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The Great Indian Bustard Wildlife Sanctuary (M. S.), India, has a wide variety of ants (Hymenoptera: Formicidae) from both natural and man-made habitats.

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ABSTRACT

The Great Indian Bustard Wildlife Sanctuary in Maharashtra, India's undisturbed and damaged habitats are the focus of this paper. Because of their rapid reaction time in response to environmental changes, ants are excellent indicators of disturbance. Pitfall traps, scented traps, and manual collection techniques were used to gather ants from two ecosystems with variable degrees of disturbance. There were a total of 19 ant species gathered from undisturbed and damaged forest areas. There were seven Myrmicinae species (35%) in the research region, followed by six Formicinae, three Pseudomyrmecinae, two Ponerinae (10%), and one Dolichoderinae and one Dorylinae (5%) each among the subfamilies. These three species of ants were found to be missing from disturbed areas whereas Leptogenyschinesis was not recorded from an undisturbed forest location. The undisturbed forest site's Shannon-Wiener diversity index (H') was marginally higher (2.76 than the disturbed forest site's) (2.46). The ant population and species composition in damaged and undisturbed forest locations differed dramatically.

Introduction

In many terrestrial eco systems across the globe, increasing human activities including deforestation, urbanization, agricultural intensification, grazing, and mining have caused significant harm to the flora and animals. It is important to note that disturbance is distinct from habitat transformation or stress, which reduce the amount of available resources or modify the microclimate or structure of the habitat (Townsend and Hildrew, 1994). (Andersen 2000; Pickett and White 1985). Because of their diverse interactions with different plant species, ants play a vital role in terrestrial ecosystems as seed dispersers, leaf- and seed predators, and in certain circumstances, as pollinators. Although ants may be found worldwide except in Iceland, Greenland, and Antarctica (Holldobler and Wilson, 1990), the number of species decreases with elevation, height, and aridity (Holldobler and Wilson, 1990). (Fowler and Claver, 1991; Farji-Brener and Rug giero, 1994; Samson et al., 1997). The mutualistic associations that certain ant species have with other creatures include both invertebrates and vertebrates. The sugar-rich solutions generated by insects such as aphids and other homopterans, for example, are protected by ants against their predators (Delfino and Buffa 2000). They may make their homes in leaf litter, rotted logs and beneath soil, inside woody branches or under rocks and they can also cultivate fungal gardens in the soils. During the development of galleries by ants, organic matter is mixed with the soil and the soil's aeration characteristics are improved (Luque et al. 2002). Insects and small vertebrates are the primary prey of ants, thus they may be employed as biological control for insect pests in terrestrial environments (Suryanto, 1993). Because of their high sensitivity to habitat alteration and disturbance, ants have been widely utilized as indicator species in environmental monitoring (Hoffmann and Andersen 2003). Decreases in ant species richness, particularly among litterinhabiting, cryptic species and specialist predators, may occur as grazing intensity increases (Bestelmeyer and Wiens 1996), as well as significant changes in species composition. However, relative proportions of various functional groups appear resilient to grazing pressure (Hoffmann 2000). Additionally, a wide range of ant species in varied environments is essential. It's our goal to research ant populations in both undisturbed and disturbed habitats in the current study region with this in mind. The Ahmednagar and Solapur districts of Maharashtra state, India, are home to the Great Indian Bustard Wildlife Sanctuary. In addition to the many towns and villages that make up the sanctuary, it also has a large metropolis and a network of highways and railroads, an airport, reservoirs, agricultural areas, minor industrial units, and "islands of forest land" that are distributed across the area. In addition, the Great Indian Bustard, a bird in grave risk of extinction, calls this refuge home. Even though the sanctuary region is being damaged by human activity, the study area's different ecosystems are

nonetheless being impacted. However, there is currently no information available on the types, extents, or effects of disturbances to the study area's flora and wildlife. There has never been a survey of this kind from the research region before this.

Material and Methods

Located in the Deccan Peninsula biogeographical zone, the Great Indian Bustard Wildlife Sanctuary has coordinates between the Deccan Peninsula and the Arabian Sea. A latitude of 75.0 and a longitude of 18.0. This sanctuary has been described as a Southern Tropical Thorn Forest, according to Champion and Seth (1968). For this research, six locations were selected from two forest sections with varying amounts of disturbance, which were studied from January 2010 to December 2010. Undisturbed areas were chosen for ant collecting as typical of the region. Plots of 110 ha (Nannaj), 100 ha (Nannaj), and 50 ha (Mardi) were also considered. The Great Indian Bustard nests in these areas because they are the least disturbed in the sanctuary. This region has almost little human activity. Large trees, bushes, and grasses abound in this forest's diverse understory. The litter content of the forest floor is similar to that of a disturbed forest site. Similar to the 100 hectares (Mardi, Private property), 40 hectares (Mardi) and 90 hectares (Nannaj) of disturbed land, three plots of ants were chosen to represent each of the three areas of disturbed land: Overgrazing, agricultural cultivation, mining, deforestation, forest fires, and other activities have ravaged these lands. Human activities have a negative impact on the habitat in this area. Grass, bushes, and a few tree species like Neem and Glericidia make up the bulk of this environment. Patches of habitat were divided up by highways and railroads.

Sampling protocols

Pitfall traps, scented traps, and hand collection techniques were all used to gather the ants between January 2010 and May 2010. A) The pit-fall traps were composed of a 0.5-liter plastic glass with a 12centimeter aperture buried in the ground. The five randomly selected 20-meter by 20-meter quadrates of a one-hectare plot at each location each had at least one pit-fall trap set up to catch unwary visitors. Ethanol and glycerol were mixed together in 25 ml glasses. During the hours of 15.00 and 17.00, the traps were placed and collected. (1993) The study was conducted by Gadagkar et all (1993). Instead of the ethanol and glycerol combination, 25 cc of sugarcane juice was used in the scent traps, which were deployed in a manner similar to pitfall traps. After baiting the quadrates, the ants were collected by hand for 30 minutes in each sample plot to ensure that all species were represented. By using three separate ant gathering techniques, we eliminated the possibility of sample error. It was necessary to wash and preserve the ant specimens before transporting them to the laboratory for identification purposes. Using taxonomic keys (Bolton, 1994; Holldobler and Wilson, 1990; Mathew and R. N. Tiwari, 2000; Sheela S. 2008), ants were photographed with a Sony digital camera before being identified at the species level using a stereo zoom trinocular microscope. Shannon-Wiener and Simpson's diversity indexes were used to determine species diversity. Standard statistical procedures were used to generate the Shannon-Wiener and Simpson's diversity indices (D).

Results and Discussion

Total of 20 ant species (from 3527 individuals) from 14 genera and six subfamilies have been recorded in the current research region. Seven Myrmicinae species (35 percent) dominated the other subfamilies, which included six Formicinae, three Pseudomyrmecinae, two Ponerinae, and one Dolichoderinae and one Dorylinae apiece, according to a study of the species' distribution. In the intact and damaged forests, 19 and 16 ant species were collected, respectively. Of the 20 ant species studied, 16 species (around 80%) were found in both disturbed and undisturbed forests, whereas 3 species (15% of the total) were discovered only in the undisturbed forests. In all, there were 20 different ant species; however, only three were found in disturbed areas, including Anochetusgraffei, Meranoplusbicolor, and Polyrhachis tibialis. Uninhabitable forests yielded more ants than disturbed forests (2298), according to the results of this study (1329). Myrmicinae, Formicinae, Pseudomyrmeci nae, Ponerinae, Dolichoderinae, and Dorylinae are the least diverse subfamilies in undisturbed forest areas, with just one species each. Myrmicinae, Formicinae, Pseudomyrmecinae, Ponerinae, Dolichoderinae, and Dorylinae are the least diverse subfamilies in disturbed forest areas, each having one species apiece. However, the quantity of ants gathered varies greatly across the two types of forest areas, despite the presence of the same number of species. For the undisturbed forest site, the three most common ant species are Monomorium indicum (9.19 percent), Tapinoma melanocephalum (9 percent), and Camponotiscompressus (8.69 percent), while for the disturbed forest site, the most common species are Paratrechinalongicornis (13.24 percent) and the

least common species are Camponotuscompressus (11.73 percent) and Tapinoma melanocephalum (9 percent) (9.55 percent). The undisturbed forest site's Shannon-Wiener diversity index (H') was marginally higher (2.76 than the disturbed forest site's) (2.46). Additionally, an undisturbed forest site's Simpson's index (D) is 0.086, whereas a disturbed forest site's (D) is 0.067. Both environments have quite distinct species compositions and densities. Given these findings, it's safe to say that in the undisturbed estuary, species richness, diversity, and abundance were all much greater than in the damaged forest. This is the result of habitat loss and an increase in human-caused disturbance. According to research done on ants, birds, and butterflies, when disturbance levels rise, species richness and diversity decline (Andersen 1995; Blair 1996; Ingalhallikar et al. 2000-2001; Kunte 2000-2001; Pachpor& Ghodke 2000-2001). Research from many parts of the globe The diversity and abundance of ant species are negatively impacted by habitat degradation, disturbance, and fragmentation, according to several studies. Undisturbed woods have a larger diversity of ant species than disturbed environments (Greenslade and Greenslade, 1977; Olson, 1991; Suarez et al., 1998; Vascon celos, 1999; Watt et al., 2002). According to Kumar et al. (1997) and Pachpor& Ghodke (2000-2001), environments with plenty of trees sustain a lot of different kinds of ants, and our findings complement their findings. Ants' preferred habitat may be provided by a variety of environmental factors, including the amount of canopy cover and the amount of soil litter. This is because the undisturbed sites had higher levels of habitat complexity and heterogeneity than the damaged locations. The numerous ant species have a variety of places to hide, nest, and forage, but disturbed areas don't. Myrmicinae from disturbed sites had a higher overall relative abundance because they may be able to adapt to a wide range of environmental conditions and are found in a variety of habitats around the world. They are classified as Gen eralizedMyemecinae (GM) functional group by Bestelmeyer and Wiens (1996), and Andersen (1998). (2000). In 2008, Savitha, S. et al. reached the same conclusions. The damaged woodland site included large concentrations of Paratrechinalongicornis, Solenopsisgeminata, and Tapinoma melanocephalum. Microhabitats that are perfect for the aforementioned ant species explain this. Researchers Savitha, S. et al. drew similar conclusions in 2008. One of the most common species of Dolichodrinae (DD), Tapinoma melanocephalum prefers hot and open environments. This species of ant is very active, aggressive, and a major competitor for the other species in the colony. This is based on (Suriyapong Y. 2003). Andersen (2000) classifies Solenopsisgeminata as a member of the Cryptic species functional category, and the species' relative abundance rises in areas that are more open to the introduction of new ant swarms (TschinkeI1988; Suarez et al. 1998). The richness and abundance of ant species may shift depending on the canopy cover, habitat complexity, and degree of disturbance, as can be shown by species diversity indexes.

Conclusion

From this research, it can be inferred that the ant species richness, abundance, and composition are all different between the wetlands and the urban areas studied. Because they react so quickly to changes in their surroundings, ants make excellent indictors. Compared to other invertebrates like spiders and hemipterans, ants fared better as disturbance indicators (Crist, 2009). In disturbed habitats, the population of certain ant species has exploded due to the excellent circumstances they've found there, such as nesting places, food sources, and open grounds for foraging, among other things. Disturbed habitats must be studied in detail to determine their level of disturbance, kind of disturbance, physicochemical qualities of soil, climatic conditions and the presence of alien flora and animals.

Table no. 1. Pitfall trap (PT), Scented trap (ST), and Hand collection technique (HC) were used to capture ants from undisturbed and disturbed areas of the GIB Wildlife Sanctuary throughout the months of March to May 2010.

Study Site	Undisturbed										Disturbed									
Species	March			April			May				March			April			May			
Collection Methods	PT	ST	HC	PT	ST	HC	PT	ST	HC	Total (A)	PT	ST	HC	PT	ST	HC	PT	ST	HC	Total (B)
Myrmicinae																				
Monomorium indicum	22	14	18	23	29	17	13	33	13	202	15	13	9	10	15	11	8	12	10	103
Monomorium destructor	12	15	14	9	13	13	13	11	15	115	15	17	8	13	16	11	12	19	9	120
Monomorium scabricepe	22	18	12	19	30	11	18	26	13	182	11	25	9	6	19	11	10	17	7	114
Metaxmyrmex bicolor	13	11	16	11	12	13	10	12	13	111	-	-	-	-	-	-	-	-	-	-
Crematogaster subnuda	10	13	22	13	16	20	11	14	23	142	14	11	16	12	10	14	6	7	12	102
Solenopsis geminata	3	6	7	2	4	8	2	2	6	40	15	21	14	16	18	13	19	25	15	156
Pheidole sp.	19	17	16	15	20	14	13	29	11	184	9	12	6	13	9	10	11	14	7	91
Formicinae																				
Camponotus angusticolin	14	26	23	11	28	20	15	23	20	180	11	14	12	9	10	8	10	13	9	96
Camponotus compressus	15	29	25	14	27	22	13	25	21	191	11	14	9	10	13	11	8	10	9	95
Camponotus sericeus	11	13	28	10	10	29	8	10	25	141	8	10	7	6	8	5	9	10	7	70
Oecophylla smaragdina	-	-	13	-	-	12	-	-	11	36			18			16			15	49
Paratrechina longicornis	18	23	9	17	21	9	18	20	12	147	17	24	12	19	27	14	21	20	12	176
Polyrhachis illaudis	7	12	8	4	9	6	2	8	4	61	-	-	-	-	-	-	-	-	-	-
Dolichoderinae																				
T. melanocephalum	22	33	33	18	30	12	19	31	12	192	11	15	12	13	19	10	15	21	11	127
Ponerinae																				
Leptogenys chinesis											1	-	5	2	-	4	2	-	3	17
Anochetus graffei	2	4	-	3	2	-	2	4	-	18	-	-	-	-	-	-	-	-	-	-
Pseudomyrmecinae																				
Tetraponera nigra	7	7	20	6	7	20	6	5	18	94	-	-	1	-	-	3	-	-	-	4
Tetraponera allaborans	4	5	16	3	5	17	4	6	17	77	-	-	-	-	-	-	-	-	-	-
Tetraponera rufonigra	4	6	20	4	5	19	5	1	20	84	-	-	1	-	-	1	-	-	2	86
Dorylinae																				
Dorylus laevigatus			2							1	-	-	2	-	-	1	-	-	4	7
Total Ants Collected	202	265	279	177	279	256	174	254	252	2198	138	173	141	130	164	102	131	178	130	1329

Grand Total (A+B)
305
235
296
111
244
196
275
276
286
211
65
223
61
319
17
18
98
77
86
8
3527

Table no. 2. This study examines the quantity and variety of ants in the undisturbed and damaged forests of GIB Wildlife Sanctuary, India.

Subfamily	Study site	
	Undisturbed	Disturbed
Myrmicinae	7 (951)	6 (686)
Formicinae	6 (779)	5 (486)
Pseudomyrmecinae	3 (267)	2 (6)
Ponerinae	1 (18)	1 (17)
Dolichoderinae	1 (204)	1 (127)
Dorylinae	1 (3)	1 (10)
Species richness	19 (2232)	16 (1329)
Shannon-Wiener diversity index (H')	2.76	2.46
e^H	15.83	11.70
Simpson's index (D)	0.067	0.086

Note: indicated There are a lot of ants in the figures in brackets.

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