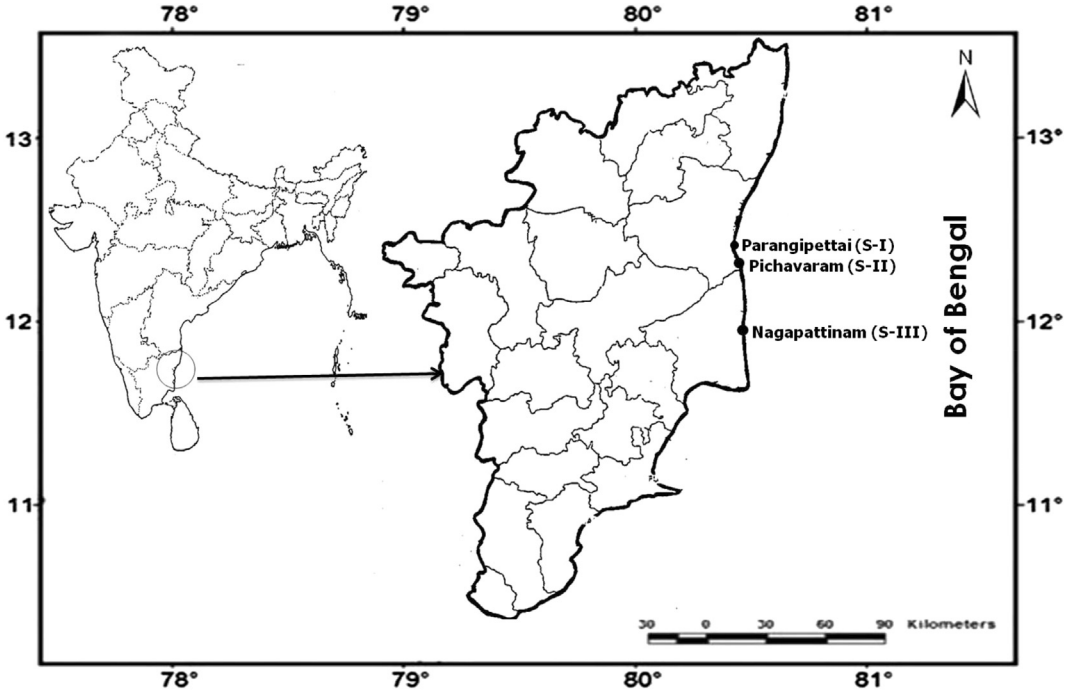

Figure 1. Map showing the sampling stations.