A Survey of Katydids (Insecta: Orthoptera: Tettigoniidae) of Ajenjua Bepo and Mamang River Forest Reserves, Eastern Region of Ghana

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Chapter 4

A survey of katydids (Insecta: Orthoptera: Tettigoniidae) of Ajenjua Bepo and Mamang River Forest Reserves, Eastern Region of Ghana

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SUMMARY

Fifty-six species of Tettigoniidae were collected, of which 13 are new to science, and, in addition to these, 12 are new species records for Ghana. Ajenjua Bepo shows a higher species count (50 species) than Mamang River (33 species), most likely a result of higher fragmentation of the habitat and a stronger edge effect in Ajenjua Bepo compared to that within Mamang River.

INTRODUCTION

Katydids (Orthoptera: Tettigoniidea) have long been recognized as organisms with a significant potential for their use in conservation practices. Many katydid species exhibit strong microhabitat fidelity, low dispersal abilities (Rentz 1993a), and high sensitivity to habitat fragmentation (Kindvall and Ahlen 1992) thus making them good indicators of habitat disturbance. These insects also play a major role in many terrestrial ecosystems as herbivores and predators (Rentz 1996). They are themselves a principal prey item for several groups of invertebrates and vertebrates, including birds, bats (Belwood 1990), and primates (Nickle and Heymann 1996). At the same time many species of katydids are threatened and some appear to have already gone extinct (Rentz 1977).

The conservation value of katydids has been recognized in Australia (Rentz 1993b) and Europe, leading to the development of captive breeding programs (Pearce-Kelly et al. 1998), listings on country (Glowacinski and Nowacki 2006) and global Red Lists (IUCN 2006), and introduction of regulations aimed at their conservation. But their use as conservation tools or targets of conservation actions in tropical regions, where their importance and the level of endangerment are the highest, is hampered by the lack of baseline data on katydid distribution as well as the shortage of katydid expertise and identification tools, a phenomenon known as the taxonomic impediment. It is therefore critically important that more effort is directed towards basic faunal surveys of katydids across the tropics, thus creating the basis on which a successful conservation strategy for these animals can be built. Such surveys, if conducted in pristine or relatively undisturbed areas, also provide reference data which can later be used in habitat monitoring or restoration efforts that should follow any industrial or agricultural activity. West African ecosystems are in particular need of extensive biotic surveys, being not only some of the least studied tropical habitats, but also as they are subject to widespread, poorly regulated, and often illegal logging, mining activities, and slash-and-burn agricultural practices. This results in a rapid decline of available natural habitats, and thus an inevitable loss of the biodiversity.

The following report presents the results of a survey of katydids conducted between August 24 and September 4, 2006 at sites within the Ajenjua Bepo and Mamang River forest reserves in the Eastern Region of Ghana. This is only the second systematic survey of katydids in this country, following a rapid assessment survey of the Atewa Range in June 2006, and its results indicate the presence of a rich and unique Ghanaian fauna of the Tettigoniidae. Prior to these two RAP surveys, the only published records of katydids in Ghana are those in the works of Beier (1965), Bolivar (1886, 1890, 1906), Karsch (1888, 1890), Ragge (1962, 1980), and Redtenbacher (1891) who collectively recorded only 13 species of katydids from this country.

The Atewa Range survey documented 61 species, of which at least 36 were new to Ghana, and 8 were new to science (Naskrecki 2007). The present survey adds 12 species that are new records for Ghana, and 13 species new to science.

METHODS AND STUDY SITES

The first area covered by the survey, Ajenjua Bepo, is classified as a moist semi-deciduous forest with a total area of 5.69 km^2. Approximately 0.74 km^2 of the forest lies within a proposed mining area. The overall condition of the forest indicated heavy disturbance due to logging, fire damage, and agricultural activity. Nonetheless, parts of the reserve still support pockets of natural forest, with stands of large, mature trees. In addition to sampling within the forest, katydids were collected on the fringes of the forest along roads and within the plantain plantation inside the reserve.

The second survey area was Mamang River. The reserve covers an area of 53 km^2. The forest within the reserve was assessed as Condition 2, reflecting relatively low disturbance and the presence of a large number of mature trees. The area sampled during the present survey was bordering on cocoa, plantain, and citrus plantations. Katydids were collected both deep within the forest and on its edges bordering on the plantations.

During the survey three collecting methods were employed for collecting katydids: (1) collecting at incandescent and mercury vapor (MV) lights at night, (2) visual search at night, and (3) net sweeping of the understory vegetation during the day and at night.

Net sweeping was employed in the vegetation along the roads within the forest, the forest understory, and natural openings within the forest, such as edges of (dried) streams. This method was highly effective for collecting seed-feeding katydids in tall grasses as well as a number of arboreal katydids that cling upside-down to the lower surface of leaves. Sweeping was standardized by performing five consecutive sweeps in a series before the contents of the net were inspected. By far the most effective method of collecting, both in terms of the number of species collected and number of collected specimens, was the visual search at night. Most of the collecting was conducted after dark, between the hours of 8 pm and 2 am when the activity of virtually all katydid species is the highest. Yet day collecting along the forest roads also yielded several interesting species, including one (*Ruspolia* sp. 1), the presence of which may indicate an encroachment of savanna elements into the reserve. The MV collecting was done nightly between approximately 8 pm and 11 pm. This method yielded a number of canopy-inhabiting Phaneropteridae, Meconematidae, and some Pseudophyllidae.

In addition to physical collection of specimens, stridulation of acoustic species was recorded using the Sony MZ-NHF 800 digital recorder and a Sennheiser shotgun microphone. These recordings are essential to establish the identity of potential cryptic species, in which morphological characters alone are not sufficient for species identification. An ultrasound detector Pettersson D 200 was also used to locate species that produce calls in the ultrasonic range, undetectable to the human ear.

Representatives of all encountered species were collected and voucher specimens were preserved in 95% alcohol and as pinned, dry specimens. These specimens will be deposited in the collections of the Museum of Comparative Zoology, Harvard University and the Academy of Natural Sciences of Philadelphia (the latter will also become the official repository of the holotypes of several new species encountered during the present survey upon their formal description.)

The main collecting site within the Ajenjua Bepo Forest Reserve was located at 6°22'2.3"N, 1°1'58"W, at the elevation of 300 m. Sampling was conducted there during the period of August 24-30, 2006. The surroundings of the site contained a relatively undisturbed forest as well as plantain and cocoa plantations.

The second major collecting site was located within the Mamang River Forest Reserve at 6°15'1.4"N, 1°2'25.4"W, at the elevation of approximately 130 m. Sampling was conducted there between August 31 and September 4, 2006. The dominant habitat was a relatively undisturbed deciduous forest, bordering on cocoa, citrus, and plantain plantations. Collecting was done both within the forest and along its edge.

RESULTS

The survey resulted in the collection of 56 species of katydids, the second highest number of katydids known from a single location anywhere in Africa, following only the results of the survey in the Atewa Range. Many collected species represent new records for Ghana, and 12 species are new to science. Many species listed here appear to have a wide, West African distribution, having been recorded from sites in Cameroon and Guinea. Their presence in Eastern Ghana supports this notion, and fills a gap in our knowledge of West African biogeography. A full list of recorded taxa is given in Table 4.1, and below I comment only on new or particularly interesting species. When a discussed species was recorded from only one site, this is indicated at the end of the description by (AB) or (MR) for Ajenjua Bepo and Mamang River respectively.

Family Phaneropteridae

This group of katydids includes most species restricted to the canopy level of the forest. Many are excellent fliers, and can be collected at night using UV, MV, or incandescent lights. Some are diurnal and can be heard calling during the day from tall trees. All members of this family are exclusively herbivorous. Twenty-seven species of this family were found during this survey.

Catoptropteryx extensipes Karsch, 1869 – This species was originally described from Lolodorf in Cameroon, and this is its first record from Ghana (AB).

Table 4.1. Katydids recorded from the Ajenjua Bepo and Mamang River forest reserves, Eastern Region of Ghana

	Species	Site 1 (Ajenjua Bepo FR)	Site 2 (Mamang River FR)	New to Ghana	New to science
	Conocephalidae				
1	*Conocephalus carbonarius* Redtenbacher	x	x		
2	*Thyridorhoptrum* sp. n.		x		x
3	*Ruspolia* basiguttata (Bolivar)	x	x		
4	*Plastocorypha vandicana* Karsch		x	x	
	Listroscelididae				
5	*Hexacentrus alluaudi* Bolivar	x	x	x	
	Meconematidae				
6	*Amyttosa insectivora* Naskrecki	x	x		x
7	*Xiphidiola hokei* Naskrecki	x	x		x
8	*Xiphidiola lobaticerca* Naskrecki	x			x
9	*Xiphidiola pulchra* Beier	x		x	x
10	*Amyttopsis palmulicerca* Naskrecki	x			x
11	*Amyttopsis bakowskii* Naskrecki	x	x		x
12	*Anepitacta guentheri* Gorochov	x		x	
13	*Gonamytta occidentalis* (Karsch)	x	x		
	Mecopodidae				
14	*Afromecopoda frontalis* (Walker)	x	x		
15	*Afromecopoda* sp. n.	x	x		x
16	*Corycoides abruptus* (Krauss)	x	x		
	Phaneropteridae				
	Ducetia fuscopunctata Chopard	x	x		
17	*Vossia obesa* Br.-Watt.	x			
18	*Phaneroptera nana* Stal	x			
19	*Arantia retinervis* Karsch	x	x		
20	*Arantia rectifolia* Br.-Watt.	x	x		
21	*Arantia* sp. n.	x	x	x	x
22	*Arantia melanotus* Sjostedt	x		x	
23	*Arantia manca* Bolivar	x	x	x	
24	*Arantia brevipes* Chopard		x	x	
25	*Arantia angustipennis* Chopard	x	x	x	
26	*Catoptropteryx capreola* Karsch	x	x		
27	*Catoptropteryx apicalis* Bolivar	x			
28	*Catoptropteryx occidentalis* Huxley	x	x		
29	*Catoptropteryx extensipes* Karsch	x		x	
30	*Catoptropteryx punctulata* Karsch	x			
31	*Eurycorypha* sp. 3	x			
32	*Eurycorypha* sp. 4	x			
33	*Cestromecha mundamensis* Karsch	x			
34	*Dapanera genuteres* Karsch	x	x		
35	*Dapanera* sp. n.	x			x

	Species	Site 1 (Ajenjua Bepo FR)	Site 2 (Mamang River FR)	New to Ghana	New to science
36	Phaner. Gen. 4 sp. 1		x		
37	*Preussia lobatipes* Karsch		x		
38	*Poreumena lamottei* Chopard		x	x	
39	*Tetraconcha* sp. 1	x			x
40	*Mangomaloba latipennis* Chopard	x			
41	*Plangiopsis* sp. 1	x			
42	*Plangiopsis semiconchata* Karsch	x			
43	*Zeuneria melanopeza* Karsch	x			
	Pseudophyllidae				
44	*Stenampyx annulicornis* Karsch	x			
45	*Tomias hadrus* (Karsch)	x	x		
46	*Tomias gerriesmithae*Naskrecki		x		x
47	*Adapantus bardus* Karsch	x	x		
48	*Adapantus prgerorurm*Naskrecki	x			x
49	*Habrocomes lanosus* Karsch	x	x		
50	*Mormotus* sp. 1	x	x		
51	*Mormotus clavaticercus* Karsch	x	x		
52	*Tympanocompus erectistylus* (Karsch)	x	x		
53	*Mustius afzelli* Stal	x	x		
54	*Zabalius apicalis* (Bolivar)	x			
55	*Zabalius lineolatus* (Stal)	x			
56	*Cymatomera modesta* Chopard	x		x	
	Totals	**50**	**33**	**12**	**13**

Arantia spp. – Seven species of this genus were recorded, one of which is new to science; in addition to the new one, four species are new to Ghana. They were all associated with tall understory vegetation within the forest as well as tall, broad-leaved plants along the roads.

Preussia lobatipes Karsch, 1890 – This species was previously reported from the Atewa Range Forest Reserve (Naskrecki 2007). During the present survey a single female was collected at the Mamang River (MR).

Family Conocephalidae

The Conocephalidae, or the conehead katydids, include a wide range of species found in both open, grassy habitats, and high in the forest canopy. Many species are obligate graminivores (grass feeders), while others are strictly predaceous. A number of species are diurnal, or exhibit both diurnal and nocturnal patterns of activity. Four species of this family were recorded.

Conocephalus carbonarius Redtenbacher, 1891 – This species is one of the few true forest species of the genus. Individuals of *C. carbonarius* were common in the understory of forests at both sites, but were particularly abundant along roads and in herbaceous vegetation along the edges of the forest. Unlike most species of the genus *Conocephalus*, males of *C. carbonarius* are active both day and night, singing from vegetation very low to the ground. This species appears to be predominantly predaceous. It was originally described from Ghana (Redtenbacher 1891), and was subsequently found in Guinea (Chopard 1954).

Plastocorypha vandicana Karsch, 1896 – This is the first record of this species from Ghana. It is a forest specialist, found only in relatively undisturbed habitats (MR).

Family Listroscelididae

Within Africa this family is represented by only 13 species, all obligate predators of insects. In West Africa only the genera *Hexacentrus* and *Afrophisis* have been recorded.

Hexacentrus alluaudi Bolivar, 1906 – This is the first record of this species from Ghana; it was previously known only from the type specimens collected in Côte d'Ivoire (Bolivar 1906.)

Family Meconematidae

This poorly studied family includes some of the smallest species of katydids, and many appear to be exclusively predaceous. Nearly all species of Meconematidae are arboreal, nocturnal, and extremely agile, making it very difficult to collect them (many are flightless, and thus rarely come to lights at night.) Five species were recorded, all representing yet undescribed species.Eight species of the genera *Amyttopsis, Amyttosa, Gonamytta* and *Xiphidiol*a were recorded,five representing species new to science (since described in Naskrecki 2008b.). They appear to be associated with the forest canopy, and could only be collected by using the MV lamp at night.

Family Mecopodidae

Three species of this exclusively tropical group of katydids were found during this survey. Most of its species are associated with humid forests, and all species appear to be herbivorous. No members of this family have ever been recorded from Ghana, although their presence there is not surprising as they are known from most of the neighboring countries.

Afromecopoda spp. – Two species of this genus were collected, and one appears to represent a species new to science. *A. frontalis* (Walker) was found to be common at both sites. Members of this genus are some of the few West African katydids associated with leaf litter and the bottom of evergreen and deciduous forests.

Corycoides abruptus (Krauss, 1890) – This interesting species is known only from the holotype from an unknown locality and a handful of specimens collected in Guinea (Chopard 1954). It was also recorded during the previous RAP survey in the Atewa Range in SE Ghana (Naskrecki 2007). Within the sampling sites it was common along the edge of the forest on trees, where males were heard calling at night from the height of 3-5 m above the ground. An opportunistic insectivory was observed in this species, the first such case among species of the family Mecopodidae.

Family Pseudophyllidae

Virtually all members of tropical Pseudophyllidae can be found only in forested, undisturbed habitats, and thus have a potential as indicators of habitat changes. These katydids are mostly herbivorous, although opportunistic carnivory was observed in some species. Many are confined to the upper layers of the forest canopy, and never come to lights, making it difficult to collect them. Fortunately, many of such species have very loud, distinctive calls, and it is possible to document their presence based on their calls alone, a technique known well to ornithologists. Twelve species of this family were collected during the present survey.

Cymatomera modesta Chopard, 1954 – The genus *Cymatomera* is a primarily East African taxon, and with the exception of a single species in Angola, *C. modesta* is the only species ever found west of Zaire. Previously *C. modesta* has been known only from the holotype female collected in the Mt. Nimba region of Guinea (Chopard 1954), and the male specimen collected at Ajenjua represents both the first record for Ghana, and the first male specimen ever collected. This species is a remarkable bark mimic, virtually invisible when resting on tree trunks during the day (AB).

Tomias spp. – Two species of this genus were recorded, one of which was new to science; it has since been described as *T. gerriesmithae* Naskrecki (Naskrecki 2008a.) The second species, *T. hadrus* Karsch, has not been recorded west of Cameroon before and its record from Ghana is new to this country. Genus *Tomias* belongs to one of the least known genera of the Pseudophyllinae and is rarely collected.

Adapantus spp. – Two species of this genus were recorded, one of which was new to science; it has since been described as *A. pragerorum* Naskrecki (Naskrecki 2008a). Species of this genus appear to be associated with undisturbed forest, and were never collected in areas where intensive logging or encroachment of secondary vegetation was present. This may indicate their value as species indicative of habitat disturbance.

CONSERVATION IMPLICATIONS

Both surveyed reserves showed disturbance caused by fire damage, logging, or even complete removal of forest vegetation. In addition, roads and plantations within the reserves allow for non-forest elements, such as the genus *Ruspolia,* to penetrate this habitat. Nonetheless, both reserves still harbor an interesting and rich fauna of katydids, including many rare or even yet undescribed species, and every effort should be made to stop the removal of the tree coverage within the reserves. Between the two reserves, Mamang River has a significantly larger area, and thus a higher potential for preservation of the biotic elements still present there. While Ajenjua Bepo has a more topographically diverse terrain, with pockets of virtually pristine forest, its small size, and the fact that over 13% of its area is a part of the Newmont mining concession makes it a less promising candidate for conservation efforts focused on preservation of intact biological communities.

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