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Chapter 4

A rapid assessment of the ants of the Boké region, Guinea

Yéo Kolo

INTRODUCTION

It is well known that tropical forests contain the majority of known terrestrial animal and plant species as well as many species yet to be discovered. Unfortunately, these forests are also under increasing pressures for human use, causing forest fragmentation and destruction. The loss of forest habitats can lead to the extinction of endemic species.

Forest loss is occurring throughout Africa, including in the Guinean Forest region, notably in the northeastern part of Guinea, which is called "Guinée Maritime". In this part of Guinea, the forest is under pressures from shifting agriculture and mining.

Faced with unprecedented levels of degradation, there is no doubt that this region should be considered as a hotspot for biological diversity. It is thus important to conduct inventories in order to know more about the species found in this area, which can aid in developing conservation strategies for areas that are directly impacted by humans.

The objective of the scientific expedition organized by Conservation International's Rapid Assessment Program (RAP) was to provide an account of the biological diversity of three sites in the Boké region of Guinée Maritime and to make recommendations concerning the conservation of the species found there.

Several plant and animal taxonomic groups are used as biological indicators to evaluate and monitor environmental quality. Among the insects, ants (Hymenoptera: Formicidae) have been used as tools for natural resource management. Numerous studies have shown that ants can be useful for evaluating the status of ecosystems in which they live (Alonso 2000, Andersen 2000, Kaspari and Majer 2000).

Ants are grouped among the social insects, which also include bees, termites and a few other insect groups. Ants are present in all terrestrial habitats. Ants are important in many ecosystem functions, particularly in trophic networks as a predator of other arthropods and as an almost unlimited food source for vertebrates such as frogs, lizards, birds, bats and other insectivorous mammals. Ants also have a great impact on the formation of soil through their movement of soil particles (Folgarait 1998).

For these reasons, ants were included in the RAP biodiversity survey in Guinea. In addition to providing information for conservation, this study on ant diversity is also important since it greatly enhances our scientific knowledge of ants in this region, as no studies on ants have been done here previously. The nearest location for which ant data are available is Bolama in Guinée Bissau (about 100 km from this study area). Therefore this RAP survey provided the opportunity to find endemic ant species that are potentially threatened by the high level of forest degradation in the area.

STUDY SITES

Three sites within the Boké Préfecture were surveyed during this RAP expedition:

1) **Sarabaya (Rio Kapatchez)** (April 23-28, 2005)

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This site was located in the sub-prefecture of Kolabui and the district of Sarabaya, approximately 21.4 km southwest of the village of Kamsar. Ants were collected from three sub-sites at this site:

- The village of Sarabaya (N10°45'297"; W14°25'546"), several collections of ant species near human settlements,
- Batipon (N10°45'206"; W014°26'428"), collections made in fallow land approximately 6-9 years old, located 1.83 km from Sarabaya,
- Soureto (N10°43'191"; W014°27'553"), a small island frequently visited by local people since it is close to rice fields, consists of palm trees, located 4.35 km from Sarabaya not far from the village of Wamounou.

2) Kamsar (April 29–May 3, 2005)
Five sub-sites were surveyed:

Taïgbé West (N10°37'108"; W014°35'535"), an island located 4.65 km from the village of Kamsar consisting of mangroves, several rivers, natural stands of oil palm, and the village of Taïgbé. The freshwater on this island was affected by seawater and had a salty taste.

Taïgbé East (N10°37'322"; W014°34'061"), another island pertaining to the district of Taïgbé, consisting of mangroves, rivers, natural stands of oil palm, a small herbaceous savanna, and the village of N'Tègbè.

Kaiboutou (Kamsar southeast) (N10°37'331"; W014°31'353"), a site mainly composed of fallow land and fields currently being cleared, located near to the village of Kaiboutou.

Tarénsa (Kamsar north) (N10°44'164"; W014°33"244"), samples taken from savanna and a small gallery forest bordering mangroves near Tarénsa village.

Kataméne (N10°52'388"; W014°22'388"), site consisting of savanna with trees and mangroves bordering the sea.

3) Boulléré (Sangaredi sub-prefecture)(May 4-9, 2005; N11°07'091"; W013°57'358"), consisting of savanna with trees. The vegetation was highly disturbed by agriculture due to a number of settlements in the area.

MATERIALS AND METHODS

Two types of methods were used to sample ants: the ALL (Ants of the Leaf Litter) Protocol and manual collecting.

Sampling Methods

ALL Protocol (Agosti and Alonso 2000)
This protocol combines two methods of collecting ants: winkler sacs and pitfall traps (Martin 1983). This is a method for rapid survey of ants carried out by first collecting 20 samples of leaf litter from 1m^2 quadrats separated 10 meters apart along a 200m (x 10m wide) transect. In each quadrat, the litter collected is sifted in a special sifter that not only separates out the large and small pieces of litter but also concentrates the fauna in the sample. Next, a pitfall trap, consisting of some type of cup, is placed in the soil near each quadrat to collect foraging ants (Bestelmeyer et al. 2000). Each pitfall trap is filled up to a quarter of its volume with a mixture of ethanol and glycerol (Greenslade and Greenslade 1971) or with ethylene glycol (Abensperg et al. 1995). The ethanol and ethylene serve to kill and preserve the specimens and the glycerol/glycol prevents evaporation of the ethanol. One can also use soapy water. The pitfall traps are left active for a 48-hour period. During this RAP survey, the pitfall traps used consisted of 350 ml plastic drinking cups filled with a mixture of ethanol and glycerol.

The collected litter is taken to the "laboratory" tent and placed in mesh bags and suspended inside a cotton "winkler sac" for 48 hours in order to extract the organisms that migrate to the bottom of the sac and fall into a cup of alcohol. The protocol permits the collection of around 70% of the ant fauna from the litter (Agosti and Alonso 2000).
At Sarabaya (Site 1), two transects were sampled, each consisting of 20 leaf litter samples (processed through the winkler sacs) and 20 pitfall traps for a total of 40 leaf litter and 40 pitfall samples. At the Kamsar site (Site 2), where the RAP team surveyed five sub-sites, we did not have time to carry out the ALL protocol since we only had one day at each sub-site. At these sites we concentrated on manual collecting in all microhabitats at each sub-site. Due to extremely dry litter at Boulléré (Site 3), the winkler method was not very effective and thus only one leaf litter transect was done at this site for total of 20 leaf litter (winkler) and 40 pitfall samples.

Manual Collections
Along each 200m winkler/pitfall transect, ants were collected by hand using forceps in a wide range of microhabitats to maximize the diversity of ants collected. Habitats investigated included live and dead tree trunks, under tree bark, under dead logs and rocks, in old termite mounds, and on trees and bushes. We also did manual collecting in the villages to determine the ant species living near humans.

Data Analysis
Data were analyzed using the data software Ecological Methodology version 6.1 (Krebs 2002). The Morisita Horn index was used to calculate similarity in the ant fauna between sites. Estimation of ant species richness from quadrat samples was obtained using the Jackknife method (Heltshe and Forrester 1983) within the Program RICHNESS, Version 6.0.

Species Identification
In order to identify the ant specimens, specimens (especially the small ones) were first mounted and examined under a microscope in the laboratory. Ants were then identified to

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genus using the keys of Bolton (1994) and then to morpho-species. Identification to species is most difficult since few keys are available so two approaches were used: 1) digital photos of specimens were taken and sent to colleagues for identification, and 2) specimens were compared to type specimens in museums.

RESULTS

During the RAP survey, we collected about 6000 ant specimens representing 85 species in 31 genera and 8 sub-families (Figure 4.1, Table 4.1). Most of the specimens were identified only to morpho-species. The list of species collected at each site is presented in Table 4.2.

A total of 110 ant species was estimated for the Boké region using the Jackknife method (Table 4.3). Our collection of 85 species thus represents about 77.3% of the estimated ant fauna of Boké.

Of the 85 ant species recorded, 38 species (44.7%) were found at only one site while 47 species (55.3%) were recorded in at least two sites. Table 4.4 lists the similarity indices between sites and shows that the ant fauna was similar among the three sites surveyed. This result is supported by the high number of species recorded at more than one site (55.7%).

At the Kamsar site (Site 2), the RAP team surveyed five sub-sites and thus it is important to compare among these sites. Table 4.5 lists the number of ant species recorded at each sub-site. A total of 70 species is estimated for the Kamsar site overall, based on 52 species recorded (Table 4.6). We thus recorded about 74.3% of the estimated ant fauna at this site. Among the 52 species recorded, 30 (57.7%) were found at more than one sub-site. Table 4.7 gives the similarity indices between the sub-sites.

DISCUSSION

The ant fauna recorded in the Boké region during the RAP survey is dominated by the genera *Camponotus* and *Crematogaster*, followed by *Monomorium* and *Pheidole*. Species of the tribe Dacetini, which are characteristic of closed canopy forest, were rarely recorded during the RAP survey, thus indicating the disturbed nature of the forests surveyed. In a global context, these results show that the ant fauna of this region, which was mostly unexplored prior to this RAP survey, is typical of the West African ant fauna, although some of the recorded species may be new to science especially in the genera *Crematogaster* and *Pheidole*.

The comparison of the three survey sites indicates that the three sites are fairly similar in species richness and composition, although a few more species were recorded at Sarabaya (Table 4.2). However, 44.7% of the ant species were recorded at only one of the sites, which also indicate some differences between sites. Further surveys are thus needed to investigate if these species are found at the other sites. Furthermore, the RAP survey took place during the dry season and we might have missed some species due to the dry conditions. Additional surveys in the wet season are warranted.

At the Kamsar site (Site 2), the comparison between sub-sites indicates that Taïgbé West, Taïgbé East and Kaiboutou have similar ant faunas while Tarénsa and Kataméne are different from each other and from the other three sites. The differences may be due to the fact that the two latter sites are located on islands and thus have soils with higher salinity than the other three sites. Soil and leaf litter ants may thus be deterred from nesting in these areas. Kateméne was particularly different from the other sites and had the lowest species richness, perhaps indicating that conditions are not suitable at this site for ants.

Many ants are predators of termites. Some ant species, such as *Pachycondyla analis*, even specialize on eating only termites. During the RAP survey we frequently observed two species of *Crematogaster* (sp. 5 and sp. 11 from Table 4.2) raiding termite nests and carrying off the termites and their brood. Occasionally we also observed ants and termites coexisting. At the Kataméne sub-site at Site 2, we observed on four occasions the species *Camponotus* sp. 1 living with a termite colony probably of the genus *Cubitermes*. Inside the nest, the two colonies appeared to mix. This symbiosis is unusual even though *Camponotus* is not usually predaceous. This interesting association may benefit one or both of the species; the ants benefit from a dry nesting site and the termites benefit from the protection that the ants may provide against predaceous ants. Further research is needed to more fully understand this association.

CONCLUSIONS AND RECOMMENDATIONS

The Boké region contains an interesting ant fauna and warrants further study in the wet season, when ants are more active and can thus be observed and more easily collected using the winkler method. Conservation recommendations include:

- Study and conserve the interesting ant-termite association at the Kataméne site.
- Create a community forest at the Sarabaya site to promote regeneration of natural vegetation in the fields that can serve as a refuge for the ant fauna.
- Educate the local population about the dangers of setting brush fires late in the season (too close to the dry season) since they can get out of control.
- Enlarge the gallery forest along river at Boulléré through reforestation.

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Table 4.1. Taxonomic distribution of the ant species recorded.

	Sub-families	Genera	No. of Species
Sub-Families Dorylomorph	Aenictinae	*Aenictus*	2
	Dorylinae	*Dorylus*	2
	Dolichoderinae	*Tapinoma*	2
		Technomyrmex	2
		Agraulomyrmex	1
		Anoplolepis	1
		Camponotus	11
		Lepisiota	4
		Oecophylla	1
		Paratrechina	1
		Phasmomyrmex	1
Sub-Families Formicomorph	Formicinae	*Polyrhachis*	3
Sub-Families Myrmeciomorph	Pseudomyrmecinae	*Tetraponera*	1
Sub-Families Myrmicomorph	Myrmicinae	*Atopomyrmex*	1
		Cardiocondyla	1
		Cataulacus	2
		Crematogaster	11
		Leptothorax	1
		Monomorium	8
		Myrmicaria	1
		Oligomyrmex	2
		Pheidole	8
		Pristomyrmex	1
		Strumigenys	1
		Tetramorium	5
Sub-Families Poneromorph	Ponerinae	*Hypoponera*	2
		Leptogenys	1
		Odontomachus	1
		Pachycondyla	5
		Platythyrea	1
	Proceratinae	*Discothyrea*	1
TOTAL	**7**	**31**	**85**

Table 4.2. List of ant species recorded at each RAP site.

	Sarabaya	Kamsar	Boulléré
Aenictus sp.1	0	1	0
Aenictus sp.2	0	1	0
Agraulomyrmex sp.1	1	0	0
Anoplolepis sp.1	1	1	1
Atopomyrmex sp.1	0	1	0
Camponotus acvapimensis (sp.3)	1	1	1
Camponotus sp.1	1	1	0
Camponotus sp.10	0	1	0
Camponotus sp.11	0	0	1
Camponotus sp.2	1	1	1
Camponotus sp.4	1	1	1
Camponotus sp.5	1	1	1

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	Sarabaya	Kamsar	Boulléré
Camponotus sp.6	1	0	0
Camponotus sp.7	1	0	0
Camponotus sp.8	1	1	1
Camponotus sp.9	0	1	0
Cardiocondyla sp.1	1	0	0
Cataulacus sp.1	1	1	0
Cataulacus sp.2	1	1	0
Crematogaster sp.1	1	1	0
Crematogaster sp.10	0	1	1
Crematogaster sp.11	0	1	0
Crematogaster sp.2	1	1	1
Crematogaster sp.3	1	1	1
Crematogaster sp.4	1	1	1
Crematogaster sp.5	1	1	1
Crematogaster sp.6	1	0	0
Crematogaster sp.7	1	0	0
Crematogaster sp.8	0	1	0
Crematogaster sp.9	0	1	1
Discothyrea sp.1	1	0	0
Dorylus sp.1	0	1	1
Dorylus sp.2	0	0	1
Hypoponera sp.1	1	0	0
Hypoponera sp.2	1	0	1
Lepisiota sp.1	1	1	1
Lepisiota sp.2	1	1	0
Lepisiota sp.3	1	1	0
Lepisiota sp.4	0	0	1
Leptogenys conradti (sp.1)	1	0	1
Leptothorax sp.1	0	0	1
Monomorium afrum (sp.3)	1	1	1
Monomorium bicolore (sp.2)	1	1	1
Monomorium individium (sp.5)	1	0	0
Monomorium sp.1	1	1	1
Monomorium sp.4	1	0	1
Monomorium sp.6	0	1	0
Monomorium sp.7	0	0	1
Monomorium sp.8	0	0	1
Myrmicaria sp.1	0	1	0
Odontomachus troglodytes	1	1	1
Oecophylla longinoda	1	1	0
Oligomyrmex sp.1	1	0	0
Oligomyrmex sp.2	0	0	1
Pachycondyla analis (sp.3)	1	0	1
Pachycondyla caffraria (sp.2)	1	0	1
Pachycondyla soror (sp.5)	1	0	1
Pachycondyla sp.1	1	1	1
Pachycondyla tarsata (sp.4)	1	1	1
Paratrechina sp.1	1	1	1
Phasmomyrmex sp.1	0	1	1

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	Sarabaya	Kamsar	Boulléré
Pheidole sp.1	1	1	1
Pheidole sp.2	1	1	1
Pheidole sp.3	1	1	1
Pheidole sp.4	1	0	0
Pheidole sp.5	1	1	1
Pheidole sp.6	0	1	0
Pheidole sp.7	0	1	0
Pheidole sp.8	0	0	1
Platythyrea sp.1	0	1	0
Polyrhachis schistacea (sp.3)	0	1	0
Polyrhachis sp.1	1	0	0
Polyrhachis sp.2	1	0	0
Pristomyrmex orbiceps	1	0	0
Strumigenys sp.1	1	0	0
Tapinoma sp.1	1	1	0
Tapinoma sp.2	1	1	1
Technomyrmex sp.1	1	0	0
Technomyrmex sp.2	1	0	1
Tetramorium aculeatum (sp.2)	1	1	1
Tetramorium sericeiventre (sp.1)	1	1	1
Tetramorium sp.3	1	1	1
Tetramorium sp.4	1	0	1
Tetramorium sp.5	1	0	0
Tetraponera sp.1	1	1	1
TOTAL 85	**60**	**52**	**47**

Table 4.3. Estimates of ant species richness for the Boké region using

Number of species observed	Number of estimated species	Standard deviation	Confidence interval
85	110,3	5,21	[87,9 ; 132,7]

Table 4.4. Matrix of Morita-Horn similarity indices comparing the ant fauna between the three RAP sites in the Boké region.

	Sarabaya	Kamsar	Boulléré
Sarabaya	1	-	-
Kamsar	0,628	1	-
Boulléré	0,576	0,571	1

Table 4.5. Number of ant species recorded at each sub-site at Kamsar (Site 2).

Taïgbé Ouest	Taigbé Est	Kaiboutou	Tarénsa	Kataméne
29	22	22	23	23

Table 4.6. Estimates of ant species richness for RAP Site 2 (Kamsar) using the Jackknife method.

Number of species observed	Number of estimated species	Standard deviation	Confidence interval
52	69,6	6,01	[52,9 ; 86,3]

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Table 4.7. Matrix of Morita-Horn similarity indices comparing the ant fauna between the five sub-sites of Kamsar (Site 2).

	Taïgbé Ouest	Taïgbé Est	Kaiboutou	Tarénsa	Kataméne
Taïgbé Ouest	1				
Taïgbé Est	0,549	1			
Kaiboutou	0,627	0,682	1		
Tarénsa	0,500	0,400	0,578	1	
Kataméne	0,500	0,444	0,489	0,478	1

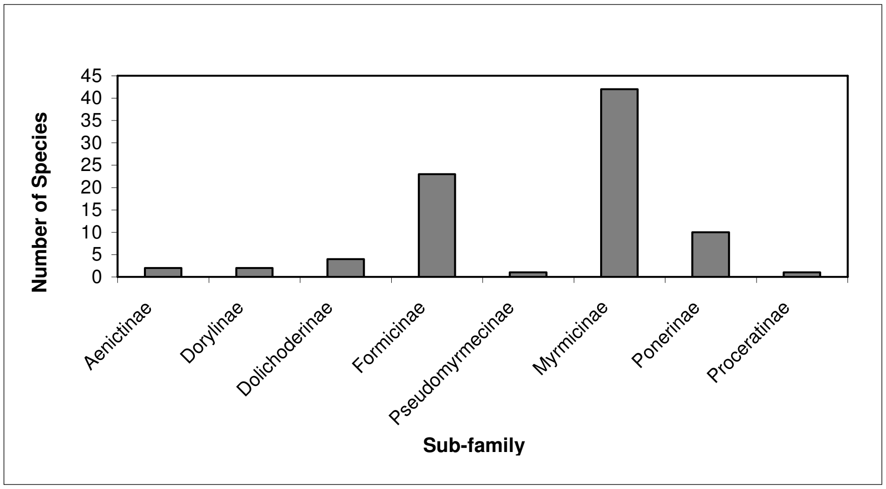

Figure 4.1. Abundance of ant sub-families collected in the Boké Prefecture.

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