

Key Biodiversity Area Special Series



Key Biodiversity Areas identification in the Upper Guinea forest biodiversity hotspot

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Date of publication (online): 06 August 2012

Date of publication (print): 06 August 2012

ISSN 0974-7907 (online) | 0974-7893 (print)

Manuscript details:

Ms # o2717

Received 23 February 2011

Final revised received 23 May 2012

Finally accepted 05 June 2012

Citation: Kouame, O.M.L., N. Jengre, M. Kobele, D. Knox, D.B. Ahon, J. Gbondo, J. Gamys, W. Egnankou, D. Siaffa, A. Okoni-Williams & M. Saliou (2012). Key Biodiversity Areas identification in the Upper Guinea forest biodiversity hotspot. *Journal of Threatened Taxa* 4(8): 2745–2752.

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For **Author Details**, **Author Contribution** and **Acknowledgements** see end of this article.

Abstract: Priority-setting approaches and tools are common ways to support the rapid extinction of species and their habitats and the effective allocation of resources for their conservation. The Key Biodiversity Area (KBA) approach is a method for the identification of fine-scale priority areas for conservation. This process led bottom-up has been used in the Upper Guinea Forest Ecosystem of West Africa where human-induced changes have increased the extinction risk of several endemic and threatened species. The irreplaceability and vulnerability criteria commonly used in conservation planning have been used to identify key biodiversity areas in Ghana, Cote d'Ivoire, Liberia, Guinea and Sierra Leone. Point locality data were compiled from scientific reports, papers published in scientific journals and museum records. The delineation was conducted following a series of decision rules. In most cases existing IBA polygons and protected areas boundaries were used. For the new sites, temporary boundaries have been drawn and will be confirmed with land-use data. Preliminary KBA data were reviewed by specialists during formal workshops. One hundred and fifty four KBA have been identified in the five countries with 202 globally threatened species. Currently 63% of the KBA are protected. Two AZE sites still exist in the region. This assessment is a first step and is driven from the best available data at the time. There is a need to refine it with recent biodiversity surveys to assist decision-makers in achieving their conservation management goals.

Keywords: AZE, biodiversity, conservation planning, IUCN, Key Biodiversity Area, Upper Guinea Forest, West Africa.



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The Key Biodiversity Area series documents the application of the concept and showcases the results from various parts of the world. The series is edited under the auspices of the IUCN World Commission on Protected Areas/Species Survival Commission Joint Task Force on 'Biodiversity and Protected Areas', with the editors supported by BirdLife International, Conservation International, IUCN, National Fish & Wildlife Foundation, NatureServe, Parks Canada, and Plantlife International.



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INTRODUCTION

The Upper Guinea Forest Ecosystem of West Africa extends from Guinea into eastern Sierra Leone, and eastward through Liberia, Côte d'Ivoire and Ghana into western Togo. The overall forest ecosystem of the region historically covered approximately 420,000km² but estimates of existing forest suggest a loss of nearly 80% (CEPF 2000). It contains exceptionally diverse ecological communities of forest habitat, providing refuge to numerous endemic species.

The region has been the subject of several conservation assessments and priority-setting initiatives. At the global level, the Upper Guinea forest ecosystem region is considered one of the world's top priority regions for conservation because of its high endemism of flora and fauna (Bakarr et al. 2004). Another global analysis conducted on centers of plant diversity and endemism has identified 14 centers of plant endemism within the Guinean Forest Hotspot. Those coarse-scale conservation priorities do not give information on the precise locations where conservation resources should be focused. In this biologically rich and highly fragmented landscape, conservation planning and implementation stand to benefit greatly from high resolution biodiversity data (Brooks et al. 2004).

The key biodiversity areas (KBAs) approach is a method for the identification of fine-scale priority areas for conservation. KBAs are sites of global significance for biodiversity conservation that are large enough or sufficiently interconnected to support populations of the globally threatened species for which they are important (Eken et al. 2004). Conservation International and several partners in the Upper Guinea region have undertaken the identification and delineation of KBAs in five countries (Guinea, Ghana, Liberia, Côte d'Ivoire and Sierra Leone). This paper

summarizes the results of applying the KBA process in the region.

METHODS

KBAs identification in Upper Guinea forest builds upon the Important Bird Areas (IBAs) identified for those five countries by the BirdLife International partnership (Fishpool & Evans 2001). In this assessment, we have documented the presence of species of mammals, reptiles, amphibians, fish, crustaceans, butterflies and plants that trigger KBA criteria in the existing IBAs, and identify new sites triggered by species in these taxa.

KBAs are generally identified based on the confirmed presence of: (i) globally threatened species, classified as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) according to IUCN Red List (IUCN 2007); and (ii) restricted-range species, using a threshold population of 5% or more of the population of species with range-sizes of 50,000km² or less (Eken et al. 2004). In addition, for IBAs, criteria had been used to identify sites based on; (iii) congregations of species that concentrate at particular sites during some stage in their life cycle; and (iv) biome-restricted species assemblages (Eken et al. 2004). The first of these four criteria addresses vulnerability, while the latter three cover different components of irreplaceability (Margules & Pressey 2000). Although a threshold of 10 pairs or 30 individuals is suggested when applying the vulnerability criteria for vertebrate species classified as VU (Langhammer et al. 2007), due to the lack of information on species abundance, we considered the confirmed occurrence of a threatened species as sufficient to trigger KBA identification.

Species occurrence data were compiled from scientific reports, papers published in scientific

Table 1. Summary data for KBA networks for each country included within the analysis.

Country	Area (km ²)	# KBAs	Area of KBAs (km ²)	% of land surface included in KBAs	# KBAs protected	% KBAs protected
Côte d'Ivoire	322,462	34	30,460	9%	30	88%
Ghana	238,535	54	18,344	8%	51	94%
Guinea	245,857	27	13,014	5%	6	22%
Liberia	111,369	25	59,654	54%	2	8%
Sierra Leone	71,740	15	11635	16%	9	60%

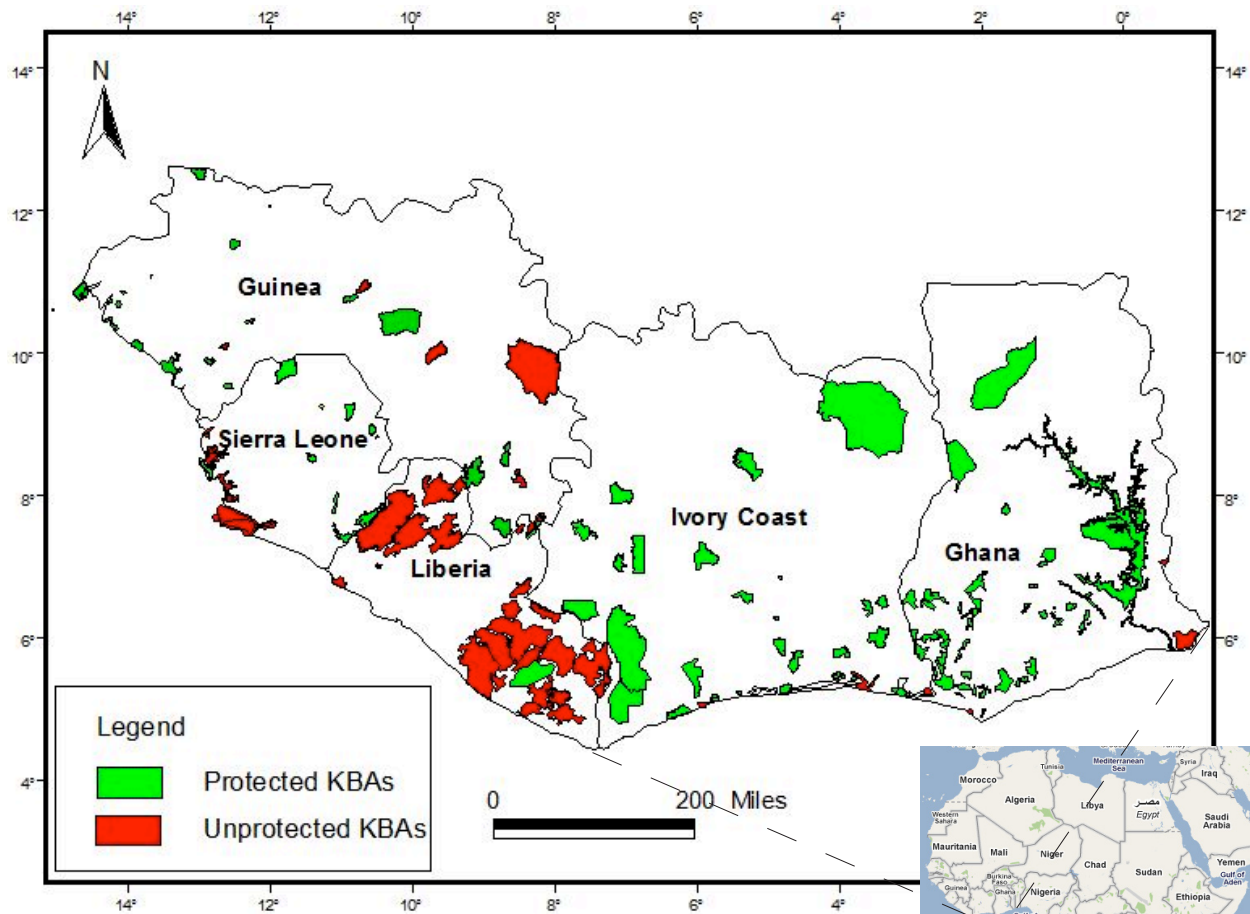


Figure 1. Map of protected and unprotected KBAs in Upper Guinea Forest region.

Table 2. Numbers of species triggering each of the KBA criteria for each higher taxonomic group.

Higher taxon	Vulnerability			Irreplaceability
	CR	EN	VU	Restricted-range
Mammals	2	9	190	27
Birds	1	2	9	15
Reptiles	2	3	3	4
Amphibians	5	9	6	26
Actinopterygii	0	1	1	5
Chondrichthyes	4	3	3	0
Crustaceans	0	1	0	0
Butterflies	0	0	0	88
Plants	4	24	91	498

journals and museum records. Mammal data were obtained from primary surveys and Rapid Assessment Program (RAP) reports. The majority of amphibian data were provided by Rödel et al. (2005) and by the IUCN Global Amphibian Assessment (Stuart et al.

2008). Most of the plant data came from the Oxford University Herbaria online database (OUH 2011). Butterfly data came from Larsen (2006). For the reptiles, occurrence data were extracted mainly from Okoni-Williams et al. (2005). Fish data were compiled from Dankwa et al. (1999), Ofori-Danson et al. (2003) and Ofori-Danson & Kumi (2006). Additional sources are listed in Appendix I.

Spatial data used to delineate the KBAs boundaries included available point localities and distribution information for species, IBA polygons, and protected areas (PA) boundaries. In some cases, existing IBA or PA boundaries were modified as needed to incorporate nearby habitat for target species. For the new sites, temporary boundaries have been drawn and will be confirmed with land-use data. The KBAs were

Table 3. Numbers of KBAs triggered by each of the criteria for each higher taxonomic group.

Higher taxon	Vulnerability			Irreplaceability
	CR	EN	VU	Restricted-range
Mammals	3	90	96	32
Birds	1	18	73	77
Reptiles	6	6	9	3
Amphibians	5	20	26	18
Actinopterygii	0	1	1	1
Chondrichthyes	4	5	4	0
Crustaceans	0	1	0	0
Butterflies	0	0	0	4
Plants	9	35	88	89

reviewed by specialists during formal workshops during October 2008 in Ghana, Sierra Leone and Ghana.

RESULTS

We identified 154 KBAs representing between 5% and 54% of the land surface of each country (Table 1, Fig. 1), and 13% of the region overall. In total, 1,032 species trigger the KBA criteria with 202 (132 VU, 52 EN, 18 CR) globally threatened species and 663 restricted-range species (Table 2 and Table 3). For IBAs, three sites were also identified for 27 species based on the congregations/aggregations criteria, and 33 sites using the biome-restricted assemblage criterion, for 217 species.

A total of 97 KBAs are currently protected (63%), while 57 are not covered by the existing protected areas system (Table 1). Protected area coverage is particularly low in Liberia, with only two of the country's 25 KBAs protected (8%).

With regards to the number of species that trigger site identification, only nine sites (6%) were identified for a

Table 4. Number of trigger species per KBA, and the number of KBAs per trigger species.

<i>n</i>	# KBAs holding <i>n</i> trigger species	# trigger species occurring in <i>n</i> KBAs
1	9	273
2	9	154
3	4	106
4	6	91
5	8	53
6	7	45
7	1	32
8	1	24
9	3	20
10	3	19
11	3	13
12		4
13	2	14
14	2	12
15	1	13
16		5
17	2	5
18		3
19	1	4
20		3
>20	92	139

single species, while 92 (60%) were triggered by more than 20 species (Table 4). Within the region, 273 species occur in one KBA only, while one species occurs in no fewer than 68 KBAs (Table 4).

Two KBAs that hold the only record of at least one highly threatened species, and which hold six such species in total (Table 5), were identified as triggering the criteria for Alliance for Zero Extinction sites (Ricketts et al. 2005; AZE 2010).

Table 5. Data for highly threatened species occurring at only one KBA globally

KBA	Country	Species	Higher taxon	IUCN Red List category
Mont Nimba	Côte d'Ivoire/ Guinea/ Liberia	<i>Arthroleptis cruscolum</i>	Amphibian	EN
		<i>Hyperolius nimbae</i>	Amphibian	EN
		<i>Hipposideros lamottei</i>	Mammal	CR
		<i>Nimbaphrynoides liberiensis</i>	Amphibian	CR
Taï	Côte d'Ivoire	<i>Amietophrynus taiensis</i>	Amphibian	CR
		<i>Hyperolius nienokouensis</i>	Amphibian	EN

DISCUSSION

The KBAs identified in the five countries of the Upper Guinea forest appear to provide a valuable update more than a decade after the Elmina Conservation Priority-Setting Workshop held in 1999 in Ghana (Conservation International 2001). They give a better idea of the current remaining priorities for species and site-scale conservation in the region.

The absence of recent biodiversity surveys and the shortfall in collaboration between conservationists and scientists in the universities and research centers require that the analysis draws from historical records, available in open access online databases. As a result, we have identified several “provisional” KBAs, sites that are suspected to be important, but for which only historical data have been collected (we excluded these candidate sites from the analysis above). We also need to delineate new KBAs to ensure that all threatened species are represented in the network of important sites because some species still fall outside the delineated sites.

Another limitation is that marine and freshwater species are poorly documented. In this initial application of the KBA approach, the criteria for biomes restricted and congregatory species have been assessed only for birds, for which Birdlife International has conducted and tested their applicability in IBA identification.

Changes in knowledge have driven some changes to AZE site identification over the last five years. Bobiri Forest Reserve, in Ghana, is no longer considered an AZE site because the frog *Hyperolius bobirensis* (EN), previously considered endemic, has now been recorded in Ankasa and Atewa forest reserves in Ghana (Rödel et al. 2005; McCullough et al. 2007). Similarly Adiopodoumé, in Côte d’Ivoire, is now no longer considered an AZE site because *Crocidura wimmeri* is now tagged as a ‘Possibly Extinct’ Critically Endangered species (IUCN 2010).

The majority of KBAs are legally protected as national parks, forest reserves and classified forest. It is important to emphasize that most of them are not managed effectively and they are under severe threats such as forest loss and fragmentation due to agricultural expansion, exploitative logging, rapid population growth, and bushmeat hunting. Mining is having a growing impact particularly in the Nimba

Mountains KBAs. According to Bongers et al. (2004), all Upper Guinea sites except for National Parks are considered to have shortage of effective protection. Chatelain et al. (2004) show that in the large majority of classified forest in Côte d’Ivoire, 40–50% of these forests have been replaced by planted crops and trees. By contrast, in Ghana, some KBAs are labeled as “Globally Significant Biodiversity Areas” to focus effort to protect the remaining priority sites. In Liberia, Cape Mount, Lofa-Gola-Mano Complex and Wonegizi mountains are in the process of being protected. The governments of Liberia and Sierra Leone have also started the formal processes of designating the Gola Rainforest as a shared National Park and Protected Area.

Considerable conservation opportunities still exist in the region due to the presence of internationally recognised sites such as Ramsar sites, UNESCO World Heritage sites and Biosphere Reserve sites. The Critical Ecosystem Partnership Fund investment in the Upper Guinea Forest, initiated in 2000, has been crucial in mobilizing local and international conservation organizations. This investment has also catalyzed further resources from bilateral donors and the private sector (CEPF 2006). For example, Conservation International and local partners are now implementing conservation activities in the Greater Nimba Highlands in Guinea with support from the U.S. Agency for International Development and Rio Tinto.

The current challenge is to secure sustainable financing for the known priority areas of the region. The growing market for climate mitigation and other payment for environmental services mechanisms appear to be opportunities to leverage conservation for human benefit. Several countries in the hotspot – Ghana and Liberia in particular – are emerging as leaders in the development of green economic pilots and policies for Reducing Emissions from Deforestation and Degradation (REDD). Conservation International, through CEPF consolidation investments, is playing a leading role in promoting and supporting learning between emerging REDD and payments for ecosystem services pilots in each of the countries which are demonstrating innovative approaches to biodiversity conservation and human well-being in the known priority areas.

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Acknowledgements: The KBAs process in West Africa was made possible with the support of a number of environmental NGOs, government institutions and agencies as well as individual experts. In Ghana, they include the Ghana Environmental Protection Agency, Ghana Ministry of Environment Science and Technology, Ghana Forestry Commission, Forestry Research Institute of Ghana, Ghana Wildlife Division, and the Resource Management Support Centre of the Ghana Forestry Commission. Others are the Ghana Wildlife Society, BirdLife International-Ghana, Friends of the Earth - Ghana, West African Primate Conservation Action - Ghana, Centre for African Wetlands - Ghana, Butterfly Conservation of Ghana, University of Ghana, University for Development Studies - Ghana and University of Cape Coast - Ghana. Beyond Ghana, key institutions include the Conservation Society of Sierra Leone, SOS-FORETS of Côte d'Ivoire, Guinee-Ecologie, University of Conakry, University of Cocody - Abidjan, Centre National de Floristique - Abidjan, Société de Développement des Forêts - Côte d'Ivoire, Office Ivoirien des Parcs et Réserves - Côte d'Ivoire, Direction des Parcs Nationaux - Côte d'Ivoire, Centre Suisse de Recherches Scientifiques - Côte d'Ivoire, Wild Chimpanzee Foundation - Côte d'Ivoire, Centre d'Etude et de Recherche en Environnement (Guinea), Ministry of Environment of Guinea, Centre National de Recherche Halieutique of Boussoura - Guinea, Ministry of Agriculture of Sierra Leone, Forestry and Food Security, Ministry of Fisheries and Marine Resources of Sierra Leone, Bumbuna Hydroelectric Project, Institute of Marine Biology and Oceanography, University of Sierra Leone (Department of Biological Sciences, Fourah Bay College) and Department of Biological Sciences- Njala, Forestry Development Authority of Liberia, Society for Conservation of Nature of Liberia, Fauna and Flora International-Liberia.

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Author Contribution: All the authors have contributed to both the study and the current paper.



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