BioOne COMPLETE

Rapid Survey of the Ants of Ajenjua Bepo and Mamang River Forest Reserves, Ghana

Authors: Kolo, Yéo, and Hormenyo, Augustine

Source: A Rapid Biodiversity Assessment of the Ajenjua Bepo and Mamang River Forest Reserves, Ghana: 27

Published By: Conservation International

URL: https://doi.org/10.1896/054.050.0107

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/ebooks/ on 17 May 2024
Terms of Use: https://bioone.org/terms-of-use

Chapter 2

Rapid Survey of the Ants of Ajenjua Bepo and Mamang River Forest Reserves, Ghana

Yéo Kolo and Augustine Hormenyo

SUMMARY

We sampled ants in two forest reserves (Ajenjua Bepo and Mamang River) and surrounding cocoa plantations in the Birim North District of the Eastern Region of Ghana. We used the ALL protocol associated with hand collecting of ants. This yielded 125 ant species belonging to 40 genera and 11 subfamilies. We collected 98 species from the Ajenjua Bepo site and 101 from Mamang River. The two sites seemed equivalent in terms of ant community species richness and composition. At both sites, the forest habitats were more species-rich than the cocoa plantations, which were characterized by the presence of ant species typical of open areas.

INTRODUCTION

Ants are social insects characterized by their numerical dominance in most terrestrial ecosystems. They occupy a wide range of ecological niches and have a considerable impact on ecosystem functioning. Ants are a part of terrestrial food webs at several levels, as herbivores, predators, mutualists (typified by interactions with another species that benefits both species), and detritivores (consumers of dead organic material). They play an important role in dispersion of several plant species (Handel et al. 1981). They are also considered to be ecological engineers because they can influence nutrient availability for other organisms living in their environment (Jones et al. 1994).

Many ant species are sensitive to environmental changes, and hence can be used as bio-indicators of ecosystem integrity (Andersen et al. 2002). Ants are advantageous for bio-monitoring because they have perennial nest sites and can therefore be resampled through time. Moreover they are easy to collect and standard methods are available to sample them (Agosti et al. 2000). Another useful attribute of ants is that their taxonomy is relatively well known (Bolton 1994). These characteristics make ants particularly suitable for rapid biodiversity assessments.

This RAP survey took place in the Birim North District of the Eastern Region of Ghana with the aim of contributing to a better understanding of the fauna and flora of the Ajenjua Bepo and the Mamang River forest reserves. During our investigations, we focused mainly on ants of the leaf litter, however ground-dwelling and arboreal species were not excluded.

STUDY SITES

Ants were sampled in two forests reserves within the Eastern Region of Ghana:

Site 1, Ajenjua Bepo (campsite at N 06° 22’ 2.3”, W 01° 01’ 58.6”), is a small forest of high elevation surrounded by farmland. The canopy of the forest is not entirely closed as a result of frequent tree felling. Leaf litter was sparse in this forest.

Site 2, Mamang River (campsite at N 06° 15’ 0.2”, W 01° 02’ 25.7”), contains low-elevation forest, and has a larger area than Ajenjua Bepo. The canopy was almost entirely closed and the soil was covered with a thick layer of leaf litter. Numerous rotting logs were also found in this forest.

Sampling was also conducted within food crop or cocoa plantations, several of which were located adjacent to these two sites.

Downloaded From: https://bioone.org/ebooks/ on 17 May 2024
Terms of Use: https://bioone.org/terms-of-use

METHODS

Two methods were used to collect ants, the Ants of Leaf Litter (ALL) protocol and hand collecting.

The ALL protocol (Agosti et al. 2000) is a standard method for measuring and monitoring ant biodiversity. It combines two of the numerous methods for collecting ants: the mini-Winkler extractor and pitfall traps. This technique addresses the ground and leaf litter-inhabiting ant fauna. At each sampling site, a 200 m transect was placed. Along this transect, 20 litter samples were collected within 1 m^2 quadrats at 10 m intervals. The litter was sieved and hung in mini-Winkler bags for 48 hours to extract the ants. Beside each quadrat (1 m apart), a pitfall trap (plastic drinking cup) was placed. The trap was filled to 25% of its volume with ethanol and a few drops of glycerine, and left active for 48 hours. The ethanol acts as a killing agent while the glycerine reduces evaporation during the active period.

Collecting by hand is a non-standardized method which involves searching for ants on tree trunks, low vegetation, under stones and dead logs, and in the leaf litter.

These collecting methods were used to sample ants in the two forest reserves and in the adjacent cocoa plantations. Each site was surveyed for five days and two transects were sampled at each of the two sites (one transect in the forest and the other in the cocoa plantations). Transects were located at close proximity to the RAP campsites.

RESULTS

Over the course of this RAP survey, we recorded a total of 125 ant species belonging to 40 genera and 11 subfamilies (Appendix 2) from the two sites combined. This ant fauna was dominated by species belonging to the subfamilies Myrmicinae (representing 57% of the total number of species), Ponerinae (21%) and Formicinae (11%). This ranking of ant subfamilies is expected in forest habitats within the tropics (see Bolton 1996, Brühl 2001, Yéo 2006) but in general the Formicinae become the second most dominant in more open habitats such as degraded forests and savannahs. We collected 98 species from the Ajenjua Bepo site (forest and plantations) and 101 species from the Mamang River site (forest and plantation). The species list is presented in Appendix 2.

For better comparison within and between these two sites, we explored the data from the standardized collecting method. Within Site 1 (Ajenjua Bepo), 84 species were collected using the ALL protocol (Winkler bags + pitfall traps). Among these, 64 species were recorded in the forest while 44 were found in the nearby cocoa plantation. These two habitats shared 24 species and the forest yielded the greater number of species restricted to one habitat-type only (40 species) while the cocoa plantation had 20. Within Site 2 (Mamang River), the ALL protocol yielded 77 species of which 69 species were collected in the forest while 43 species were found in the cocoa plantation. Out of these species, 34 were restricted to forest and only 8 species restricted to the cocoa plantation.

We recorded roughly the same number of species from both sites with Site 2 slightly richer (Appendix 2, Figure 2.1). Figure 2.1 shows a species accumulation curve comparing the different habitats within and between sites based on the results from the ALL protocol. In each site we found more species in the forest than in the nearby cocoa plantations. We also found that the Ajenjua Bepo forest habitat has nearly the same number of species as the forest habitat at the Mamang River site. The same pattern was observed for the cocoa plantations in both sites.

The chao-Jaccard index of similarity between the two sites is 0.81, this value was computed using EstimateS 7.5 (Colwell 2005) . The Chao-Jaccard index calculates the probability that two randomly chosen species, one from each of the sites, would both belong to a species shared among the two sites.

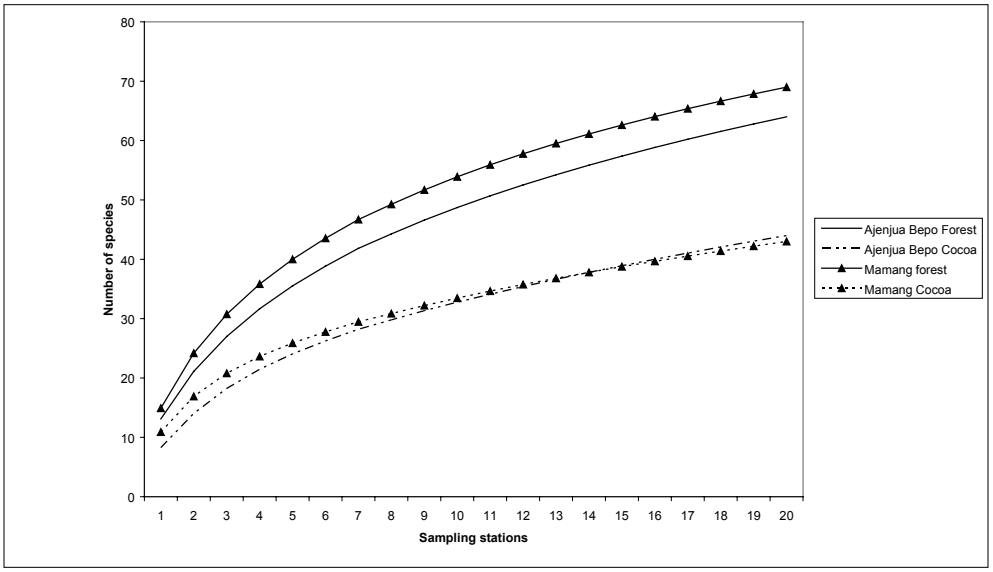

Figure 2.1. Ant species accumulation curve comparing the different habitats within and between two sites based on the results from the ALL protocol

Downloaded From: https://bioone.org/ebooks/ on 17 May 2024
Terms of Use: https://bioone.org/terms-of-use

DISCUSSION

The 125 species collected during this RAP survey represent about 31% of the total ant species know from Ghana (404 species as listed on the "Ants of Africa" Website http://antbase.org/ants/africa/). Comparatively Belshaw and Bolton (1994) recorded 197 species from a wide range of forest in Ghana including primary forest, secondary forest and cocoa plantations.

Our results show that the two sites surveyed are similar in term of ant species richness and composition. However in Mamang River, ants were more abundant in the traps than in Ajenjua Bepo. This may be attributed to the relatively better condition of the former forest reserve (thicker layer of leaf litter and a comparatively closed canopy).

The forest habitat of both sites still holds important ant diversity compared to the degraded areas represented by the cocoa plantations as shown in Figure 2.1. Typical forest species like *Pachycondyla pachyderma* and several species of the tribe Dacetini were found at both sites. The degraded areas around the forest in both sites contained species more characteristic of open areas, some known to often live close to human settlements. For instance *Camponotus acvapimensis*, *Lepisiota* sp.01, *Paratrechina weissi* (sp.01), *Paratrechina* sp.02 and *Tetramorium sericeiventre* were specific to the cocoa plantation at Site 1. At Site 2 *Monomorium pharaonis*, *Paratrechina longicornis* and *Tetramorium aculeatum* were found in the degraded plantation areas.

A good example of species association in relation to the two different habitats is offered by the two African species of the genus *Odontomachus*. We observed that *O. assiniensis* was abundant in the forest and rare in cocoa plantations whilst *O. troglodytes* showed the opposite pattern of abundance. *Odontomachus troglodytes* has also been reported to be dominant throughout cocoa growing areas in Nigeria (Taylor 1976).

During this survey we collected seven individuals of *Apomyrma stygia* (single described species from the subfamily Apomyrminae) at Mamang River. Initially known only from Lamto in Côte d'Ivoire, the distribution of this species is widening as new records are being made. This is its second record in Ghana as Belshaw and Bolton (1994) found a sole worker at Esukawkaw Forest Reserve. Another worker of this species was collected in Benin (Bolton, pers. comm.). This species seems to be associated with moist and semi-deciduous forest in West Africa.

CONSERVATION RECOMMENDATIONS

- Despite heavy forest clearing, typical forest species of ants remain in forest patches on the hilltops of the Ajenjua Bepo, indicating that this area still maintains important habitat for biodiversity and should be preserved.
- In Mamang River, the relatively good quality of the forest is threatened by a significant network of human footpaths that provides easy invasion for non-forest ants. Such invasive elements can disturb ecosystem function.
- The loss of habitat for forest ant species means that plants and animals that depend on them for protection (e.g. myrmecophytes) or food (e.g. certain lizards and amphibians) could be adversely affected.

REFERENCES

Agosti, D. and L.E. Alonso, 2000. The ALL protocol. Pp 204-206. *In:* Agosti, D., J.D. Majer, L.E. Alonso and T.R. Schultz (eds.). ANTS: Standard methods for measuring and monitoring biodiversity. Smithsonian Institution Press, Washington, DC.

Andersen, A.N., D.B. Hoffmann, J.W. Müller and D.A. Griffiths. 2002. Using ants as bioindicators in land managements: simplifying assessment of ant community responses. Journal of Applied Ecology 39: 8-17.

Belshaw, R. and B. Bolton. 1994. A survey of leaf litter ant fauna in Ghana, West Africa (Hymenoptera: Formicidae). Journal of Hymenoptera Research 3: 5-16.

Bolton, B. 1994. Identification guide to ant genera of the world. Harvard University Press.

Bolton, B. 1996. A preliminary analysis of the ants (Formicidae) of Pasoh forest reserve. Pp 84-95. *In:* Lee, S.L., Y.M. Dan, I.D. Gauld and J.B. Bishop (eds.), Conservation Management and Development of Forest. Proceedings of the Malaysia-United Kingdom Programme workshop. Frim, Kuala, Lumpur.

Brühl, C.A. 2001. Leaf litter ant communities in tropical lowland rain forests in Sabah, Malaysia: effects of forest disturbance and fragmentation. Doctorate thesis, University of Würzburg.

Colwell, R.K. 2005. EstimateS: Statistical estimation of species richness and shared species from samples. Version 7. Persistent URL: purl.oclc.org/estimates

Handel, S.N., S.B. Fisch and G.E. Schatz. 1981. Ants disperse a majority of herbs in a mesic forest community in New York State. Bulletin of the Torrey Botanical Club 108: 430-437.

Jones, C.G., J.H. Lawton and M. Shachak. 1994. Organisms as ecosystem engineers. Oikos 69: 373-386.

Taylor, B. 1976. Ants of the Nigerian Forest Zone (Hymenoptera: Formicidae). I. Ponerinae, Cerapachyinae, Pseudomyrmecinae. Cocoa Research Institute of Nigeria Technical Bulletin Series 4: 1-41.

Yéo, K. 2006. Dynamique spatiale et diversité des fourmis de la litière et sol dans une mosaïque forêt-savane en Côte d'Ivoire. Unpublished PhD thesis Paris: Université Pierre et Marie Curie.

Downloaded From: https://bioone.org/ebooks/ on 17 May 2024
Terms of Use: https://bioone.org/terms-of-use