

Diversity of ant fauna in selected coastal areas of Vizhinjam, Thiruvananthapuram District, Kerala, India

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Abstract

Ecosystem services and biodiversity conservation are seriously threatened by habitat disruption and change. The present study focused on the diversity and distribution of ant fauna on the selected coastal sites of Vizhinjam in Thiruvananthapuram district. The objective of the study is to analyze and assess the distribution of ants and to study their impact on habitat restoration. Habitats near the sea port construction areas were chosen for sampling and were carried out in the year 2023 and 2024. The all-out search method, Pitfall trap method, and Bait methods are the chief sampling methods used to collect ants. A total of 17 species of ants representing 4 subfamilies were recorded from the sites of Vizhinjam. Myrmicinae and Formicinae were found to be the most dominant subfamilies with 7 species each followed by, Ponerinae, and Dolichoderinae. Diversity of ants are low at locations that are significantly agitated or disturbed. The most species-rich genera found in the study area was, *Camponotus*. Ants' inclinations for either open or shaded environments may influence population dynamics, which can lead to species turnover as a result of changes in vegetation structure. It will be easier to understand how ant diversity reacts to changes in land use and management intensity if knowledge from multiple disciplines is integrated.

Keywords: Ants, coastal zones, vizhinjam, disturbed habitat

Introduction

Ants are regarded as one of the planet's most varied, prevalent, and ecologically important creatures. Ants are direct or indirect herbivores, predators, and scavengers that occupy various ecological niches and take advantage of a wide variety of food sources. Ant species can be used as instruments for environmental impact monitoring, ecosystem finance, and ecological study. Since the majority of species have a fixed and relatively limited foraging range, ants are especially suitable for monitoring programs. Because they serve a variety of roles in an ecosystem as herbivores, detritivores, mutualists, and predators and prey, ants are significant ecologically (Agosti *et al.*, 2000) ^[1]. Ants frequently serve as "keystone species" and occupy a variety of habitats. There is a positive correlation between ant species richness and other taxa. According to Lawton *et al.* (1998) ^[5], there was a positive correlation between the species richness of canopy ants and the species richness of other ground-dwelling ants and other taxa that are found in the canopy. Changes in species composition, loss of diversity, alterations in interspecific interactions, and modifications of ant-provided ecosystem services such as dispersal, predation, and soil modification all exemplify the disturbance effects on ant communities.

Materials and Methods

Study area

Vizhinjam is situated in Thiruvananthapuram district of Kerala, South India (8°22'45"N 76°59'29"E). It is situated at an elevation of approximately 1 meter above sea level. The

study area had extensive anthropogenic disturbances due to the construction of Vizhinjam International Seaport, which is India's first deepwater container transshipment port.

Sampling Technique The objective of this study was to investigate the diversity and abundance of ant species at study area. The study was carried out from January 2023 to December 2024. Sampling was carried out at the coastal area, approximately 1km from the shoreline. Ants were collected from soil, litter, ground surface, and tree trunk by using different sampling methods (Gadagkar *et al.*, 1993) ^[3]. The methods used were: All out-search method- common method in which ants were picked up by hand using brush and forceps; Honey bait method-to collect nectar-feeding ants. Ants collected through various methods were preserved in vials containing 90% ethyl alcohol and labelled with place and date of collection. Ants were identified with the help of a stereomicroscope and taxonomic keys given by Bolton (1994) ^[2].

Results

In the present study, 17 species of ants were recorded from the coastal zone of Vizhinjam (Table 1). All the collected ants were identified and they belong to four subfamilies. Formicinae and Myrmicinae were found to be the most dominant subfamily with 7 species each. It is an indication of their capacity to withstand changes in environmental conditions in the shore. As per Fig. 1, Formicinae (41%) and Myrmicinae (41%) were the most dominant subfamilies recorded from the coastal zone followed by Ponerinae (12%) and Dolichoderinae (6%)

Table 1: List of ant species present in the coastal zones of Vizhinjam

Sl.No.	Subfamily	Scientific name
1.	Dolichoderinae	<i>Tapinoma melanocephalum</i>
2.	Formicinae	<i>Anoplolepis gracilipes</i>
3.	Formicinae	<i>Camponotus compressus</i>
4.	Formicinae	<i>Camponotus irritans</i>
5.	Formicinae	<i>Camponotus rufoglaucus</i>
6.	Formicinae	<i>Camponotus sericeus</i>
7.	Formicinae	<i>Oecophylla smaragdina</i>
8.	Formicinae	<i>Paratrechina longicornis</i>
9.	Myrmicinae	<i>Crematogator dohrni</i>
10.	Myrmicinae	<i>Meranoplus bicolor</i>
11.	Myrmicinae	<i>Pheidole sp.</i>
12.	Myrmicinae	<i>Solenopsis geminate</i>
13.	Myrmicinae	<i>Tetramorium walshi</i>
14.	Myrmicinae	<i>Tetramorium smithi</i>
15.	Myrmicinae	<i>Trichomyrmex destructor</i>
16.	Ponerinae	<i>Diacamma ceylonense</i>
17.	Ponerinae	<i>Leptogenys chinensis</i>

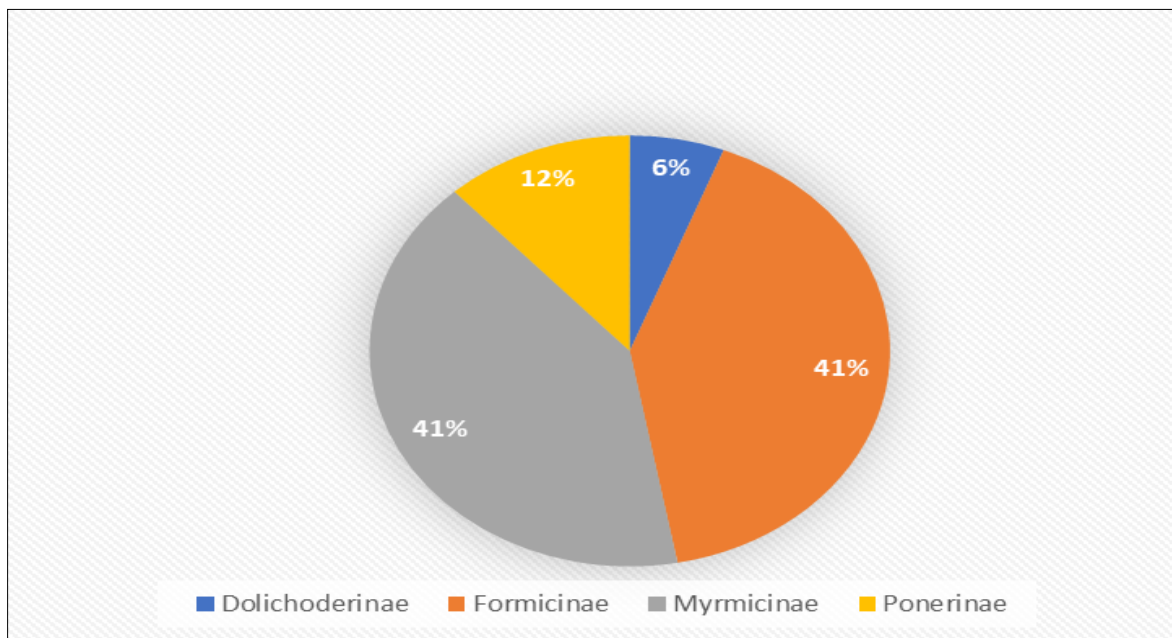


Fig 1: Subfamilies of ant fauna present in the study area

Discussion

The present study documents the impact of large-scale coastal development on ant biodiversity along the Vizhinjam coastline, an area currently undergoing significant ecological transformation due to the ongoing construction of the Vizhinjam International Seaport. Over the past decade, this region has experienced extensive habitat modification, fragmentation, and resource redistribution — factors known to influence ant community composition and ecosystem functions.

Only 17 ant species were recorded during the study period, a relatively low number considering the tropical coastal setting, which typically supports higher ant diversity. These species belonged to four subfamilies of the Formicidae family, with Formicinae and Myrmicinae emerging as the most dominant subfamilies (7 species), followed by Ponerinae (2 species), and Dolichoderinae (1 species). The dominance of Myrmicinae and Formicinae suggests that these subfamilies are more resilient to anthropogenic disturbances, likely due to their generalist foraging

behaviors, nesting flexibility, and broader ecological tolerance.

The most abundant species were *Camponotus compressus* and *Camponotus rufoglaucus*. These species are known for their ecological plasticity, disturbance tolerance, and adaptability to human-modified environments. These ants live in enormous communities, travelling long distances from their nests, and are active at all times of day and night (Krishna Ayyar PN, 1935) [4]. Their presence across multiple sites, particularly in disturbed areas, may indicate a shift towards ant communities dominated by opportunistic and disturbance-tolerant taxa. These species typically nest in tree trunks, utilizing natural cavities such as tree holes and dead limbs, which may explain their persistence even as natural habitats are degraded or lost.

In addition, invasive and synanthropic species such as *Technomyrmex destructor* and *Paratrechina longicornis* were also recorded. *T. destructor* is a globally recognized invasive species known for its presence in urbanized and coastal regions. Similarly, *P. longicornis*, commonly known

as the "crazy ant," is known for its rapid movement, adaptability, and high reproductive rates. The presence of these species in abundance may further reflect ecological imbalance and competitive displacement of native ant fauna, a phenomenon frequently associated with disturbed or urban habitats.

The relatively low species richness observed in this study is indicative of a stressed ecosystem. Habitat fragmentation, reduction in vegetative cover, changes in microclimate, and human disturbance are likely major drivers of biodiversity loss in the area. Furthermore, the simplification of habitat structure due to coastal infrastructure development likely reduces the availability of nesting sites and food resources for less tolerant or specialist ant species.

Ants, due to their ecological roles as predators, scavengers, seed dispersers, and soil engineers, are excellent indicators of ecosystem health (Yvonne Tiede *et al.*)^[7]. The observed shift toward a community dominated by disturbance-tolerant and invasive species reflects the ongoing environmental pressures in the Vizhinjam coastline. Removal of vegetation or growth of weedy plants following disturbance can have a significant effect on ant assemblages through changes to the microclimate (Philpott *et al.*, 2009)^[6]

Therefore, conservation and restoration strategies should prioritize the preservation of remaining natural habitats, the planting of native vegetation, and the reduction of human-induced disturbances. Long-term monitoring of ant communities could provide valuable insights into the trajectory of ecological change and the effectiveness of restoration interventions in the region.

Conclusion

The present study of ant fauna in the coastal zones of Vizhinjam suggest that the areas hold diverse ant fauna. In the study area *Camponotus compressus* and *Camponotus rufoglaucus* were found to be most abundant species. The presence or absence of certain species will yield valuable information about the various adaptations of ants that have helped in their existence after habitat disturbances.

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