

## PRELIMINARY BIODIVERSITY ASSESSMENT (HERPETOFAUNA AND MAMMALS) OF A COASTAL WETLAND IN THE VOLTA REGION, GHANA

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### Abstract

Herpetofaunal and mammal species were surveyed in four contrasting habitats (grassland/thicket, agricultural/urban, freshwater ponds/ditches, and brackish lagoon) in a coastal wetland and lagoon (Keta) during June-July 1997 and May-June 1998, using direct observation, live-trapping, refuge searches, transect walks, and interviews. The survey recorded a total of 13 species of herpetofauna and seven species of mammal species. The most diverse herpetofaunal community was in grassland, with 11 herpetofaunal species, while the least diverse habitat was brackish lagoon, with three herpetofaunal species. An interview of the local inhabitants showed the presence of bushbucks (*Tragelaphus scriptus*) and grasscutters (*Thryonomys swinderianus*), which are common bushmeat species in Ghana. It is recommended that herpetofaunal conservation efforts in the area should focus on protection and monitoring of grassland/thicket habitats and freshwater ponds, since mammalian species diversity of the area is already very low for a variety of reasons.

### Résumé

ATTUQUAYEFIO, D. K., RAXWORTHY, C. J. & RYAN, J. M.: *Évaluation préliminaire de biodiversité (Herpetofaune et les mammifères) d'une zone humide littorale dans la région de volta du Ghana*. Les espèces herpetofaunes et mammifères étaient étudiées en quatre habitats contrastés (herbages/fourré, agriculture/urbain, étangs d'eau douce/fossé et la lagune saumâtre) dans une zone humide littorale et une lagune (Keta) pendant les mois juin-juillet, 1997 et mai-juin 1998, utilisant l'observation directe, attrapant à vif, les fouilles en refuge, les promenades transversales et les entretiens. L'enquête enregistrerait un total de 13 espèces de herpetofaune et sept espèces des mammifères. La plus diverse de communauté herpetofaunes était dans les herbages avec 11 espèces herpetofaunes, alors que le moins divers habitat était la lagune saumâtre avec trois espèces herpetofaunes. Un entretien avec les habitants locaux révélait la présence de lapin de brousse (*Tragelaphus scriptus*) et les agoutis (*Thryonomys swinderianus*), qui sont les espèces de viande de brousse commune au Ghana. Il est recommandé que les efforts de conservation de herpetofaune dans la zone doivent se fixer sur la protection et la surveillance des habitats de herbage/fourré et étangs d'eau douce, puisque la diversité des espèces mammifères dans la zone est déjà très basse pour une variété de raisons.

### Introduction

The coastal wetlands and lagoons of Ghana do not seem to have been the subject of specific herpetofaunal and mammal surveys, although the coastal thicket herpetofauna has been

documented by Hughes (1988); and Booth (1956, 1959, 1960) has provided checklists of the mammals of the Accra Plains. Generally, information on the herpetofaunal and mammalian diversity of Ghana's coastal Ramsar sites has

been virtually non-existent, despite the important roles these taxa play in maintaining ecosystem balance as well as the socio-cultural life of the local communities.

Although West Africa has been the target of herpetofaunal and mammal surveys for more than a century, most previous accounts of the systematics and distribution of these two faunal groups in Ghana (Cansdale, 1951, 1954; Booth, 1956; Schiøtz, 1964, 1969; Hughes & Barry, 1969; Leston, 1970; Leston & Hughes, 1968), have not been updated since they were published decades ago. It is, therefore, necessary to conduct as many biodiversity assessment surveys as possible, especially in previously unsurveyed areas like wetlands, to build up, with time, badly needed updated and comprehensive checklists of the herpetofauna and mammals for the whole country. This is especially important, since it has been established that though the general abundance and diversity of West African fauna have largely declined in the last 300 to 400 years, the decline has generally greatly accelerated during the last two to three decades. Although it is acknowledged that over 80 per cent of original forest cover of Ghana has been destroyed (Bakarr *et al.*, 2001), the situation in the Volta Region is especially serious because of extensive deforestation and widespread habitat loss due largely to agricultural expansion, human settlements, hunting pressure, and bush fires (Oates, 1999; Hawthorne, 2001).

In the light of the foregoing, field surveys of the herpetofaunal and mammalian communities of a coastal wetland (Keta) in Ghana were undertaken with the main objective of ascertaining the ecological status of the wetland, as well as updating current species lists in selected protected areas in Ghana.

The study had several specific objectives: (i) To document the herpetofauna and mammals of a coastal wetland in Ghana (Keta), a focus of long-term conservation programmes as part of the country's commitment to the mandate of the Convention on Biodiversity (Anonymous, 2001).

(ii) To identify and determine the distribution and abundance of endemic and/or rare species, and species of conservation concern regarding their habitat associations. (iii) To provide the requisite scientific database that would lead to an increased understanding of the species diversity of the coastal regions of Ghana (Piersma & Ntiama-Baidu, 1995) as a basis for developing effective management strategies or conservation action plans for such wetlands.

### Study area

The Keta Ramsar Site (06° 03' N, 00° 53' E) is located at the south-eastern coast of Ghana in the Volta Region. This wetland, the largest in Ghana, has an area of 530 km<sup>2</sup> surrounding the 300 km<sup>2</sup> Keta Lagoon (05° 55' N, 00° 59' E). It is the most easterly of Ghana's coastal wetlands, located close to the Togo border (Fig. 1) (Piersma & Ntiama-Baidu, 1995). The extensive brackish-water lagoon is surrounded by settlements, agricultural lands, a thriving local fishing industry, with little natural forest remaining, except for very small blocks of fetish forests near several villages. The climate is equatorial with high temperatures, high humidity, and low rainfall. Rainfall is bimodal, with two distinct rainy seasons: March/April to July (main season), and September to November (minor season), interspersed with a short dry season during August-September. Mean annual rainfall ranges from 780 mm (coast) to 950 mm in the north. The hottest months of the year are February and March, while the coolest month is August. Mean annual temperature is 27.5 °C. Three survey localities were selected and surveyed over a 6-day period (Fig. 2):

#### *Anyako Site (AY) (05° 59.6' N, 00° 54.1' E)*

A tiny peninsula on the northern shore of the lagoon, characterised by a degraded baobab (*Adansonia* spp.) dominated forest surrounded by brackish-water marshland. Most baobab trees were covered by mats of climbers (*Ipomoea aquatica*), with the understorey covered by herbs (e.g., *Polygonum langerum*, *Mimosa*

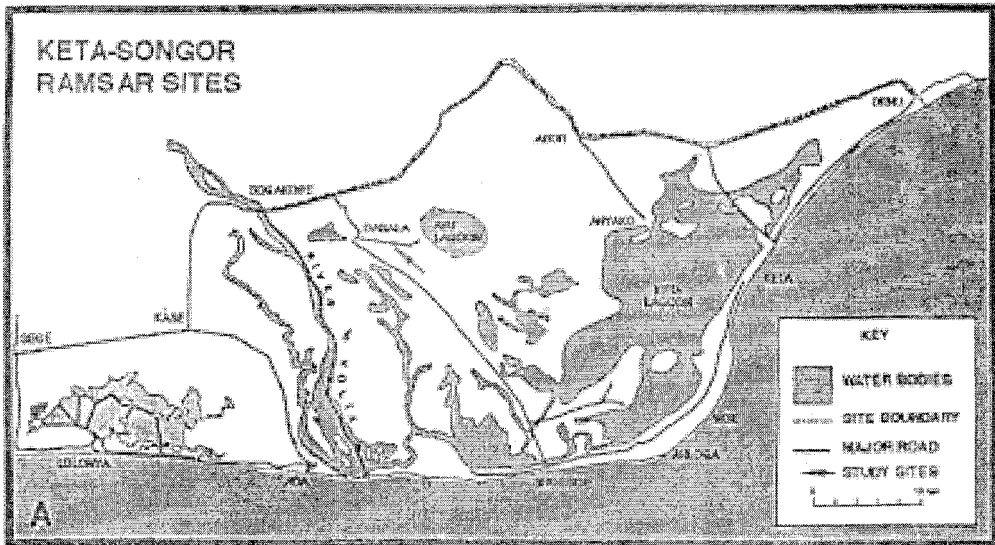


Fig. 1. Map of the southern coast of Ghana indicating the study area.

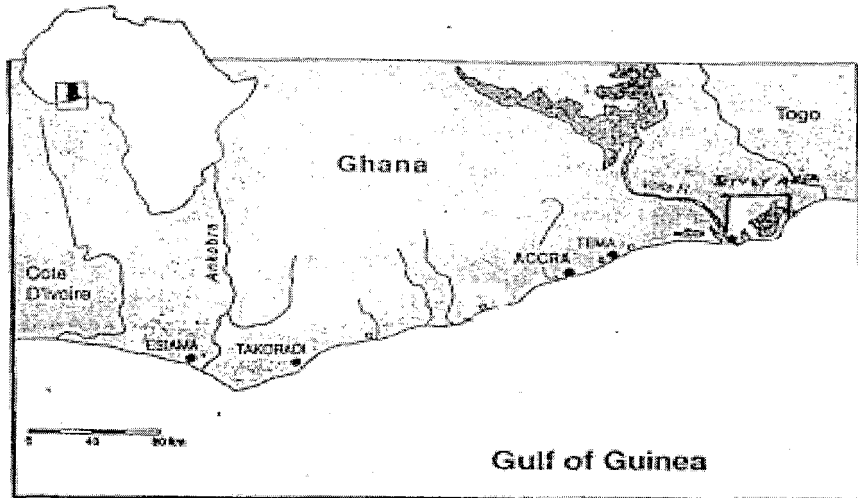


Fig. 2. Map of the Keta-Songor Ramsar sites indicating the location of the three study sites: Anyako, Adutor-Dabala and Anloga-Srogboc.

*pigra*).

*Adutor-Dabala Site (AD)* ( $05^{\circ} 58.2' N$ ,  $00^{\circ} 40.2' E$ )

This area comprises tall grasses and sedges interspersed with small *Azadirachta indica* (neem) thickets located throughout the drier areas. It formed the major habitat of the site, with

extensive exploitation of thickets and larger trees for fuelwood. Large ponds, drainage ditches, and tall red beds were present.

*Anloga-Srogboc (AL/SR)* ( $05^{\circ} 47.6' N$ ,  $00^{\circ} 49.2' E$ )

An area dominated by grassland, agricultural areas, and human habitations along the edges of

the brackish waters of the lagoon.

### Experimental

#### *Visual and acoustic searching/direct observation*

There were two periods of visual searching for herpetofaunal species. Daytime searches were undertaken from 8.00 to 11.00 h GMT; it was considered the most productive, because lizards and snakes were basking or active during this time. Afternoon/evening searches were conducted between 16.00 and 22.00 h GMT when temperatures were declining and diurnal and nocturnal species were active. There was also direct opportunistic observation of the larger mammals and herpetofauna, with any animal sightings being recorded either by driving or walking along main access roads or paths or animal trails (trail surveys). Nocturnal large mammals and herpetofauna were observed through night surveys, with the help of experienced hunters who used headlamps and torches.

#### *Refuge examination and opportunistic collection*

Reptile hooks and tongs were used to search for herpetofaunal species under and in fallen logs and rotten tree stumps, under bark, under rocks, in leaf litter, root mat, soil, and burrows. Because suitably sized rocks were rare and dead wood was generally lacking (probably continually removed by the local people for fuelwood), refuge examination was mostly confined to excavating holes in the ground or in old termite mounds. These were examined between 8.00 and 11.00 h GMT, and between 16.00 and 22 h GMT, which were considered the best times for finding diurnal and nocturnal species.

Two experienced professional reptile trappers identified active reptile burrows and caught available snakes and monitor lizards. Small lizards and geckos were captured by firing rubber bands at them. Ponds and drainage ditches along roadsides were also searched for small herpetofaunal species (mainly frogs and toads).

Vehicle headlights were also used for opportunistic collection of specimens at night (e.g., frogs crossing the road and fresh road-killed snakes). The specimens were identified using comparative specimens at the American Museum of Natural History and the relevant scientific literature (Guibe & Lamotte, 1963; Villiers, 1963; Schiötz, 1967; Hughes, 1988; Perret, 1988). They were then stored in the Zoology Department of University of Ghana, and the Herpetology Department of the University of Kansas Natural History Museum, USA.

#### *Small mammal live-trapping*

Small mammals (rodents and shrews) were live-trapped using two types of live-traps: Sherman Collapsible Traps (H.B Sherman Traps Inc., Florida, USA) measuring 23 cm × 9 cm × 7.5 cm (suitable for smaller species), and larger National "Tomahawk" Folding Traps (Tomahawk Trap Company, Wisconsin, USA) measuring 48 cm × 16 cm × 16 cm. Transects were cut through representative vegetation in the various survey areas, and the Sherman and National traps (baited with a mixture of groundnut paste, corn meal, and fish oil) were placed at 10 and 40-m intervals, respectively, along those transects. Transect length varied from 100 to 500 m, depending on type of habitat. Each trap-station was provided with one Sherman trap and marked with red flagging tape for easy identification. The traps were placed within a 1-m radius of the position of the flagging tape. At stations with both National and Sherman traps, the former was placed about 2 m away from the latter and covered with some vegetation to conceal it.

The traps were checked twice daily—early in the morning and late afternoon—with between three and five consecutive nights of trapping, depending on study area, habitat type, and the time available for a particular survey. A "trap-night" was defined as one trap in use for one night, or a 24-h period. Captured animals were euthanized with chloroform, identified on the spot (if possible), sexed (using the anal-genital distance, which is longer in males), aged (assigned to three broad age-classes: juvenile, sub-

adult, and adult), weighed, and examined for reproductive condition (abdominal or scrotal testes in males; enlarged nipples, perforate vaginas and pregnancy in females). Standard measurements (body, tail, ear, and hind limb lengths) were taken for all the animal specimens, and the trap-station numbers were also recorded. All the captured specimens were serially labelled and preserved in formalin. Animals which could not be immediately identified in the field were later identified by comparison with voucher specimens stored in the vertebrate museum of the Zoology Department, University of Ghana. Key references for small mammal identification were Meester & Setzer (1974), Delany & Happold (1979), Happold (1987), Haltenorth & Diller (1988), and Kingdon (1997). Small mammal field-handling techniques were as outlined in Wilson *et al.* (1996).

### Results and discussion

A total of 22 species, comprising 15 herpetofaunal (six amphibian and nine reptile species) and seven mammal species, were recorded during the survey (Table 1). The herpetofaunal species recorded represented 15.3 per cent of the 98 species of coastal thicket herpetofauna recorded for Ghana (Hughes, 1988), and suggested a low herpetofaunal species diversity in the area. Although the duration of the survey cannot be considered enough to ensure a more complete herpetofaunal survey of the area, it is quite possible that the more common species were sampled. The absence of large rivers and lakes in the survey area could explain the absence of turtles (soft-shelled) and crocodiles at the site.

The seven recorded species of mammals belonged to four orders (two Insectivora, three Rodentia, one Primates, and one Artiodactyla) (Table 1). Thus, the area is also characterized by low abundance and diversity of mammals, probably due to heavy human settlement and absence of natural forest. Serious overgrazing by cattle in the grassland/thicket habitats was also evident. Organized hunter interviews were lacking in this area, but one local hunter in Avuto village near Avu

Lagoon (Fig. 2) claimed to have seen bushbuck (*T. scriptus*) and baboons (*Papio anubis*) on some of his fishing expeditions. This could, however, not be independently confirmed. The presence of giant rats (*Cricetomys gambianus*) and grasscutters (*T. swinderianus*) and small hunting groups of young boys in the area suggest some trade in bushmeat, but on a small scale.

Of the recorded species, six were of international conservation significance; one species (*Crocidura oliveri*) is designated as Vulnerable (VU) by the IUCN, and five species (*Chamaeleo gracilis*, *Varanus niloticus*, *Python regius*, *P. sebae*, and *Papio anubis*) are listed under CITES Appendix II. Four of these species (*V. niloticus*, *P. regius*, *P. sebae* and *P. anubis*) are also of national conservation significance (Schedule II, Ghana Wildlife Conservation Regulations) (1995), together with *C. gambianus* and *T. scriptus* (Table 1).

The herpetofaunal species were fairly evenly distributed among the three localities of Adutor-Dabala, Anloga-Srogboe, and Anyako; the first two with six captures each, and the third with five captures. No species were found to be restricted to brackish water, and only one species (*Dicroglossus occipitalis*) occurred in all the habitats (Table 2). Trees were often growing new shoots, suggesting that this form of coppice exploitation might be sustainable. Of much greater concern was the clearing of thicket for agricultural land. New areas prepared for cultivation were seen at Anyako baobab forest and thicket, which, considering the small size of the habitat, suggested that protection will be needed quickly if this relic forest is to survive.

The grassland/thicket habitats recorded the most diverse herpetofaunal community, with 11 species (about 86.7 % of the total). It is, therefore, recommended that priority herpetofaunal conservation efforts should be focussed on monitoring and maintaining this habitat, which is also important as a source of fuelwood for the local communities. This was evidenced by sightings of prepared wood bundles for later

TABLE I  
Checklist of herpetofaunal and mammal species at Keta Ramsar Site

Species	Common name	Recording methods			Conservation significance		
		LT/C	Int.	H	IUCN	CITES	National
<b>HERPETOFAUNA</b>							
<b>Amphibia</b>							
<i>Bufo regularis</i>	Common toad	*					
<i>Bufo maculatus</i>	Toad	*					
<i>Hyperolius viridiflavus</i>	Reed frog	*					
<i>Dicoglossus occipitalis</i>	Common frog	*					
<i>Hylarana galamensis</i>	Common frog	*					
<i>Ptychadena oxyrhynchus</i>	Ridged/Grass frog	*					
<b>Reptilia</b>							
<i>Chamaeleo gracilis</i>	Chameleon	*				II	
<i>Agama agama</i>	Agama lizard	*					
<i>Hemidactylus brookii</i>	Common house gecko	*					
<i>Lygodactylus conraui</i>	Gecko	*					
<i>Mabuya perotetii</i>	Orange-flanked skink	*					
<i>Varanus niloticus</i>	Nile monitor	*				II	II
<i>Python regius</i>	Royal python		*			II	II
<i>Python sebae</i>	African python		*			II	II
<i>Bitis arietans</i>	Puff adder	*	*				
<b>MAMMALIA</b>							
<i>Crocidura bottegi</i>	Bottego's shrew	*					
<i>Crocidura oliveri</i>	White-toothed shrew	*				VU	
<i>Tatera kempii</i>	Kemp's gerbil	*					
<i>Cricetomys gambianus</i>	Gambian giant rat	*		*			II
<i>Thryonomys swinderianus</i>	Grasscutter (cane rat)		*	*			
<i>Papio anubis</i>	Baboon		*	*		II	II
<i>Tragelaphus scriptus</i>	Bushbuck		*	*			II

Recording methods:

LT/C = Live-trapped/Collected at site; I = Interview (reported by locals); H = Hunted for bushmeat

Conservation significance:

- *Global criteria*

- o *Vulnerable (VU)*: Species believed likely to move to the EN (Endangered) category, if the causal factors continue operating, because of rapidly decreasing populations and extensive habitat destruction (IUCN)
- o *Appendix II* species are species for which levels of trade are limited (CITES)

- *National criteria (Ghana Wildlife Conservation Regulations):*

Ghana's Wildlife Laws (Ghana Wildlife Conservation Regulations, 1971, and Ghana Wildlife Conservation (Amendment) Regulations, 1988; 1995) also categorise animal species into two main schedules based on the level of protection required for a particular species:

- o *Schedule II* species are partially protected (i.e., their hunting capture or destruction is absolutely prohibited between 1<sup>st</sup> August and 1<sup>st</sup> December of any season, and the hunting, capture and destruction of any young animal, or adult accompanied by young, is absolutely prohibited at all times)

TABLE 2  
*Herpetofaunal species recorded in various habitats and survey sites*

Species	Common name	Survey sites				Habitats		
		A	A/D	A/S	G/T	A/U	P/D	BL
<b>AMPHIBIA</b>								
<i>Bufo regularis</i>	Common toad			*		*	*	
<i>Bufo maculatus</i>	Toad			*	*		*	*
<i>Dicroglossus occipitalis</i>	Common frog		*	*	*	*	*	*
<i>Hylarana galamensis</i>	Common frog		*		*		*	
<i>Hyperolius viridiflavus</i>	Reed frog		*		*		*	
<i>Ptychadena oxyrhynchus</i>	Ridged/grass frog			*	*		*	*
<b>REPTILIA</b>								
<b>Lacertilia (Lizards)</b>								
<i>Agama agama</i>	Agama lizard		*	*		*		
<i>Chamaeleo gracilis</i>	Chameleon		*		*			
<i>Hemidactylus brookii</i>	Common gecko	*		*	*	*		
<i>Lygodactylus conraui</i>	Gecko	*			*	*		
<i>Mabuya perotetii</i>	Orange-flanked skink	*	*		*			
<i>Varanus niloticus</i>	Nile monitor	*			*			
<b>Serpentes (Snakes)</b>								
<i>Bitis arietans</i>	Puff adder	*			*			
<i>Python regius</i>	Royal python				*			
<i>Python sebae</i>	African python				*			
<b>TOTAL</b>		5	6	6	13	5	6	3

**LEGEND:***Survey sites*

A = Anyako; A/D = Adutor/Dabala; A/S = Anloga/Srogboe

*Habitats*

G/T = Grassland/Thicket; A/U = Agriculture/Urban; P/D = Ponds and Ditches; B/L = Brackish lagoon

transportation at Anyako, and cut stumps in the thickets throughout the sites. The least diverse habitat was the brackish lagoon, with three species (23 %) (Table 2).

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