PRIMATE CONSERVATION
IN THE FORESTS OF WESTERN GHANA:
FIELD SURVEY RESULTS, 2005-2006

A Report to the Wildlife Division, Forestry Commission, Ghana

From

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CONTENTS

EXECUTIVE SUMMARY

1. To assess the status of primates and other wildlife, and to formulate management recommendations, forest surveys and community meetings were conducted at four target sites in western Ghana (Mamiri Forest Reserve, Boi Tano FR GSBA, Krokosua Hills FR GSBA, and Bia National Park and Resource Reserve) from 21 November 2005 to 31 January 2006.

2. The surveys included 78 foot censuses searching for primates that occupied 286 hours. Further information on the status of wildlife was obtained by interviewing hunters, and by studying the reports of previous surveys.

3. Four community meetings (one for each target forest) were organized to gather the views of people living near each forest about how the forest was being managed, about trends in wildlife abundance, and about their expectations for the future.

4. A workshop to discuss the survey results, and to discuss elements of a broader primate conservation strategy, was held at Shai Hills in July 2006, attended by representatives the Wildlife Division and other branches of the Forestry Commission, representatives of non-governmental conservation organizations, and traditional rulers.

5. During the field survey, very few day-active anthropoid primates (monkeys and apes) were encountered. On census walks we had nineteen encounters with associations of anthropoids, and these associations were estimated to contain a total of 22 individual groups of different species; on only six occasions were any of these primates actually seen. Most encounters were with two species that are widespread in the Ghanaian forest zone and elsewhere in West Africa: Lowe's monkey (*Cercopithecus campbelli lowei*), 10 encounters; and spot-nosed monkey (*C. petaurista petaurista*), 6 encounters. Black-and-white colobus (*Colobus vellerosus*) were encountered three times and olive colobus (*Procolobus verus*) twice. Calls of chimpanzees were heard at one site (Bia RR), and nests or hand/foot prints seen at two other sites (Mamiri, Boi Tano).

6. No evidence was found of three critically-endangered monkeys unique to this region: the white-naped mangabey (*Cercocebus atys lunulatus*), the roloway monkey (*Cercopithecus diana roloway*), and Miss Waldron's red colobus monkey (*Procolobus*

badius waldroni). These monkeys are probably now extinct at all the sites we visited, although there is a slight possibility that roloway monkeys still occur in the Krokosua Hills GSBA.

7. Other wildlife was also found to be rare, and we had only 11 encounters with mammals other than squirrels during day censuses. However, elephants are still present in the south of Bia Resource Reserve and tracks said to be of bongo were seen at Mamiri, Boi Tano and Bia. Hardly any large birds were seen apart from one encounter with large hornbills at Boi Tano.

8. Comparisons with previous reports, hunter interviews and community discussions all point to a pattern of continuing steady decline in the numbers of primates and other wildlife in the target forests.

9. Although heavy logging had severely damaged the canopy of the forest in parts of all of our target forests, areas of high, closed-canopy forest were also present at all sites (and formed suitable habitat for any of Ghana's forest primates). However, all the sites showed evidence of hunting, which was evidently occurring at very high levels at Bia, Boi Tano and Krokosua. There was less hunting evidence at Mamiri than at the other sites, perhaps because animal numbers are now so low that hunting is no longer a worthwhile activity at that site. Hunters at all sites used guns, while wire-snare traps were in especially heavy use at Boi Tano and Krokosua.

10. These results indicate that two conservation mechanisms, the National Park/Resource Reserve (at Bia) and the Globally Significant Biodiversity Area (GSBA, at Boi Tano and Krokosua) are not effective in their present form for protecting wildlife.

11. Miss Waldron's colobus is almost certainly extinct in Ghana. The roloway monkey and white-naped mangabey will soon follow the red colobus into extinction if management measures are not taken to protect key surviving populations. Such populations are probably still present in the Nini-Suhien National Park/Ankasa Resource Reserve/Draw River Forest Reserve complex. This entire area should be upgraded to a national park and given strong protection. Efforts should be made to identify at least one other site where the roloway monkey and mangabey may be seriously protected.

12. Bia National Park and Resource Reserve should be constituted as soon as possible into a single national park, and their protection improved. Although these reserves are not well protected now, they have more immediate conservation potential than any of the GSBAs, given their existing legal status, the presence of some protection staff, their existing infrastructure, and their relatively large combined area (306 km^2).

13. To gain improved protection of the Bia and Ankasa conservation areas, incentive systems should be instituted that reward staff for taking action against poaching. Improved staff monitoring should be instituted. Every effort should be made to secure adequate long-term funding for protection; among funding mechanisms that should be explored are trust funds.

14. Reintroduction of the white-naped mangabey and roloway monkey to Bia should be considered. These species were once present in that forest, and could likely survive there again if protection was made adequate.

15. An urgent rethinking is required of the GSBA concept. In its present form the GSBAs we visited were not protecting forest primates or other wildlife from hunting, in part because the financial rewards offered by the Community Investment Fund (CIF) are not accompanied by any effective punishment for those breaking GSBA rules.

16. The CIF itself should be objectively evaluated so as to understand whether the livelihood activities it supports can truly function as effective off-sets for the prohibition of hunting in conservation areas. If this funding mechanism can be made effective it should be extended to national parks.

17. Even if they can be made more effective, the 30 declared GSBAs are too numerous to be properly protected against hunting, and most of them are too small to be able to conserve viable populations of large animals over the long term.

18. If serious hunting controls are to be introduced at any of the GSBAs so that they may function better to conserve forest primates and other wildlife, the number selected for such attention will have to be small, given resource constraints. Wildlife protection efforts could then be concentrated on this small number. At this point it is not certain that any existing GSBA still contains populations of endangered primates, with the exception of chimpanzees. The Krokosua Hills GSBA (142 km^2) might be worth more

attention if really firm evidence for a viable population of roloway monkeys was found there, and the Dadieso FR/GSBA (171 km^2) if it still contains mangabeys.

19. A more wide-ranging survey of chimpanzees should be undertaken, and a network of permanent chimpanzee conservation sites established. Because chimpanzees live at low densities and range over wide areas, conservation sites need to be large to be effective. Funding is likely to be a constraint on such an expansion of forest conservation efforts, so special funding would have to be sought for new conservation measures (potential donors could be the Great Apes Survival Project, GRASP, and timber companies – especially in areas where timber concessions support chimpanzees).

20. There should be an increased effort to raise awareness at all levels of Ghanaian society about the long-term value of safeguarding wildlife. Awareness campaigns should emphasize the aesthetic value of wildlife, in addition to mentioning more material benefits. Because chimpanzees probably still occur widely, and need to be managed across broad landscapes, a nationwide campaign should encourage the protection of chimpanzees wherever they occur.

1. INTRODUCTION

Oates was engaged as a consultant by the Wildlife Division (WD) of the Forestry Commission (FC) of the Ministry of Lands, Forestry and Mines of the Republic of Ghana, to generate the necessary baseline data in respect of the primates of four reserves in the Western Region of Ghana (Mamiri, Krokosua, Boi Tano and Bia) to enable appropriate management prescriptions to be identified and adopted.

Specifically, the Wildlife Division requested that the consultant should:

1. Review any available reports, papers or other records of primates in Ghana in general, and the four study areas in particular.
2. Conduct field surveys in the four reserves to determine the abundance and distribution of primate species, as well as threats to both populations and habitats.
3. Describe the main habitat types of the identified primates in the study areas and assess their condition.
4. Report on other species of conservation interest present in these areas, including any rare, endangered, restricted range or biome-restricted species, highlighting the status of these species in the sites, their habitat requirements and conservation management needs.
5. Identify specific management actions that should be taken to protect and manage primate habitats within the sites particularly any critical habitats that need particular attention.
6. Using the above information, produce a primate conservation strategy document for the reserves through a participatory workshop process involving all relevant stakeholders, with emphasis on participation of local communities.

2. BACKGROUND

2.1. Introduction

As stated in the Terms of Reference for this study, primate conservation in Ghana has not been addressed in a fully coordinated way, despite the presence in the country of several restricted-range and highly endangered primates. In a paper published in 2000 it was

suggested that one of these primates, Miss Waldron's red colobus monkey (*Procolobus badius waldroni*), was probably already extinct (Oates et al., 2000), and that the extinction of other animals in the region was likely if more resources were not devoted to the rigorous protection of wildlife. Miss Waldron's colobus originally became known to science from individuals collected near Goaso in Ghana (formerly the Gold Coast) in 1933 that were formally described in 1936 (Hayman, 1936); this monkey was last seen by primatologists in Ghana in the 1970s.

Not only has information on the status of Ghana's primates been accumulated in a piecemeal fashion, but during the last 10 years there has been a reorganization of government departments responsible for wildlife conservation and forest management. Also, a new category of conservation zone was introduced in 1998, the Globally Significant Biodiversity Area (GSBA).

It is has been perceived as important, therefore, to gather new data on the status of Ghana's primates, especially in the forest zone of the southwest of the country, where the most endangered species occur, to integrate these findings with the results of previous studies, and to produce recommendations for conservation that take account of the changes in how biodiversity is managed in the country. Although this project targeted four reserve areas identified on the basis of formal and informal reports on the presence within them of primate species of conservation concern, and although the consultant has been asked to make management recommendations for those specific sites, it seems important that recommendations be developed that take a broader view, considering the conservation needs of Ghana's most threatened primate species from a national perspective.

2.2. Ghana's Primates

Ghana's known primate fauna is usually considered to comprise 15 species, listed in Table 1 (and see Booth, 1956). To these 15, a further two may be considered as present, based on recent taxonomic revisions and new field data. For at least 20 years it has been recognized that the dwarf galagos of the African forest zone include more than the one commonly recognized species, *Galagoides demidovii*; a second similar species, *G. thomasi*, is now known to be present at many sites and, based on recent field surveys and the recording of vocalizations, both these species are now reported to occur in Ghana (S. Bearder, personal communication to JFO, 2005). Groves (2001) divides the species traditionally known as

Cercopithecus aethiops (the green monkey and vervet group) into six species, of which two occur in Ghana: *C. sabaeus* in the savanna zone west of the Volta River, and *C. tantalus* to the east (as well as on the Accra Plains); Groves places this *C. aethiops* group in the genus *Chlorocebus*, rather than *Cercopithecus*. However, not all primatologists have accepted Groves's taxonomy of the green monkeys.

Table 1. Primate species (and subspecies) of Ghana, based on Booth (1956), but using the taxonomy of Grubb et al. (2003).

Family	Species, subspecies	Common names
Galagidae	*Galagoides demidovii demidovii*	Demidoff's dwarf galago
	Galago senegalensis senegalensis	Senegal galago, Northern lesser galago
Lorisidae	*Perodicticus potto potto*	Bosman's potto
Cercopithecidae	*Cercocebus atys lunulatus*	White-naped mangabey
	Papio anubis	Olive baboon
	Erythrocebus patas	Patas monkey
	Cercopithecus aethiops sabaeus	Green monkey
	Cercopithecus aethiops tantalus	Tantalus monkey
	Cercopithecus diana roloway[1]	Roloway monkey, Diana monkey
	Cercopithecus campbelli lowei	Lowe's monkey, Lowe's mona monkey
	Cercopithecus mona	Mona monkey
	Cercopithecus petaurista petaurista	Spot-nosed monkey, lesser spot-nosed monkey
	Procolobus verus	Olive colobus
	Procolobus badius waldroni	Miss Waldron's red colobus
	Colobus vellerosus	White-thighed colobus, black-and-white colobus
Hominidae	*Pan troglodytes verus*	Western chimpanzee

Footnote 1: The roloway monkey is treated as a distinct species, *Cercopithecus roloway*, by Groves (2001).

2.3. Threatened Primate Species in Ghana

Five of Ghana's primates are regarded as threatened in the IUCN Red List of Threatened Species (www.redlist.org), as follows:

- *Cercocebus atys* is listed as at Low Risk as a species, but *Cb. a. lunulatus* as a Critically Endangered subspecies;
- *Cercopithecus diana* is listed as an Endangered species and *C. d. roloway* as a Critically Endangered subspecies;
- *Procolobus badius* is listed as an Endangered species, and *P. b. waldroni* as a Critically Endangered subspecies;
- *Colobus vellerosus* is listed as Vulnerable;

- *Pan troglodytes* is listed as an Endangered species, and *P. t. verus* as an Endangered subspecies).

In other words, five of Ghana's primates are regarded as Vulnerable (1), Endangered (1) or Critically Endangered (3). Historically, four of these primates have been restricted to the high forest zone in the southwest of the country while the fifth, *Colobus vellerosus*, has its distribution extending into forest outliers and gallery forests in savanna regions (Booth, 1956). *Cercocebus atys lunulatus*, *Cercopithecus diana roloway* and *Procolobus badius waldroni* were until recently known only from western Ghana and eastern Côte d'Ivoire, although *Cercocebus atys lunulatus* has now been found to range into far southern Burkina Faso; these three monkeys, and the chimpanzee, are therefore the Ghanaian primates of greatest global conservation concern.

Special concern about the future of Ghana's most threatened primates was raised by a series of surveys in 1993-99 which found evidence of *Cb. a. lunulatus* surviving in only 4 reserves, *C. d. roloway* in 5, *P. b. waldroni* in none, and *P. troglodytes* in 2 (Oates et al., 2000). More recent research reported evidence of *P. troglodytes* living at one further site (and evidence of their possible presence in two other areas) (Magnuson et al., 2003) (see Table 2).

Table 2. Distribution of Ghana's most endangered primates as reported in Oates et al. (2000) and Magnuson et al. (2003).

Primate taxon	Reserve areas where evidence reported
Cercocebus atys lunulatus	Ankasa + Nini-Suhien; Draw River; Krokosua Hills; Boi Tano
Cercopithecus diana roloway	Ankasa + Nini-Suhien; Draw River; Krokosua Hills; Yoyo; Boin River
Procolobus badius waldroni	Absent in all survey areas
Pan troglodytes verus	Ankasa; Bia; Krokosua Hills; Nini-Suhien (possible); Dadieso (possible); Yoyo (possible)

The factors leading to the endangered condition of these four primates are: (1) a dense and still growing rural human population, leading to habitat destruction from farming; (2) habitat degradation from logging activity both inside and outside forest reserves; and (3) the hunting of primates for meat, consumed both within hunters' communities and traded to more

distant markets. Logging and hunting interact as threat factors because logging activities improve forest access for hunters, and members of logging crews are themselves likely to hunt for the pot and for commerce. These four primates are also at risk because of their intrinsic features. They are large or relatively large in size, making them more conspicuous and profitable targets for hunters; the white-naped mangabey, roloway monkey and red colobus are relatively noisy animals that typically live in large social groups, factors that also make them easy to detect (and the roloway and red colobus also have colourful coat patterns). Moreover, the roloway and red colobus are upper canopy specialists that are adversely affected when the forest canopy is damaged by logging.

2.4. Organization of Biodiversity Conservation in Ghana

Game and Wildlife was originally a subsection (the Game Unit) of the Forestry Department in Ghana, until it was separated as an independent department in 1967. This department was responsible not only for the management of wildlife sanctuaries, reserves and national parks, but also for the protection and management of wildlife outside those conservation areas; most of its field staff were based at reserves and parks, however. Forest reserves remained under the jurisdiction of the Forestry Department (FD), but the FD was primarily concerned with management of the timber resources of reserves rather than with wildlife protection.

The Forestry Department became the Forestry Commission in 1980, and in 1999 forestry and wildlife administration was restructured and unified within the Forestry Commission, with separate divisions for Forest Services, Wildlife, and Timber Industry Development.

2.5. Globally Significant Biodiversity Areas

The following material is derived from discussions with several Forestry Commission staff in Accra and Kumasi, and briefing documents that they were able to provide, including one from Conservation International (2002). The concept of the Globally Significant Biodiversity Area (GSBA) evolved from the 1986-92 forest inventory conducted by the Planning Branch of the Forestry Department. This exercise led to the designation of Hill Sanctuaries (Protection Working Circles) within forest reserves, which were not to be logged and would permanently protect tree diversity. As a component of this exercise, areas of high

"Genetic Heat" were identified, based on floristic diversity (see Hawthorne & Abu-Juam, 1995).

In 1998, the Government of Ghana designed a Natural Resources Management Programme, to be funded by multiple donors. As part of this programme, $8.7 million were provided by the Global Environment Facility for a six-year High Forest Biodiversity Conservation Project (HFBCP). In addition to supporting the establishment of GSBAs, and preparing management plans for them, this project included several research projects including: this primate survey; the development of a National Great Ape Survival Plan; floral surveys; and a general series of baseline faunal surveys (see Institute of Renewable Natural Resources, 2005).

Thirty forest areas have been designated as GSBAs under the HFBCP. The 30 areas were chosen based on their floristic Genetic Heat Index, but they were now intended to conserve both floral and faunal diversity, and to be managed jointly by the Forest Services Division of the Forestry Department and by local communities. The total area of the GSBAs is 117,322 ha (an average of 3,911 ha each).

Within GSBAs, ecotourism, research and the harvesting of non-timber forest products (NTFP's) are permitted, and logging, hunting, commercial harvesting of NTFP's and burning are proscribed. Local communities are expected to maintain and monitor GSBA boundaries on a contractual basis. To ensure their cooperation in the management of the GSBA forests, the communities are being assisted with measures designed to improve their livelihoods. These measures are supported by a Community Investment Fund (CIF) of $2.5 million launched in August 2005. The fund provides loans for livelihood activities regarded as ecologically sustainable, such as the raising of grasscutters and edible snails, fish-farming, piggeries and poultries.

The HFBCP was originally scheduled to run from six years from 1998, but has been extended to June 2006. The boundaries of 24 GSBAs have been demarcated, community committees have been established (Community Biodiversity Advisory Groups) and faunal and floral surveys are being conducted. A manual has been produced for the writing of GSBA management plans.

Only Boi Tano and Krokosua Hills of the sites we visited had formally designated GSBAs, with communities eligible for CIF support. Mamiri Forest Reserve had a protected hill sanctuary area and a Community Forest Committee.

3. TIME SCHEDULE, SURVEY SITES AND METHODS

3.1. Schedule

The consultant assembled and reviewed previous literature on Ghana's primates and their conservation prior to travelling to Accra on 15 November 2005. Following briefing discussions and final contract negotiations in Accra on November 16-18, the survey team travelled to the field on November 21. With short breaks for re-supply and holidays, work on the project continued until January 24, 2006, with final community meetings held on January 31, 2006.

In addition to field surveys and community meetings, meetings were also held by the team leader and senior counterpart with other WD staff, with FC Forestry Services Division staff in Accra, with staff of the FC Resource Management Centre in Kumasi, and with officers of the Samartex timber company at Samreboi.

3.2. Survey Team and Sites Visited

In addition to Oates (team leader), the main survey team consisted of Michael Abedi-Lartey (senior counterpart; WD, Protected Area Planner, Accra HQ), Yaw Boafo (WD, Park Manager, Biomonitoring Unit, Goaso), John Atingah (WD, Wildlife Ranger, Biomonitoring Unit, Goaso), James Oppong (WD, Wildlife Ranger, Biomonitoring Unit, Goaso), and Geneviève Campbell (Canadian primatologist with West African survey experience). In various combinations, these team members took part in foot censuses in the target areas, and were assisted by guides from local communities (usually men with hunting experience) as well as by local wildlife staff at Bia (including Bia principal technical assistant Philip Mensah who also participated in the Krokosua surveys).

Table 3 summarizes how forest surveys were distributed across sites, and the number of foot censuses led by different team members. Nineteen censuses were conducted at Mamiri, 22 at Boi Tano, 17 at Krokosua. and 20 at Bia.

Table 3. Sites and dates of forest surveys, and numbers of censuses conducted by different team leaders

Survey site	Dates of surveys	Census leaders (and N of censuses led)*
Mamiri Forest Reserve	23-25 November 2005; 9-14 December 2005	JFO (2), YB (7), JA (5), JO (5)
Boi Tano Forest Reserve GSBA and Tano Nimiri Forest Reserve	26-27 November 2005; 16-20 December 2005	JFO (2), MAL (6), YB (6), JA (4), JO (4)
Bia National Park and Resource Reserve	7-14 January 2006; 19-20 January 2006	JFO (1), MAL (3), GC (9), YB (6), JA (1)
Krokosua Hills Forest Reserve GSBA	17-24 January 2006	JFO (4), MAL (4), GC (4), YB (3), JA (2)

* Key: JFO, J. Oates; MAL, Michael Abedi-Lartey; GC, Geneviève Campbell; YB, Yaw Boafo; JA, John Atingah; JO, James Oppong.

3.3. Forest Survey Methods

Supplementing the study of previous survey reports, of maps, and of remote sensing imagery, evidence on the status of wildlife and forests was gathered from interviews with Forestry Commission staff, members of local communities (especially hunters), and employees of timber companies. The primary source of information was, however, surveys on the ground in forests; team members drove around and (where access roads were available) through the forests and, most importantly, conducted censuses on foot.

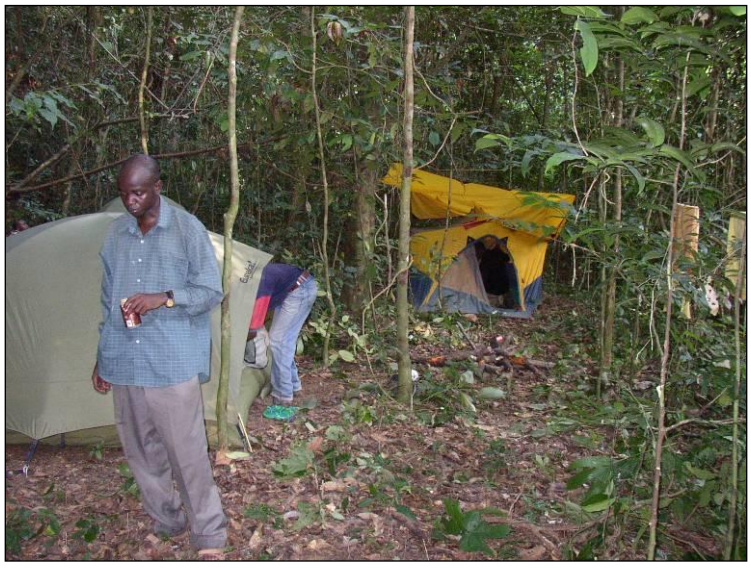

Figure 1. Survey camp in Mamiri Forest Reserve.

In each targeted reserve, foot censuses were made in several different areas, distributed across different sectors of the reserve. These censuses were almost all made from camps established within or on the edge of the reserve; this also allowed primate calling to be monitored through all waking hours.

Because of time constraints and the relatively large areas to be covered, it was decided not to cut straight-line transects through the forests for census purposes. Although such transects have advantages (for instance, they allow a census to avoid trails frequented by people), they take a long time to cut in dense vegetation (especially in hilly or swampy terrain), they need to be left for some days after cutting before they can be censused for primates, they damage the habitat, and they can open up new areas of forest to hunters. Instead of a line-transect method we therefore employed a reconnaissance (or "recce") walk method (White & Edwards, 2000), following existing trails (and sometimes logging roads), or a path of least resistance through the forest in the absence of trails.

A census team usually consisted of two or three people, of which one was primarily responsible for producing a report on the census and of which one was a local guide familiar with the area. They walked quietly and slowly (1-2 km/hr) through the habitat, searching for and recording any visual or audible signs of primates, other mammals and large birds (this included footprints and feeding signs). During these walks, notes were also taken on: 1) the structure of the forest canopy; 2) the most abundant large tree species; 3) the visibility of the understory; 4) the nature of the terrain; 5) signs of human activity. Start and end times of the census were noted and GPS coordinates obtained at these points wherever possible (as well as at obvious landmarks and where any primates were encountered). An estimate was made of total distance walked in km.

The great majority of censuses began between 06:15 and 08:30 h in the morning (dawn was at about 06:15 h) and lasted for between 2 and 5 hours (influenced by the extent of habitat, the availability of pathways, and other work planned for the day). A few censuses were made in late afternoon.

If primates were encountered on a census, the following were recorded in a field notebook: time, species, method of detection, number of individuals detected, estimated perpendicular distance from survey path and estimated height above ground. Most encounters with monkeys involved hearing only their calls or sounds of movements.

Evidence of chimpanzees involved only sounds, hand or footprints, or old nests (whose number and height were noted).

These field notes, together with habitat information, were transcribed as soon as possible (usually back at camp) on to prepared data forms.

Because it is not possible to determine social structure of primates (including group size and composition) during brief census encounters with unhabituated individuals (especially if they are only detected by calls heard some distance away), our primate observations have been analyzed and presented in terms of "encounters." Seeing or hearing one or more individuals of one species (e.g., *Cercopithecus campbelli*) at the same point on a census, with no more than 100 metres separating any detected individual from another individual of the same species, was scored as one encounter (with *C. campbelli*). If one (or more) other species is detected at the same point (and was therefore part of a "polyspecific association"), this event was scored as one encounter with an association, but in terms of individual species in the association the event was scored as a distinct encounter for each those species. In practice, primates were encountered at such a low rate during our field work that no individual record of one species came from within 500 m of a second record of the same species in a given habitat.

Some additional evidence for the presence of primates was obtained by listening from campsites and from observation posts near camps. And a small number of walks were made at night with a headlamp and/or flashlights, searching for evidence of prosimian primates and other mammals, detected by eye reflections and calls.

3.4. Previous Survey Reports Reviewed

For information on the occurrence of primates and other mammals in the target forests recorded in previous surveys, the following reports were reviewed: Struhsaker (1993), who conducted primate surveys in Bia in November 1993; Whitesides & Oates (1995), who surveyed primates in Bia and Krokosua Hills in July 1995; Abedi-Lartey (1998, 1999), who surveyed for primates in Boi Tano in November 1997 and October 1998, and in Krokosua Hills in April 1998 and January 1999; White & Berry (1999), who surveyed primates in Krokosua in July-September 1999; Magnuson (2002), who surveyed primates in Bia and in Krokosua in 2001; Deschner & Kpelle (2004), who surveyed primates in Boi Tano in October 2003 and Krokosua in November 2003; Decher, Oppong & Fahr (2004) who

surveyed small mammals and bats in Boi Tano and Krokosua in 2003 (as part of the same Rapid Assessment programme participated in by Deschner & Kpelle); the Institute of Renewable Natural Resources, KNUST, Kumasi (2005), who surveyed mammals, birds and butterflies in 24 GSBAs including Boi Tano and Krokosua Hills in 2004; and Dowsett-Lemaire & Dowsett (2005), who surveyed birds in Bia and Krokosua in January 2005, and made notes on mammals. Together, these reports represent a very substantial body of information collected over approximately 10 years in Bia, Boi Tano and Krokosua Hills. No reports of prior primate surveys in Mamiri were located, but given the small size of this forest reserve (45 km^2) we believe that our 9 days of survey coverage provide adequate information on its primates.

We also consulted the unpublished findings of the "Wildlife Inventory in Forest Reserves" project, conducted by the Wildlife Division in 2001-2002 and coordinated by Abedi-Lartey; this includes summary information for Boi Tano, Krokosua Hills and Mamiri, which were some of 67 reserves in 43 blocks surveyed using forest walks and hunter interviews. Additional general information on the history and status of forest vegetation was obtained from Hawthorne & Abu-Juam (1995), and additionally for Mamiri from the Forestry Commission's 2001 *Management Plan for FMU 10, Mamiri Group of Forest Reserves*.

3.5. Hunter Interviews

Information obtained from interviewing hunters and other local people was used mostly to provide impressions and clues as to the status of wildlife. In the experience of the team leader, hunters in Ghana vary greatly in the reliability and accuracy of their reporting. Even when reporting with apparent accuracy on their knowledge of wildlife, this reporting is affected by their general lack of higher education, so that without special training in objective reporting and critical thinking they often report as "fact" things that are more in the nature of beliefs or stories, or things that they think their questioner wishes to hear. The results of hunter interviews must be used with caution, therefore.

In questioning local hunters we endeavoured not to ask leading questions, we tried not to indicate whether one answer was sought more than another, and we asked questions in different ways to test the reliability of answers to other questions. Typically, hunter interviews (following personal introductions and questions about the hunter's occupation and his experience of a particular area) started by asking the interviewee to name the animals of

the target forest in his own language. Subsequently, the interviewee would be asked to say when he had last seen different species and, for primates, what the relative abundance was of each species. Only after giving an interviewee a chance to provide information himself might we prompt him with questions about species he had not mentioned.

In reviewing reports of previous surveys, the extent to which they relied on information from hunters and other non-scientists was evaluated.

3.6. Community Meetings

Formal meetings, based on prior announcement of a date, were held with members of communities living close to each of the four target reserve areas. These meetings were held at: Kamaso on 21 December 2005 (for Mamiri FR); Tanoso/Accra Town on 21 December 2005 (for Boi Tano FR); Benchama/Nkatieso on 31 January 2006 (for Krokosua Hills FR); and Kumkumso also on 31 January 2006 (for Bia NP/RR). These meetings were chaired by prominent personalities from the participating community: Osofo Quarm at Kamaso; Nana Odoi Laryea (ex-chief of Tanoso) at Tanoso/Accra Town; Nana Aforo Kwaw II (Chief of Nkatieso) at Benchema/Nkatieso; and Nana Afrukwaa II (Chief of Debiso) at Kumkumso.

We explained to community members that the main objectives of the meeting were to solicit community input into a strategy document to guide future management, using their perceptions of past and present management, trends in wildlife abundance, and their expectations for the future.

All meetings were facilitated by Abedi-Lartey. Proceedings were written down by a pair of "secretaries" at each meeting. Notes were taken by Yaw Boafo, John Atingah and James Oppong for Mamiri and Boi-Tano, whilst John Atingah and Alex Agyei (Wildlife Ranger, Goaso) took notes for Krokosua and Bia. To ensure that no crucial point was missed, each scribe took turns at taking notes; in this way, one scribe focused on one issue, endeavouring to record all salient points and conclusions accurately, whilst his colleague proceeded with the subsequent issue. The conclusions for each issue were read out to participants at the end of each meeting so that necessary corrections could be made and a general consensus reached. Hunters who had served as guides to us in the field surveys were not allowed to contribute to perceptions of wildlife changes, so as not to influence the general community based on their work and conversations with us. However, they actively participated in deliberations on other issues. Despite the presence of chiefs and other

prominent citizens from different communities, almost every participant freely expressed him/herself on given topics. We aimed at consensus on any information or issue before moving on.

Figure 2. Community meeting at Kamaso for Mamiri F.R., 21 December 2005 (M. Abedi-Lartey).

Because we found that there was variation both across and within individual communities in their understanding of the meeting objectives and in the issues that concerned them most, the meeting format was kept flexible. However, the general format for the meetings was as follows (with the order in which the topics were addressed and the depth to which they were examined varying):

- A brief history of reserve (acquisition of land, interactions between management and communities, etc).
- Management trends (past, present and perceived future direction).
- Resource changes (past, present and perceived future direction).
- Threats to resources (natural and anthropogenic).
- Suggested solutions to problems.
- Identifiable stakeholders for action points.

- General conclusions.

We made a conscious effort not to turn the meetings into a review of the CIF programme, but in the case of the GSBAs this inevitably became an important theme.

A detailed summary of what was said at the community meetings is presented in Appendix 1.

4. DESCRIPTION OF TARGET RESERVES

4.1. Mamiri FR

Mamiri Forest Reserve covers an area of 45 km^2 immediately south of the town of Sureso. It was constituted as a reserve in 1949. It has a long, narrow shape, extending for about 15 km from north to south, and only 2-4 km from east to west (see Map 1, Appendix 2). Its southern boundary joins the northern boundary of the larger Fure Headwaters Forest Reserve (169 km^2) and its northern boundary is separated by 1.5 km from the southern tip of the Bura River Forest Reserve; a major road, the town of Sureso, and other human settlements and farms lie in the gap between Mamiri FR and Bura River FR. The northern sector of Mamiri FR is hilly, with a maximum elevation of around 250 m, and swampy valleys; the southern part is more gently undulating, again with swampy areas.

Mamiri lies on the boundary between the Wet Evergreen and Moist Evergreen forest zones of Hall & Swaine (1981).

Hawthorne & Abu-Juam (1995) reported that Mamiri was last logged in 1973. Samartex Timber and Plywood Ltd was granted a 40-year concession to log Mamiri in 1997, relinquished this in 2001, then later took the concession back (FC Regional Planning Team, 2001; Forest Office, Asankrangwa). Twelve of 17 compartments in the northern sector of the reserve are designated as Hill Sanctuary compartments, protected from logging (Regional Planning Team, 2001), but this area has not been formally declared as a GSBA.

Our observations found the forest structure of Mamiri to be quite varied. The north-central section has a continuous canopy at 10-25 m with scattered emergents to 35-40 m. Common large trees are *Alstonia*, *Berlinia*, *Ceiba*, *Cylicodiscus*, *Dacryodes*, *Distemonanthus*,

Khaya, *Parinari*, *Piptadenistrum* and *Strombosia*. There is a moderately dense understory. Near Sureso in the far north of the reserve, the forest has been more disturbed by logging than in the central hills and the undergrowth is thicker. The flatter, southern section has been heavily disturbed by logging and typically has a low, broken canopy with often very thick undergrowth. Of the large trees that remain, *Triplochiton* is abundant in this southern area and among other species recorded were *Amphimas*, *Antiaris*, *Cylicodiscus*, *Piptadeniastrum*, *Pycnanthus*, *Terminalia* and *Tieghemella*.

Two roads in active use touch the edge of Mamiri with the Sureso to Samreboi highway passing through the northern tip of the reserve.

4.2. Boi Tano FR

Boi Tano Forest Reserve covers a total area of 129 km^2. It was constituted as a reserve in 1967. Its northern boundary joins the southern and southwestern boundary of the Tano Nimiri Forest Reserve. The Tano River forms part of their eastern boundaries of both reserves, and the Boin River flows close to the western boundary of Boi Tano. The town of Boinso lies 2 km from the western boundary of Boi Tano, on the road from Gyema to Alatakrom.

Boi Tano FR lies entirely within the Wet Evergreen forest zone of Hall & Swaine (1981).

The Boi Tano GSBA covers 62 km^2, including the northern half of the reserve, adjacent to Tano Nimiri, together with eight forest compartments along the Tano River. Much of Boi Tano is hilly, especially in the GSBA area, with many small watercourses and swamps. Southern parts of Boi Tano (outside the GSBA) are being exploited by Samartex, with the current felling cycle due to be completed in 2013.

The southern section of the Boi Tano GSBA has been heavily logged in the past (Hawthorne & Abu-Juam, 1995, reported that Boi Tano was last logged in 1980); such areas have a low canopy with thick undergrowth and scattered tall trees. The hilliest sections in the north of the GSBA, close to the boundary with Tano Nimiri, are the least disturbed; some of this area shows no evidence of logging and there is open undergrowth and a relatively high canopy. Among abundant large trees noted in the GSBA are *Cynometra*, *Dacryodes*, *Daniellia*, *Heretiera*, *Khaya*, *Lophira*, *Nauclea*, *Parkia*, *Piptadeniastrum*, and *Tieghemella*.

Lophira alata was particularly common in places. The introduced pioneer tree, *Cecropia peltata*, is very abundant along logging roads in Boi Tano, occupying a niche that would once have been filled by *Musanga cecropioides*.

Fig. 3. Logging road, Boi Tano FR, GSBA. On the right pioneer *Cecropia* and *Musanga* are intermixed.

Some of the old logging roads in Boi Tano are still in use, including one being used to carry farm produce from the western to the eastern side of the reserve through the GSBA.

Because local hunters who acted as our guides for Boi Tano insisted that the southern section of Tano Nimiri was an important habitat for chimpanzees and other primates, some of our surveys extended from the Boi Tano GSBA into Tano Nimiri.

4.3. Krokosua Hills FR

Krokosua Hills Forest Reserve covers 482 km^2 and was established in 1935. It lies close to the east of the Bia River, to the west of Bia National Park and Resource Reserve. The Krokosua Hills GSBA occupies the northernmost section of the forest reserve and has an area of 142 km^2. A high, steep-sided ridge (with elevations up to 600 m) runs from northeast to southwest through the central part of the GSBA. The town of Adwumadiem lies close to the northeastern boundary of the GSBA, and Asempanye is close to the southwestern boundary. The settlement of Mim is enclaved with the northernmost part of the GSBA.

The Krokosua Hills reserve lies in the southern part of the Moist Semideciduous forest zone of Hall & Swaine (1981).

The lowlands of the Krokosua GSBA have been heavily logged in the past, and the team leader observed logging in progress in the reserve by the GAP company on a visit in 1995. Lowland areas have a very broken canopy, thick undergrowth (often dominated by the exotic weed, *Chromolaena odorata*), and scattered large trees. Some of the past logging has extended into the hills, into areas that were supposed to be protected from felling. Generally, however, the hill forest shows relatively few signs of disturbance, with a high density of large trees and open understory.

Fig. 4. Hill forest, Krokosua Hills FR, GSBA.

Among common large trees noted at Krokosua were *Antiaris*, *Canarium*, *Ceiba*, *Celtis*, *Chrysophyllum*, *Entandrophragma*, *Guarea*, *Khaya*, *Parkia*, *Petersianthus*, *Piptadeniastrum*, *Terminalia* and *Triplochiton*.

Farms extend far into the Krokosua GSBA around the Mim settlement, but we were not able to determine the precise boundaries allocated to this enclave. An old logging road connects Mim through the GSBA to other villages on the northeastern edge of the reserve, and then to a highway. This road has light vehicle traffic and heavy foot traffic. In the south of the GSBA, north of the large town of Sanyerano, we observed some illegal patches of cultivation inside the forest, growing plantain, cocoyam, pepper and marijuana.

4.4. Bia NP & RR

Bia Tributaries South Forest Reserve, covering 306 km^2, became the Bia National Park (Bia NP) in 1974. Under subsequent pressure from logging interests, a large part of the southern section of the park had its status changed to "Game Production Reserve" (GPR) in 1977, which opened it to loggers. The national park was reduced to 78 km^2 in the north of the former forest reserve, an area with fewer large trees than the GPR that may have been farmed in the relatively recent past. Bia GPR later became the Bia Resource Reserve (Bia RR); the team leader observed active logging here by the Mim Timber Company in 1995, logging that was illegal at this time, according to forestry officials in Kumasi. Efforts to terminate logging in the Resource Reserve continued, and the Protected Areas Development Programme (PADP) for the Western Region of Ghana finally managed to bring a halt to this logging in 1998 (PADP, 7th Quarterly Progress Report, October-December 1998, by ULG Consultants).

Because of the past logging, the forest canopy in Bia RR is generally broken and there is often dense undergrowth dominated by *Chromolaena*. However, there are some areas with relatively light logging damage and a more open understory.

The Bia terrain is generally flat, undulating between 150 and 300 m asl. In the far south of Bia RR the valleys of the reserve's numerous small watercourses are often swampy.

Bia NP lies right on the boundary between Hall & Swaine's Moist Evergreen and Moist Semideciduous forest zones, with Bia RR falling entirely within the Semideciduous zone. Among large trees noted as common at Bia were *Albizia*, *Alstonia*, *Ceiba*, *Celtis*,

Chysophyllum, *Cola gigantea*, *Entandrophragma*, *Khaya*, *Nesogordonia*, *Piptadenistrum*, *Pycnanthus*, *Pterygota*, *Terminalia* and *Triplochiton*. Past cultivation in the national park sector is indicated by the presence of old, scattered oil-palm trees.

Although many of the logging roads in the Bia RR are now overgrown, one road is presently being cleared and regraded from Adjuafua on the eastern side of the reserve to the WD Bongo Camp in the south central part of the reserve. According to a signboard, this work is part of a feeder roads programme financed by the European Union. At the time of our visit in January, road clearing had reached about 10 km into the reserve. Rather than just clearing the old road course, earth had been moved and vegetation cleared (including the felling of some large trees) for several metres on either side of the actual road, creating a swathe of destruction through the forest. The scale of this destruction had ameliorated towards the end of the cleared section, apparently after expressions of concern by management.

Fig. 5. Reopened logging road through Bia Resource Reserve, January 2006.

5. FINDINGS ON WILDLIFE AND HUNTING

5.1. Primates and Other Mammals

Direct evidence for the presence of primates (from sightings, calls and – for chimpanzees – tracks or nests) in the targeted reserves was very sparse, and we detected no signs of the three critically endangered taxa (the white-naped mangabey, *Cercocebus atys lunulatus*; the roloway monkey, *Cercopithecus diana roloway*; Miss Waldron's red colobus, *Procolobus badius waldroni*).

Table 4 summarizes the results of primate encounters on daytime census walks in all four reserves.

In addition to the encounters reported in Table 4, at Bia there was an additional encounter with an association of *Cercopithecus campbelli* and *Procolobus verus* during a return walk along a route already censused, at a location where primates had not been detected on the outbound search walk. Also, on several occasions (once at Mamiri, 9 times at Krokosua) loud calls of adult male *C. campbelli* were heard from camp sites or listening/ observation points when observers were not engaged in a formal census; once (at Krokosua) a male *C. petaurista* call was heard from camp.

Table 4. Frequencies and rates of primate encounters on daytime census walks in target reserves.

Reserve	No. of censuses conducted	Total search time (hrs:mins)	Species composition of primate associations encountered, and N of distinct associations	Encounter rate per species (encounters with sp. x/hr)	Total encounter rate (sum of encounter rates for individual species)
Mamiri	19	71:17	0	0	0
Boi Tano	22	80:37	*C. campbelli*, 4 *C. petaurista*, 1	*C. campbelli*, 0.050 *C. petaurista*, 0.012	0.062
Krokosua	17	58:07	*C. campbelli*, 2 *C. petaurista*, 1 *C. campbelli* + *C. petaurista* + *Pr. verus*, 1 *Co. vellerosus*, 2[1]	*C. campbelli*, 0.052 *C. petaurista*, 0.034 *Co. vellerosus*, 0.034 *Pr. verus*, 0.017	0.138
Bia	20	76:04	*C. campbelli*, 2 *C. petaurista*, 2 *C. campbelli* + *C. petaurista*, 1 *Co. vellerosus*, 1 *Pr. verus*, 1 *P. troglodytes*, 1	*C. campbelli*, 0.039 *C. petaurista*, 0.039 *Co. vellerosus*, 0.013 *Pr. verus*, 0.013 *P. troglodytes*, 0.013	0.118

Footnote 1: *Colobus vellerosus* sighting and loud call detected 2 hours apart in the same general area of Krokosua Hills on the same day. Uncertain if from same or different groups, but considered here as two separate groups.

Table 4 indicates one direct encounter with chimpanzees, *Pan troglodytes*: this was a set of distant vocalizations heard in Bia RR on 13 January 2006. Other evidence for chimpanzees was one set of three nests seen at a height of about 15 m in the northern part of Mamiri FR on 9 December 2005; foot and knuckle prints and feeding signs in the south of Tano-Nimiri FR about 2 km north of the Boi Tano GSBA on 17 November 2005, and additional prints in the northern part of the Boi Tano GSBA also on 17 November 2005. Two hunters at Krokosua reported having seen chimpanzees in the southwest of the GSBA in November or December 2005 but on our foot censuses we did not detect any signs of chimpanzees.

Crescendo calls of dwarf galagos, almost certainly *Galagoides demidovii,* were heard in the evening and around dawn at camp sites in all four reserves, and the galagos were also seen during "night shining" with a headlamp at Boi Tano, Krokosua and Bia. They appeared to be abundant at all sites. A hunter was seen emerging on to a road close to the boundary of Bia Resource Reserve with a young potto (*Perodicticus potto*), which was confiscated by Wildlife staff and taken to Kumasi Zoo, and later in the survey a hunter was arrested by Bia staff at the boundary of the national park and resource reserve and in his bag was a potto, along with a tree hyrax and a small bird.

Table 5. Frequencies and rates of direct encounters with non-primate mammals on daytime census walks in target reserves.

Reserve	**Total search time (hrs:mins)**	**Species encountered, and frequency of all encounters (sightings; calls or nearby movement)**	**Total encounter rate for species-groups (N encounters/hr)**
Mamiri	71:17	Small tree squirrels, 1 (1; 0) Giant forest squirrel, 4 (3; 1) Maxwell's duiker, 2 (2; 0) Large duiker, 1 (0; 1) Mongoose, prob. *Crossarchus*, 1 (1; 0)	Squirrels, 0.070 Antelopes, 0.042 Mongooses, 0.014
Boi Tano	80:37	Small tree squirrels, 4 (4; 0) Side-striped squirrels, 1 (0; 1) Giant forest squirrel, 5 (4; 1) Tree pangolin, 1 (1; 0) Civet, 1 (1; 0) Tree hyrax 1 (0; 1)	Squirrels, 0.124 Pangolins, 0.012 Civets, 0.012 Hyraxes, 0.012
Krokosua	58.07	Side-striped squirrels, 1 (0; 1) Giant forest squirrel, 19 (18; 1) Royal antelope, 2 (1; 1) Tree hyrax, 2 (0; 2) Mongoose, prob. *Crossarchus*, 1 (1; 0)	Squirrels, 0.344 Antelopes, 0.034 Hyraxes, 0.034 Mongooses, 0.017
Bia	76:04	Small tree squirrels, 3 (3; 0) Giant forest squirrel, 7 (3; 4) Tree pangolin, 1 (1; 0) Mongoose, prob. *Crossarchus*, 3 (3; 0) Elephant, 1 (0, 1)	Squirrels, 0.131 Pangolins, 0.013 Mongooses, 0.039 Elephants, 0.013

Table 5 summarizes direct encounters by daylight census teams of non-primate mammals. Direct encounters includes sightings, vocalizations, or hearing an animal moving close to the census path and then examining a track (one large antelope at Mamiri, possibly a black duiker; and an elephant at Bia).

The overall encounter rate with non-primate mammals was 0.126/hr in Mamiri, 0.161/hr in Boi-Tano, 0.429/hr in Krokosua, and 0.196/hr in Bia. The relatively high encounter rate at Krokosua results from a report by one team member of 12 sightings of giant forest squirrels on a single census; excluding that unusual observation, the Krokosua overall encounter rate is 0.223, similar to the rate at other sites.

Using information on tracks and trails in a quantitative fashion to compare animal densities is problematic as the frequency with which obvious tracks are observed depends on soil conditions and weather, and the persistence of the tracks; a single animal can leave tracks in several different places. Similarly, the frequency of droppings is notoriously difficult to translate into a population density measure. In addition, not all team members were equally expert at identifying tracks and droppings. Finally, because our survey was concentrating on arboreal primates, team members could not devote great attention to looking at the ground they were traversing. With those caveats in mind, we recorded 15 sets of duiker tracks at Mamiri and at Boi Tano, compared to 3 each at Krokosua and Bia; fresh duiker droppings were noted at Mamiri, Boi-Tano and Bia; royal antelope tracks or droppings were recorded at Boi Tano (2) and Krokosua (1); tracks believed to be of bushbuck were noted at Mamiri (2), Krokosua (5) and Bia (8), and of possible bongo at Mamiri (2), Boi Tano (1) and Bia (1). Footprints of small carnivores were seen at Mamiri (4), Boi Tano (3), Krokosua (1) and Bia (3). Elephant tracks, trails and dung were seen only in southern Bia, where they were abundant. Brush-tailed porcupine trails were relatively abundant at Mamiri, Boi Tano and Krokosua, but were noted only once at Bia. Summing these records of mammal tracks and other signs, there were about 0.5 records/hr of census in Mamiri; 0.4/hr in Boi Tano; 0.4/hr in Krokosua; and 0.5/hr in Bia. It is also interesting that Mamiri and Boi Tano appeared to have higher duiker densities than the other sites; observers diagnosed the duiker tracks seen at Mamiri and Boi Tano as made by *Cephalophus maxwelli* (small), *C. dorsalis* (medium) and *C. niger* (large), although the team leader is sceptical as to whether duiker tracks can always be reliably identified to species. Mamiri, despite its dearth of primates, was also the only site where duikers were actually sighted by team members. Larger antelope tracks, possibly of

bushbuck and/or bongo, were most commonly noted at Bia. In terms of mammals of conservation concern, the possible bongo tracks at Mamiri, Boi Tano and Bia, and the elephants signs in southern Bia are of most significance.

5.2. Large Birds

In their 2005 ornithological survey of Bia, Krokosua Hills, Ayum and Subim, Dowsett-Lemaire & Dowsett (2005) recorded no large hornbills (*Bycanistes cylindricus* and *B. subcylindricus*, *Ceratogymna atrata* and *C. elata*) in any of the reserves. They encountered no guineafowl, and obtained only one record of the large great blue turaco (*Corythaeola cristata*). They attribute this lack of large birds, once known to be residents of the forests they surveyed, to overhunting. Although our survey team did not include experienced birdwatchers, all of these large birds are readily recognizable. Yet we also encountered very few large birds. No guineafowl were detected at any of the sites we visited, and we had only one encounter with any large hornbills: in Boi Tano, on the boundary with Tano Nimiri F.R., Abedi-Lartey made one sighting of a pair of large hornbills (probably *Ceratogymna* sp.). Great blue turacos were encountered during three censuses at Mamiri, two at Krokosua and one at Bia (and the smaller yellow-billed turaco was often heard calling at Mamiri, Boi Tano and Krokosua).

5.3. Evidence of Hunting

There were signs of hunting by humans at all the sites we surveyed, and these signs were especially abundant at Boi Tano and Krokosua. Table 6 summarizes the evidence we encountered.

The sites showed very different patterns of hunting evidence. Mamiri had relatively few signs of hunting, which may be related to the low densities of animals left in the forest, making hunting an uneconomic activity (at Mamiri we had our lowest non-primate mammal encounter rate, and saw no monkeys during censuses). Boi Tano and Krokosua had very high levels of trapping activity, and Bia had abundant evidence of shotgun hunting but relatively low levels of trapping (the very high number of traps encountered at Boi-Tano include 212 seen on one single census; if that census is removed from analysis the Boi-Tano total is very similar to that of Krokosua). Shotgun hunting, especially at night, may be more popular at Bia than trapping because it can be done in short surreptitious visits that may elude protection staff, while static traps can be quite readily found and destroyed by staff. Even so,

the high frequency with which we heard gunshots and found spent cartridges at Bia indicates that protection is relatively ineffective. There is also the possibility that more game still survives at Bia than at the other survey sites; in general trapping becomes most frequent in tropical forests when shotgun hunters start to encounter few animals on their hunting trips. However, our primate and non-primate mammal encounter rates were higher at Krokosua than at Bia.

Table 6. Material evidence of hunting at four survey sites.

Type of Evidence	**Mamiri**	**Boi Tano**	**Krokosua**	**Bia**
Spent cartridges	20	78	91	89
Gunshots heard[1]	8	0	5	22
Wire-snare traps or trap sites	16	451	182	45
Digging for rats	5	1	9	2
Carbide piles, batteries, battery wrappers	3	7	16	10
Hunters encountered	2	2	0	3
Camp sites	0	2	4	0
Total no. of signs (excluding gunshots)	46	541	302	149
Total signs per hour of census (excluding gunshots)	*0.65*	*6.71*	*5.20*	*1.96*

Footnote 1: Gunshots include those heard from camp sites at night.

5.4. Hunter Interviews

As noted in 3.5 above, information obtained from hunters and other local people needs to be interpreted with caution, but it can still provide useful clues to the presence/absence and abundance of wildlife.

Mamiri

At Mamiri, an interview with the chief at Kamaso village on the west side of the GSBA elicited the information that only Lowe's (mona) monkeys and chimpanzees had been seen in the last two years, and that other monkeys had been "driven off by noise." An old hunter at Sureso town on the north edge of the GSBA noted killing spot-nosed monkeys and (most frequently) Lowe's monkeys in the past, and said he had seen olive colobus in the forest; he said that on hunting trips some years previously he had twice met chimpanzees. Two hunters who acted as guides for us during our first visit to the forest in November 2005 only reliably identified the call of Lowe's monkey when a tape of West African monkey vocalizations was played to them. The only diurnal primates for which we got direct evidence of their presence during our surveys at Mamiri were Lowe's monkey and chimpanzees (the latter from a set of three nests).

Fig. 6. School compound at Sureso, on the edge of Mamiri Forest Reserve.

At Mamiri we investigated a report that chimpanzees had appeared in the compound of a primary school in Sureso a few years ago. We were told that 3 chimpanzees were seen in about 2002, that the schoolchildren were frightened, and that someone got a gun and shot one chimp, killing it; the meat was sold. This event, we were told, led to a visiting hunter entering the forest and shooting another chimp. Sureso lies in a narrow corridor of human settlement between the northern tip of Mamiri and the southern tip of the Bura River FR, so it

is possible that chimpanzees sometimes attempt to cross through this corridor between the forests.

Boi Tano

A hunter who accompanied us on our initial visit to Boi Tano said he had seen Lowe's monkeys and spot-nosed monkeys about one month previously, black-and-white colobus about two months previously, and roloway monkeys about six months ago (in the team leader's experience, reports of when animals were last seen are generally not precise in terms of the time reported, but do give an indication of relative abundance, or even absence; when a species is said have been seen many months or some years ago, ground surveys usually fail to find that species and it is likely very rare or absent). This hunter did not recognize the distinctive whistle calls of roloway played to him from a tape, and confused the roloway male's croaking loud call with that of a black-and-white colobus. He did correctly identify the "laughing" call of a male olive colobus. He made no mention of mangabeys and did not recognize their taped call. He said that chimpanzees occurred in the area where Boi Tano and Tano Nimiri reserves meet, something reported to us by other hunters. He said that roloway monkeys, black-and-white colobus and red colobus were more abundant 18 years ago. In our extensive surveys in Boi Tano we encountered only Lowe's monkeys and spot-nosed monkeys, and saw signs of chimpanzees in the area where Boi Tano and Tano Nimiri meet.

Krokosua Hills

At Krokosua, a hunter from Mantebea village described seeing Lowe's monkeys, spot-nosed monkeys and olive colobus in the last few months but said he had seen none of the other forest monkey species for at least 10 years (and red colobus 30 years ago). Another man who acted as our guide, and said he had been hunting in the GSBA area for 30 years, noted seeing Lowe's monkeys, spot-nosed monkeys, olive colobus and black-and-white colobus in the last 3 weeks; chimpanzees 1.5 months ago; roloway monkeys 4 years ago; and red colobus about 25 years ago. A third hunter, from Dome, who said he now only hunts with traps, said that olive colobus, spot-nosed monkeys and Lowe's monkeys are present in the forest where he hunts, but that he had not seen other species since he stopped shotgun hunting 7 years ago; he said he had last seen red colobus 20 years ago. A fourth hunter, a young man from Mim, only mentioned (without prompting) the presence of spot-nosed monkeys, Lowe's monkeys, olive colobus and black-and-white colobus; when prompted with

their Twi names he claimed to have seen roloway monkeys and mangabeys in another area in the past, and he said chimpanzees had also been heard by another hunter 5 days ago. At Krokosua we encountered Lowe's monkeys, spot-nosed monkeys, olive colobus and black-and-white colobus.

Bia

Three Bia staff and a hunter reported the presence of chimpanzees, spot-nosed monkeys, Lowe's monkeys, olive colobus and black-and-white colobus. We saw or heard all these species at Bia. In addition, principal technical assistant Philip Mensah (who has been employed at Bia for many years) reported in the past (more than 10 years ago) having seen mangabeys, roloway monkeys and red colobus.

6. SUMMARY OF COMMUNITY MEETINGS

Minutes of these meetings are provided in Appendix 1.

Each community raised different concerns, in part because the forests in their areas were under different management regimes. Mamiri FR does not have a GSBA, so its surrounding communities are not eligible for benefits from the Community Investment Fund (CIF). Likewise, the communities at Bia (where the forest has the status of National Park and Resource Reserve) are not eligible for CIF assistance. Having heard of the benefits of the CIF, communities at these reserves inevitably wished for an opportunity to participate in it.

Many comments we heard at the meetings suggested the dangers inherent in establishing a financial incentive in aid of conservation. Although Mamiri and Bia wished they could participate, at the sites where the CIF scheme was in effect (Boi Tano and Krokosua) concerns were raised about the relatively small amount of money available per person, and about transparency in the management of funds. Once money was available to some people, others who had not directly benefited felt that they had no obligation to help protect a GSBA, while even those who did benefit apparently were still exploiting the forest (Krokosua Hills) and appeared to perceive few constraints on their exploitation.

Fig. 7. Meeting of chiefs, Kumkumso Camp, Bia National Park, 31 January 2006.

(Photo M. Abedi-Lartey)

Boi Tano and Krokosua communities seemed to have a poor opinion of the Forest Services Division's commitment to forest protection, and the ability of its staff to show leadership in forest protection. Each community raised concerns about the reasonableness (and validity) of large numbers of permits apparently issued by FSD officers to outsiders for various exploitation activities in forest reserves. Similarly, people at Bia thought that the Wildlife Division was doing a poor job of protecting the park and reserve; they thought that there should be more employment opportunities for local people, and much more stringent control of entry by outsiders during the snail-gathering season.

At each site, community members agreed that almost all wildlife species, including monkeys, were declining in numbers. Therefore, communities essentially agreed that none of the various conservation measures in place are working effectively to protect animals, which was the clear conclusion pointed to by our own forest surveys.

7. CONCLUSIONS

7.1. Status of Primates at Target Sites

It is evident that the species diversity and abundance of diurnal primates (monkeys and apes) in all four targeted reserves is now low. We had a total of only 22 encounters with groups of different primate species during day census walks that had a total duration of 286 hours (0.08 encounters/hr). Just 6 of these encounters involved an actual sighting of monkeys (*Cercopithecus petaurista*, 3; *C. campbelli*, 2; *Colobus vellerosus*, 1). As our slowest census walking speed was about 1 km/hr, these figures are equivalent to a maximum of 0.08 encounters/km, or 0.02 sightings/km. This may be compared with 0.26 encounters/km by Struhsaker in Bia in 1993, and 0.75-1.26 encounters/km by Struhsaker and Oates at Kakum, also in 1993 (Oates et al., 2000). In this new survey, our encounter rate at Bia was 0.12 groups/hr, suggesting (though the sample size is very small from each year) a 50% decline in primate abundance from 1993 to 2005-06.

We will summarize our findings for each site, comparing them with findings from previous surveys where data are available (Mamiri has not previously been surveyed for primates, so comparative field data are not available).

Mamiri

In Mamiri Forest Reserve we recorded the presence of Lowe's monkey (*Cercopithecus campbelli*) and the chimpanzee (*Pan troglodytes*); there is a possibility (based on one interview) that two other species that often survive in situations where there is high hunting pressure, the spot-nosed monkey (*C. petaurista*) and the olive colobus (*Procolobus verus*) are also present, but if so they are probably now very rare.

Boi Tano

In Boi Tano GSBA and adjacent southern parts of Tano Nimiri Forest Reserve we recorded Lowe's monkey, the spot-nosed monkey, and chimpanzees; based on interviews and the nature of the habitat we inferred that olive colobus and possibly black-and-white colobus (*Colobus vellerosus*) may survive at low densities.

Abedi-Lartey surveyed Boi Tano primates in 1997 and 1998; in 1997 he encountered just one group of Lowe's monkeys, and in 1998 a mixed group of Lowe's, mangabeys and

olive colobus (Abedi-Lartey, 1998; Abedi-Lartey, 1999). In two transect surveys in the Boi Tano GSBA in 2003, Deschner & Kpelle saw no diurnal primates (Deschner & Kpelle, 2004). In the IRNR faunal survey of GSBAs, only Lowe's monkey and olive colobus are reported from Boi Tano (IRNR, 2005). These recent surveys produced results consistent with our own, and suggest that mangabeys (*Cercocebus atys*) are likely now extinct in Boi Tano.

Krokosua Hills

In the Krokosua Hills GSBA we recorded Lowe's monkey (*Cercopithecus campbelli*), the spot-nosed monkey (*C. petaurista*), olive colobus (*Procolobus verus*) and black-and-white colobus (*Colobus vellerosus*); interviews suggested that chimpanzees (*Pan troglodytes*) are probably still present in small numbers.

In a two-day visit to what is now the GSBA area of the Krokosua Hills in 1995, Whitesides & Oates (1995) encountered no monkeys, but concluded from the evidence of interviews that *C. campbelli*, *C. petaurista*, *Co. vellerosus*, *P. verus* and *Pan troglodytes* were probably present at low densities. Following up with a visit in April 1998, Abedi-Lartey detected only *C. campbelli* and *C. petaurista*; in a second visit in January 1999 he heard *Co. vellerosus*, *P. verus*, *C. campbelli* and *C. petaurista* (Abedi-Lartey, 1999). Conducting primate surveys later that same year, and also in the GSBA area, White & Berry (1999) conducted 50 km of transect censuses and surveyed 22 km of bush trails; they sighted *C. campbelli*, *C. petaurista*, *Co. vellerosus* and *P. verus*, and report hearing calls from a further 32 groups, including *Cercocebus atys* – however, neither White nor Berry themselves heard the calls said to have been made by mangabeys, which were reported by their assistants. In the course of 6.4 hrs of transects and 37.9 hrs of scouting surveys in Krokosua in 2003, Deschner & Kpelle (2004) saw Lowe's monkey once, heard them twice, and saw spot-nosed monkeys once (an encounter rate of 0.090/hr, compared to our rate of 0.086/hr for the same two species); they also report seeing possible chimpanzee feeding remains. In 2004, the IRNR team encountered only Lowe's monkeys (IRNR, 2005).

Our findings from this survey, and the findings of most other investigators, are consistent with the conclusion of Whitesides & Oates (1995) that the diurnal primates present in the Krokosua Hills GSBA area are *C. campbelli*, *C. petaurista*, *Co. vellerosus*, *P. verus* and *Pan troglodytes*. However, there have been a few reports of the presence at Krokosua of the roloway monkey (*Cercopithecus diana*) and the white-naped mangabey (*Cercocebus*

atys). The roloway reports are from a statement in Abedi-Lartey (1999) that a team of wildlife guards from Bia detected two groups of roloway monkeys at Krokosua during an August 1998 visit, and from Magnuson (2002), who reports on surveys on 37 days in 2001 in the Mim area. Based on all the evidence we have evaluated from 10 years of surveys, we are doubtful that *C. diana* has been present in the Krokosua GSBA area for several years, and we conclude that it is almost certainly now extinct there. We are not sure how to evaluate Magnuson's report, and we do not consider the report from 1998 by the Bia guards to be wholly reliable. The mangabey evidence (apart from the possible vocalizations mentioned by White & Berry) also derives from what Bia guards reported to Abedi-Lartey (1999), and we conclude that the mangabey is also no longer present at Krokosua. Miss Waldron's red colobus (*Procolobus badius waldroni*) did occur in Krokosua more than 40 years ago, but surveys there by Rucks (undated report) in the early 1970's failed to locate any of the monkeys and all reports since that time have been anecdotal and unreliable; this monkey must certainly now be extinct at Krokosua.

Bia

At Bia we obtained direct evidence of more species than at other sites, but of no species additional to those at the other sites: Lowe's monkey, spot-nosed monkey, olive colobus, black-and-white colobus and chimpanzee.

In the mid-1970's there was a primate research project at Bia (it terminated in 1977), and at that time Campbell's monkey, the spot-nosed monkey, the roloway monkey, the olive and black-and-white colobus, the white-naped mangabey and chimpanzees were all present. But when Struhsaker visited Bia in 1993 he found evidence only of Lowe's and spot-nosed monkeys and chimpanzees, although he was told that black-and-white colobus were still present. Whitesides & Oates in 1995 also encountered Lowe's and spot-nosed monkeys, and received apparently reliable reports of olive and black-and-white colobus. Magnuson (2002) reports the detection of black-and-white colobus at Bia and received seemingly reliable reports of Lowe's and spot-nosed monkeys. These other reports concur with our finding that Lowe's monkey, the spot-nosed monkey, the olive colobus, the black-and-white colobus and chimpanzee are present at Bia; the roloway monkey and mangabey are almost certainly now extinct, and the red colobus definitely extinct.

Summary comparison

Table 7 summarizes our conclusions about the presence of monkeys and chimpanzees in the four target reserves.

Table 7. Presence of anthropoid primates in four target reserves.
X = present; (X) = probably present, (X?) = possibly present; (0) = probably absent; 0 = absent.

Species	**Mamiri F.R.**	**Boi Tano GSBA**	**Krokosua GSBA**	**Bia NP & RR**
Cercocebus atys	0	0	0	0
Cercopithecus diana	0	0	(0)	0
Cercopithecus campbelli	X	X	X	X
Cercopithecus petaurista	(X)	X	X	X
Procolobus verus	(X)	(X)	X	X
Procolobus badius	0	0	0	0
Colobus vellerosus	0	(X?)	X	X
Pan troglodytes	X	X	(X)	X

7.2. Status of Other Wildlife

The abundance of other mammals and large birds was also found to be very low in the target reserves. During 286 hours of day censuses, there were only 11 encounters with mammals other than squirrels. This included Maxwell's duiker, royal antelope, pangolins, mongooses and a civet, none of them of high conservation concern, with the possible exception of the pangolins. Very few large birds were encountered. This is consistent with the observations of Dowsett-Lemaire and Dowsett (2005) in Bia and Krokosua, who ascribed the low mammal and large bird encounter rates they obtained to overhunting; we agree with their diagnosis. Dowsett-Lemaire and Dowsett (2005) found a high diversity of smaller birds in Bia and Krokosua, with 151 species recorded in 4 days at Bia, and 135 species in just 2 days in the logged forest around Mim at Krokosua. Among birds of particular interest was the red-fronted parrot, *Poliocephalus gulielmi*, found to be very common near Mim.

Perhaps the animals of greatest conservation interest that we encountered are the elephants still present in Bia Resource Reserve. However, we encountered elephant signs only in the far south of the reserve. Also of special interest were tracks of possible bongo seen at Mamiri, Boi Tano and Bia.

7.3. Human Pressures on Target Forests

Damage to the forest habitat by human action was observed to vary greatly across the four sites. All have been legally protected against farming for 40 years or more (70 years in the case of Krokosua Hills), but all have been subjected to logging in that time. All the reserves exhibit extensive areas in which many large trees have been felled, producing a low, dense tangle of vegetation with abundant climbers, through which scattered trees emerge. A broken canopy of this kind with a dense thicket is a poor-quality habitat for upper-canopy specialists like the roloway monkey and red colobus, but it does suit species like Lowe's monkey, the spot-nosed monkey and olive colobus, and these smaller monkeys can hide from hunters in the low tangled growth. Despite legal protection against farming, scattered farms were found in low-lying areas of Krokosua, and the settlement of Mim appeared to be farming well beyond its defined enclave boundaries.

In hill areas there was less habitat damage from either farming or logging. This applied to the hilly northern parts of Mamiri, the hilly areas where the Boi Tano GSBA adjoins the Tano Nimiri Forest Reserve, and especially the high ridge running through the centre of the Krokosua Hills GSBA, which has mature forest with many large trees that has suffered only light logging, especially at the highest elevations. Areas such as these could provide suitable habitat, albeit of a limited extent, for any of the forest primates recorded from Ghana. The national park section of Bia has not been logged or farmed since the park was established in 1974 but this forest has a broken canopy and contains many trees typical of relatively young secondary forest, suggesting that it was quite heavily farmed in the past.

As mentioned many times in this report, hunting pressure is the greatest threat posed by humans to the survival of primates and other large animals in these western Ghana forests. A combination of shotgun hunting and trapping (controlled to a limited extent in Bia but essentially uncontrolled elsewhere) has wiped out some species and is set to drive others to extinction.

7.4. Management Challenges: Reserve Size and Shape

The size and shape of reserves are factors that affect how successfully they can protect viable primate populations. Mamiri, at only 45 km^2, is too small to be a very effective conservation area, especially for large-bodied species such as chimpanzees that range over wide areas and live at low population densities. The long, narrow shape of Mamiri would also make boundary protection difficult, and increase its susceptibility to "edge" effects. However, at its southern end Mamiri adjoins the much larger Fure Headwaters Forest Reserve, which we have not investigated. Since chimpanzees are present in Mamiri they are likely to be present also in Fure Headwaters, which has its own 47 km^2 GSBA.

The Boi Tano GSBA at 62 km^2 is also too small on its own to be a very effective conservation area, and it also has an elongated shape, including a row of single forest compartments along the Tano River. Considered in conjunction with the remainder of the Boi Tano Forest Reserve (another 67 km^2) and the adjoining Tano Nimiri Forest Reserve (206 km^2), however, it could be a large enough forest area to support many animal species - if hunting could be controlled. Tano Nimiri contains a 35 km^2 GSBA, but the remainder of the reserve is being logged. A combined Boi Tano-Tano Nimiri reserve therefore also has some potential for chimpanzee conservation.

The Krokosua Hills Forest Reserve was considered for national park status before Bia, but Bia was chosen in its place when red colobus monkeys (perceived as threatened with extinction in Ghana even 40 years ago) could not be found there. Although much of the reserve has been severely degraded by logging and cultivation, the 142 km^2 GSBA is the least damaged part of the reserve and supports good forest on its central ridge. However, this area too suffers from its relatively small size and its isolation from other forests, mitigating against it as a really good long-term primate conservation site. Several large villages and small towns lie close to the Krokosua GSBA boundary, and are exerting intense hunting pressure on the area's fauna. The Mim settlement, enclaved in the north of the GSBA, continues to expand in an uncontrolled fashion and the people of Mim seem unlikely to accept resettlement without major compensation.

Although Bia has suffered major logging damage over much of its area, and is currently quite poorly protected against hunting, it has the advantage for conservation of a relatively large size (306 km^2) and a relatively compact shape.

7.5. Management Challenges: Problems with the GSBA Concept for Biodiversity Conservation

One obvious conclusion about GSBAs to be drawn from our work (albeit from a very small sample: Boi Tano and Krokosua Hills) is that these areas are not effective for broad biodiversity conservation. Like the Protection Working Circles or Hill Sanctuaries that preceded them, they may be quite effective at protecting trees from logging, but many other plants and animals are not being well conserved by them. Non-timber plant products are still being harvested, and the hunting of larger animals is continuing with no obvious restraint. Indeed, the cleared boundary of the Boi Tano GSBA was improving the access of hunters to the forest.

The average size of GSBAs (39 km^2) is far too small to maintain viable populations in the long term of large-bodied and wide-ranging species, such as elephants, large ungulates, chimpanzees, and large frugivorous birds like hornbills. In the absence of that fauna, which serves ecological functions such as seed dispersal, the forest composition is most likely to change through time, with the loss of other species. According to data provided to us by the Forestry Commission, only five GSBAs have an area of >100 km^2; these are Atewa Range (232 km^2), Dadieso (171 km^2), Draw River (128 km^2), Tano Offin (108 km^2), and Krokosua Hills (142 km^2)

Even if most GSBAs were of reasonable size, it is not evident that the current management system can protect their fauna. The system relies on financial incentives from the Community Investment Fund, with at this point no complementary enforcement system to control hunting. As currently operated the system relies largely on community members to police themselves through such mechanisms as Community Biodiversity Advisory Groups. Because no one appears to be seriously punished for infringing on GSBA rules, there is no reason for individuals not to receive funds for raising snails or pigs while still hunting quietly for wild animals in the forest. Meanwhile, although the fund as a whole seems large ($2.5m), when spread across the many thousands of people who must live around 30 GSBAs (combined perimeter 1,035 km^2) the average incentive available per individual is relatively small, while local power structures mean that not everyone benefits equally, further undermining the likelihood of widespread cooperation in conservation.

If Wildlife Division personnel were brought in to police hunting within all GSBAs this would require very large resources of manpower, buildings and equipment, when the WD already lacks sufficient resources to protect adequately the relatively few areas under its present aegis.

The GSBA and CIF systems therefore appear to be badly misconceived as mechanisms for protecting biodiversity in a broad sense.

7.6. Management Challenges: Making Bia Work Better

Compared to the other reserves we surveyed, Bia has the following advantages: it already has full legal status for wildlife conservation (though it would be better if the Resource Reserve section was given full National Park status); it has considerable infrastructure (partly rehabilitated under PADP I), though very few vehicles; and it has a relatively large size (306 km^2).

Even so, Bia is not working effectively as a wildlife conservation area. We did not meet a significantly greater diversity or abundance of primates in Bia than at other sites, and there was widespread evidence of hunting (especially with shotguns, though we noticed fewer traps than at Boi Tano and Krokosua).

The protection system at Bia is clearly inadequate. We were told that the combined reserves (NP plus RR) currently have a staff of 64, of whom only 27 are patrol staff (the others being office and maintenance personnel). The patrol staff are assigned in groups of three to each of 9 camps. As one staff member usually stays in camp while others go on patrol, this has meant that at most two people can patrol at one time from 9 camps (assuming no one is sick or on leave), resulting in a real protection force at any one time of 18 staff for over 300 km^2, leading inevitably to inadequate protection of the fauna from hunting. At the time of our visit a new "striking force" had been organized at the northern Kumkumso Camp. This force had a mandate to join a patrol in any part of the conservation area at any time; we were also told that maintenance staff would in future be able to join patrol teams. However, also at the time of our visit the park had no functioning vehicle other than an agricultural tractor (a pickup truck was said to have been under repair in Kumasi for the previous three months). And staff morale appeared to be generally low; patrol staff are paid about ¢400,000/month (about $45), from which they must support their families.

Struhsaker (1993) commented on exactly the same staffing problems after his own survey visit to Bia. He proposed a salary bonus system based on performance, with money to be paid, for example, to individuals responsible for arrests leading to the conviction of poachers and the confiscation of their equipment. Struhsaker obtained a commitment of funds to start such a programme from WWF, but it was never enacted. However, P. Marshall has pointed out (personal communication) that such bonus systems can be difficult to operate fairly and effectively. One obvious potential flaw is that if they are successful in the short-term, resulting in declines in the numbers of poachers, guns, traps and arrests, then bonuses also decline, with the result that staff motivation falls; and they are hard to sustain if they rely on short-term donor funding.

It is tragic that, despite the large sums of money (Euros 4.6m) spent on Ankasa and Bia through the EU-funded Protected Areas Development Programme (PADP; 1997-2001), wildlife conservation at Bia seems no better than in 1993, and that the diversity and abundance of wildlife is almost certainly lower now than it was 13 years ago. The stated aim of PADP was "to enhance biological diversity conservation in two nationally and internationally representative protected areas" (ULG Northumbrian Ltd., 2001)

Community members at Bia appeared to accept the idea of a national park if it were properly run (and hunting prohibited). They did not think it made sense for them not to be able to farm the reserve if wildlife was not being protected (so that Bia was becoming, in their words, a reserve for snails and hyraxes), if many outsiders rather than local people were given jobs with the Wildlife Division, and if many abuses of protection occurred during the annual snail-gathering season. Community members had heard about the Community Investment Fund available to people living near GSBAs and reasonably thought that such funds should also be available to them.

8. RECOMMENDATIONS

1. Urgent measures are needed to safeguard remaining populations of Ghana's Critically Endangered (CR) primates. IUCN lists as CR the white-naped mangabey (*Cercocebus atys lunulatus*), the roloway monkey (*Cercopithecus diana roloway*), and Miss Waldron's red colobus (*Procolobus badius waldroni*). None of these monkeys was detected at any of the sites we surveyed, and no really convincing evidence obtained that they still survived at these sites. Miss Waldron's red colobus is almost certainly extinct in Ghana (as reported in 2000), and the other two monkeys must now be very rare and restricted in their distribution.

2. As a matter of urgency, the status of the roloway monkey and white-naped mangabey in Ghana should be more clearly ascertained. This effort should include thorough surveys in the Nini-Suhien National Park/Ankasa Resource Reserve/Draw River Forest Reserve complex. Roloway monkeys and mangabeys were observed in this forest in the recent past, and it appeared to offer one of their best chances of long-term survival. If these two species are still present in this forest, then efforts to protect them should be redoubled. Ideally, the whole Nini-Suhien National Park/Ankasa Resource Reserve/Draw River Forest Reserve complex, which has a combined total area of 777 km^2, and which supports an elephant population, should be upgraded to a national park. If that is politically impossible, then Ankasa at least should be upgraded to national park status along with Nini-Suhien, and all of Draw River F.R. given stricter protected status, with all three areas coming under a common management regime. A second site should also be sought where these two monkeys may be protected, or failing that at least two further sites identified where they can be protected individually.

3. A more wide-ranging survey of chimpanzees needs to be undertaken to adequately identify the best sites for chimpanzee conservation in Ghana. Chimpanzees are known to be present in the Ankasa and Bia conservation areas (where protection needs to be made more effective), but the results of this survey suggest that they are probably still present in many other forests, albeit at low densities. A few of these other forests could be added to a network of permanent chimpanzee conservation sites, but this would be a costly undertaking (funds might perhaps be sought through the Great Apes Survival Project, GRASP). In addition, a nationwide campaign could encourage the protection of chimpanzees wherever they occur. Chimpanzees, unlike some other forest primates, can probably move between forest areas

through regenerating farmbush, so a landscape approach to their conservation should be considered.

4. To gain improved protection of the Ankasa and Bia conservation areas, ways need to be found to increase staff motivation, including consideration of fair and sustainable bonus systems that reward effective protection work. Better monitoring of staff patrols should be instituted, including monitoring of patrol routes with GPS technology. Every effort should be made to secure long-term funding for protection that is not reliant on short-term assistance projects; among support mechanisms that should be explored are trust funds.

5. Reintroduction of the white-naped mangabey and roloway monkey to Bia should be considered. These species were once present at Bia, and could likely therefore survive there if protection is made adequate; these two monkeys are currently the targets of a captive breeding programme at the Acca Zoo ("West African Primate Conservation Action Ghana").

6. An urgent, and possibly radical, rethinking is required of the Globally Significant Biodiversity Area (GSBA) concept for the conservation of biodiversity in Ghana's forest region. As currently functioning this system is not protecting forest primates or other wildlife from hunting, in part because the financial rewards it offers to community members are not accompanied by any effective punishment for those breaking the rules (for instance, by hunting inside GSBAs).

7. The Community Investment Fund mechanism associated with GSBAs should be carefully and objectively evaluated so as to understand whether the activities it supports, such as the raising of snails and grasscutters, can be truly cost-effective in the long run and act as an effective off-set for the prohibition of hunting in conservation areas. If this funding mechanism can be made effective, it should be extended to national parks.

8. Even if the GSBA model could be made more effective, especially by introducing more controls on hunting, there are far more GSBAs than can be properly protected against exploitation, and most of them are too small to be able to conserve viable populations of large animals in the long term.

9. If GSBAs are to be used at all for the conservation of forest primates and other wildlife, a small number would have to be selected; wildlife protection should then be concentrated on this small number. To have a chance of effectively conserving species like

chimpanzees, any selected GSBA would have to be at least 100 km^2 in area (and preferably larger), and/or would have to be combined with adjacent areas of forest (e.g., combining the Boi Tano GSBA with part of the Tano Nimiri Forest Reserve). The Krokosua Hills GSBA (142 km^2) might be worth more investment if any really firm evidence for a viable population of roloway monkeys was found there, and the Dadieso FR/GSBA (171 km^2) if it still contains mangabeys (reported by Magnuson, 2002).

10. Where GSBAs are identified that have real potential for the long-term conservation of wildlife, obstacles to their effective functioning need to be identified and removed as a matter of urgency. As an example, the Mim enclave in the north of the Krokosua GSBA could be excised from the GSBA by a redrawing of boundaries, and perhaps another area of the Forest Reserve (to the east of the GSBA) added to make up for the loss.

11. If selected GSBAs are to be given effective protection against hunting, this will need the long-term commitment of resources beyond the Community Investment Fund. Among sources of support for protection, the assistance of timber companies should be sought, as these companies are coming under increasing international pressure to show that their timber is harvested in a way that allows wildlife as well as timber resources to be sustained. If a selected GSBA is not in or near a timber concession, timber companies could still be asked to contribute to protection under an "off-set" mechanism.

12. There should be an increased effort to raise awareness at all levels of Ghanaian society about the long-term value of safeguarding wildlife. Such campaigns should give due emphasis to the aesthetic value of wildlife, in addition to mentioning more material benefits (possible income from ecotourism and international research, readier international sales of timber, more secure water supplies from intact ecosystems).

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APPENDIX 1

MINUTES OF COMMUNITY MEETINGS

Mamiri FR Community Meeting at Kamaso (21 December 2005)

Brief history

Most settlements, especially on the western boundary of the reserve, were established in the late 1940 and 1950s by people following the logging operations of African Timber and Plywood Ltd (AT&P). The reserve falls under the Wassa Amenfi stool-land.

Animal abundance

The participants believed that all species in the reserve have reduced in numbers, attributing this to the narrowness of the reserve, as well as past logging in the southern portions. Primates now move in multi-species groups for the purposes of companionship and safety after heavy poaching.

Species	*Last seen/Abundance*	*Current Rank*
Primates		
Awinhema (Spot-nosed monkey)	1 week	3
Kwakuo (Lowe's monkey)	1 week	4
Asibey (Olive colobus)	1 week	5
Akaatia (Chimpanzee)	<2 months	6
Biopia (Roloway monkey)	2 years	7
Efoo (B-&-w colobus)	1 year	8
Krawa (Mangabey)	10 years	9
Ebene (Red colobus)	20 years	10
Aposo (Potto)	2 days	2
Aprenkesema (Galago)	1 day	1

Other animals

Otwe (Maxwell's duiker)	1 day
Akrantie (Grasscutter)	<1month
Wansane (Bushbuck)	2 weeks
Oyuo (Black duiker)	1 month
Odabo (Bay duiker)	3 months
Kokote (Red River hog)	2 weeks
Ebie (Forest hog)	25 years
Okwaduo (Yellow-backed duiker)	<1month
Tromo (Bongo)	2 months
Abrebee (Palm civet)	<1week
Aprawa (Tree pangolin)	<1month
Kotoko (Crested porcupine)	6 years
Apese (Brush-tailed porcupine)	1 day
Adowa (Royal antelope)	<1month
Sisire (Honey badger)	3 years
Osebo (Leopard)	20 years
Owam (Casqued hornbill)	1 day
Kokokyinaka (Great blue turaco)	1 day
Kodee (Crowned eagle)	<1week

Perception of forest habitat changes

- There has not been logging in the Hill Sanctuary section in the northern parts of the FR, apart from selective logging in the flatter terrain more than 30 years ago by AT&P. Thus, the reserve is very good for all animals in that section. But this is not so in the southern area, which is a timber production zone; here, logging in the past was very intensive and has caused the forest to become impenetrable bush that can only be entered with exhausting cutting.

- Illegal chain-sawing and harvesting of chew stick (*nsorkor*) had been rampant up to about 3 years ago, especially in the Sureso area, but has now stopped because of the vigilance of the Community Forest Committees (CFC's).

- All logging in this FR done by AT&P, and now Samartex. New stock survey done in the south; expecting renewed logging very soon.

- On the whole, they respect the FR and its boundary, especially after the formation of the CFC's some 2 years ago by the RMSC from Kumasi.

Perceptions about the Community Forest Committees and their operations

- They were formed by the FSD (through the District Office at Asankrangwa and the RMSC at Kumasi) to assist them to protect the forest reserve.

- Until the formation of the CFC's, the communities had freely take NTFP's (mainly pestles, chew stick and rattans) for domestic use, often in exchange for boundary cleaning service for the forest guards.

- The forest rangers (Technical Officers/TO's) often go to the communities (alone or with resource persons from the RMSC, etc) to give pep talk on the need to protect the FR. The CFC's are also given training in nursery and tree planting.

- Through a local NGO (Centre for Agro-forestry Development), the Kamaso community has got funding from the World Bank and GEF Small Grants Programme to go into agro-forestry. Some community members already have agro-forestry projects with trees (teak, *Gmelina* and *Cedrela*) over 10 years old. Other communities are yet to emulate this, but the NGO aims to spread its activities.

- Cases of illegal activities are either detected or reported to CFC's, who mobilize other community members to attempt to arrest such people. However, informants may find themselves becoming victims through exposure/betrayal/indiscretion, or are simply ignored, or they are not reimbursed for expenses (vehicle fare).

- For now, there is little or no financial incentive (depending on the community) for participating in the CFC concept, but they hope this will be addressed through a programme similar to the GSBA and CIF in neighbouring forest reserves.

- Each major community around the reserve has a CFC but the numbers are low: two to four active members each, with little inter-community communication due to long distances between them. However, they manage to send messages to each other on market days, or through the Forest Ranger.

- CFC members are the main groups that clear the reserve boundaries now, and they are hoping that incentives like protective clothing will be provided regularly.

Conclusions

1. The communities have generally kept faith with the FSD and reduced their level of extraction from the reserve, especially over the past 2 to 3 years since the CFCs were created.

2. However, they have been wondering why they should not benefit from the CIF since there is no difference between the concepts.

3. The CFCs cannot guarantee the integrity of the reserve if they do not get tangible financial and material incentives to facilitate their work. Otherwise, people will still go in.

4. The communities will not stand any attempts to log the northern half of the reserve (this seems to be instigated by the NGO), since they will not get any rewards from it (it stays with the paramount chief) and they are not sure of the benefits from Social Responsibility Agreement (SRS) packages.

5. The modified Taungya farming programme should be actively promoted in the area, since cocoa has not been a very successful economic venture.

6. There is concern that Kamaso is receiving too much attention from the forestry sector, due to its strong linkage with the agro-forestry NGO.

Boi-Tano FR Community Meeting at Tanoso/Accra Town (21 December 2005)

History

This host town settled here from Omanpe before the reserve was created about 50 years ago. An area near the original FR boundary Pillar 1 was excised for us to farm. The whole reserve is under the Enchi Paramount Stool, with Omanpe as the Divisional Stool.

Animal abundance

Community perceptions of relative faunal abundance are presented here, based on when particular species were last seen (ranking of abundance done for primates only). All primate species numbers were said to be declining from 50 years ago, except for Lowe's and spot-nosed monkeys, and pottos and galagos.

Species	*Last seen/Abundance*	*Current Rank*
Primates		
Akaatia (Chimpanzee)	<1 month	7
Efoo (B-&-w colobus)	3 weeks	9
Krawa (Mangabey)	<1 month	8
Kwakuo (Lowe's monkey)	<1 month	4
Awinhema (Spot-nosed monkey)	<1 month	3
Asibey (Olive colobus)	<1 month	5
Biopia (Roloway monkey)	2 years	6
Ebene (Red colobus)	3 years	10
Aposo (Potto)	<1 month	2
Aprenkesema (Galago)	<1 month	1

Other animals

Tromo (Bongo)	5 years
Kokote (Red river hog)	<1 month
Ebie (Forest hog)	3 years
Okwaduo (Yellow-backed duiker)	<1 month
Wansane (Bushbuck)	<1 month
Oyuo (Black duiker)	<1 month
Odabo (Bay duiker)	<1 month
Opra (Giant pangolin)	>10 years
Aprawa (Tree pangolin)	<1 month
Kotoko (Crested porcupine)	6 years
Akrantie (Grasscutter)	<1 month
Apese (Brush-tailed porcupine)	<1 month
Otwe (Maxwell's duiker)	<1 month
Abretwe (Water chevrotain)	>25 years
Adowa (Royal antelope)	<1 month
Sisire (Honey badger)	<1 month
Osebo (Leopard)	5 years
Abrebee (Palm civet)	<1 month
Esono (Elephant)	Never seen in this area
Owam (Casqued hornbill)	<1 week
Kokokyinaka (Great blue turaco)	<1 week
Kodee (Crowned eagle)	<1 week
Asam (Crested guinea fowl)	2 months
Tikwankora (White-breasted g/fowl)	3 years

Forest habitat degradation

- All species have reduced in numbers and distribution. Now, primates generally mix up in multi-species groups for the purposes of companionship after heavy poaching.

- All logging in this FR done by AT&P, and now Samartex.

- It used to be easy to move through the forest undergrowth, as it was more open. But now, most areas are impenetrable without exhaustive cutting, as a result of the profuse re-growth after the more intensive logging by Samartex as compared to the more selective logging by AT&P.

- The degradation was more detectable after 1993 (Samartex logging began).

- Legal and illegal extraction of chew-stick also to blame: now, even 10 cm diameter (at the base) is scarce, as compared to previous sizes of up to 40 cm.

- More streams are drying up (and much earlier) now, compared to just 10 years ago, with less volume even in the rainy season.

Human influence /contribution to changes in flora and fauna

- There used to be better protection of the FR until 15 years ago.

- Before then, communities could freely take NTFPs (mainly pestles, chew stick and rattans) for domestic use, often in exchange for boundary cleaning service for the forest guards.

- Now, people come from all sorts of places with "permits" purported to have been issued by the District FSD office at Enchi. There is no way of verification. These people hire local villagers (who also host them) to extract these permits, paying a pittance for the service. Since the communities owe no allegiance to the FSD, there is no inclination to check abuses. Where there is the inclination to do so, they rarely actually carry it out, as it can pit members of the community against each other.

- There are numerous road barriers from the FR's to the cities that are operated by the police and district assemblies. So if these goods are not apprehended, they must be legal.

- The forest rangers (Technical Officers/TOs) often go to the communities (alone or with resource persons from the RMSC, etc) to give pep talk on the need to protect the GSBAs. After they go back, nothing more is heard from them. When cases of illegal activities are reported, informants may find themselves becoming victims through exposure/betrayal/indiscretion, or are simply ignored.

Perceptions about the GSBA and its management

The chronology of their involvement with the GSBAs is that:

1. They were informed by the FSD of the intention to form GSBAs.

2. Told of the financial package for alternative livelihood ventures to compensate them for the loss of user access. This news was received enthusiastically, since they had nothing to lose.

3. So far, 11 groups/cooperatives of 9 to 11 members each have been formed, and their members given two weeks training in their chosen ventures: snail or grasscutter raising, bee-keeping, piggery, etc.

4. Some community members do not belong to any group at all, and consider themselves not bound by any of such arrangements.

5. Trainees were expected to train their colleagues, but this has not been done: knowledge treated as personal property.

6. Only four teams have been selected for the first CIF disbursement in their areas with the explanation that the other teams will benefit after about 3 years, subject to the performance of the first batch.

7. CBAG members now allocate portions of the GSBA boundaries (1 km each) to themselves, clear them about once a year, with or without inspection by the forest guards, and wait for their money. They are thus seen to be employees of the FSD and therefore solely responsible for protecting the forest ("stopping fire, chainsaw, etc.").

Conclusions

1. There is still a great deal of confusion as to what the whole programme is all about.

2. Whether they are going to benefit or not, people are still going into the reserve, anyway.

3. There is no leadership role by forest guards to direct the CBAG's on their mode of operation on a daily/weekly basis. Reports to TO's are not addressed.

4. The communities are divided about who is to do what, and whether their colleagues are now FSD staff. There seems to be a new leadership structure, with CBAG members putting on airs, and being paid for it.

5. Left to the majority of the people, the land should be released to them for the modified *Taungya* farming as they have heard it done in some places elsewhere in the country.

6. If the CIF works (i.e., if every living member of the communities is paid something) they can hope for protection (no entry for all). "Otherwise, forget it".

Krokosua Hills FR Community Meeting At Benchama/Nkatieso (31 January 2006)

Local recollection of the history and management of KHFR

- There have been modifications in the forest ecology, from structure to functions, due to the drought of the early 1980s. Areas from Benchema to the source of River Sayere and other streams were the worse affected (the place has been given for the modified *Taungya*).

- Those that demarcated the FR in the 1930s told our fathers that the place was being reserved for construction of rail line. After demarcation we were prevented from entering.

- The Forest Rangers/Guards up to the late 1990s looked more fierce than soldiers. Therefore, law enforcement was effective. Now, who is there to stop anyone? The Rangers only ride around on their motorbikes and collect bribes from chainsaw operators and timber men, and there are no Guards to even check the boundaries well.

- In the 1960's the Forest looked more intact. It was so beautiful to watch, and contained lots of animals.

- However, we have lost a lot of trees and animals as a result of burning.

- (Reporters' comment: There was a general avoidance of personal acceptance for the degradation and species loss: others did it, not us.)

- Up to about 30 years ago, there was more respect for traditional authority. During snail seasons the chief would normally beat a gong for people to pick snails from the reserve. The off-take was low, as it was mainly for personal consumption. No local policing was necessary, and villages stuck to their portion of the reserve. A gong was beaten after (normally) two weeks to close the season.

Animal species and their abundance

The community perception of major faunal changes is that all species numbers said to be going down from 30 years ago, except for the pottos and galagos, which seem to have widened their habitats after the logging opened up forest edge habitats along the hauling roads.

Species	*Last seen/Abundance*	*Current Rank*
Primates		
Akaatia (Chimpanzee)	<2 months	7
Efoo (B-&-w colobus)	1 week	6
Krawa (Mangabey)	2 months	8
Kwakuo (Lowe's guenon)	<1 week	4
Awinhema (Spot-nosed monkey)	<1 week	3
Asibey (Olive colobus)	<1 week	5
Biopia (Roloway monkey)	3 years	9
Ebene (Red colobus)	1 year (Eteso)	10
Aposo (Potto)	2 weeks	2
Aprenkesema (Galago)	Every day	1+
Other Animals		
Esono (Elephant)	5 years (at slopes of Dome hills)	
Ebie (Forest hog)	10 years	
Wansane (Bushbuck)	<1 month	
Tromo (Bongo)	3 years	
Oyuo (Black duiker)	3 years	
Okwaduo (Yellow-backed duiker)	<1 month	
Odabo (Bay duiker)	<1 month	
Opra (Giant pangolin)	>10 years	
Aprawa (Tree pangolin)	<2 days	
Kokote (Red river hog)	<1 month	
Kotoko (Crested porcupine)	10 years	
Owea (Hyrax)	1 day	
Akrantie (Grasscutter)	1 day	
Apese (Brush-tailed porcupine)	1 day	
Otwe (Maxwell's duiker)	1 day	
Adowa (Royal antelope)	<1 month	
Sisire (Honey badger)	<1 month	
Osebo (Leopard)	5 years	
Abrebee (Palm civet)	<1 month	
Kankane (African Civet)	1 week	
Owam (Casqued hornbill)	1 week	
Kokokyinaka (Great blue turaco)	1 week	
Kodee (Crowned eagle)	1 week	
Asokwaa (White-crested hornbill)	1 day	
Ekom Pete (Palm vulture)	1 year	

Present situation of the Forest Reserve, and comments on CBAG function

- Due to population factors, respect for these traditions has dwindled. A large portion of the population is made up of migrants with different cultural background, and chieftaincy disputes lead to factions even among indigenes. With active political interference pre- and post-independence, the authority of the chieftaincy institution has been weakened. Thus, access cannot be controlled by the chiefs any longer. The real authority is the Forest Services Division (FSD), and the District Forest Manager wields clout. Because the FSD's talk of collaboration is mere rhetoric, without clear devolution of authority to the traditional chiefs, no enforcement can be achieved.

- Now, as in every FR area, people come from all sorts of places with "permits" purported to have been issued by the District FSD office. There is no way of verification. These people hire local villagers (who also host them) to extract canoes, electric poles (Afena) and other NTFP's, and pay a pittance for their services.

- In the olden days before the onset of the snail season, the chiefs went to Forestry to obtain a permit. After that a fowl was slaughtered for the gods of the land. The season was opened for two weeks, after which a ram was slaughtered to appease the gods. Every chief had his area of authority and operations. Chiefs could freely exercise their access right for NTFPs in the FR on behalf of the people so long as they respected the boundary line and did not fell timber. This traditional management participation is now lost, and chiefs are not even consulted when it comes to dealing with forest offences. Forest officials deal with CBAG members directly.

- Although chiefs played a pivotal role during the selection of CBAG members, they are now helpless to request them to undertake any assignments since they (chiefs) are fully aware of their unfulfilled promises (from the FSD) and cannot order them to work against their will (it being a voluntary job).

- Volunteers and CBAG members are not empowered and motivated to work efficiently and effectively:

- Promises of incentives in the form of allowances, uniforms have not been fulfilled.

- They are too few to organize any law enforcement activities, since the rest of the communities do not feel obliged to assist them (it is your job, not ours).

- CBAG members are not armed, and therefore cannot (or refuse) to confront possibly armed illegal chainsaw operators, let alone hunters.

- Even in the face of the provision of the above, the communities feel their protection efforts will come to naught, because incidents like the following continue, and give them little confidence in the good intentions of the FSD:

- About two years ago there was some illegal logging involving 15 logs in the FR near Nsinsin. A volunteer went and informed the District Forest Manager (DFM). According to the DFM, the logs were sold to Suhuma Timber Company Ltd. The company came and spent two months just picking 15 logs, which ended up in them felling more under the deliberate absence of any forestry official.

- In another instance, the CBAG members at Mim frequently reported of poaching and felling to the WD and FSD. Not even once were they paid any transport fares for their efforts. Besides, they lost out for their public-spiritedness because other community members made farms and hunted at will in the reserve. At the end of the year, the CBAG members were poorer, whilst the harvest from the illegal farms (marijuana) enriched the others. The only reasonable alternatives for them were therefore to join the criminals, to keep quiet, or just leave the village.

- In 2003, a joint patrol of WD and CBAG hunter volunteers arrested a truckload of poles for electric lines near Dome, resulting in a fierce confrontation with some community members, and the beating and wounding of the enforcing team. Even though this was finally reported to the police and the FSD/FC, the truck was released back to the owner (against the law's demand for confiscation), nobody was prosecuted, and none of the patrol team was even commended or compensated. If this could happen even to WD staff, how much more to us CBAG?

- There was an instance where some people came and illegally felled trees in the night near Benchema and were confronted by the chief and people. The logs were seized and the DFM informed. The community put across a request for the DFM to allocate some of the wood for some developments, but this was refused. This is weakened the commitment of the chiefs and his elders to combating forest related offences.

The Community Investment Fund

- After the creation of groups and payment of collateral, as well as training in alternative livelihood ventures, some groups have been paid their money, with an average allocation of ¢2.8 million (about $310). This is woefully inadequate as start-up capital. The money cannot be pooled either, because though they came together as groups, the money is collected and will be paid back individually through the group account. Thus, the money is used for needs other than provision of alternative NTFP's. Ironically, there has been frequent swindling, with some group leaders collecting as much as ¢30 million through multiple registration. Essentially, communities feel there was no transparency in the allocations. Some people had their names in more than three communities and received allocations accordingly. The consensus was that the whole process be audited thoroughly.

- The implementers of the programme gave promises that the money belonged to each community forever, and that it should revolve over, say, 3-year periods such that eventually everyone including the newest baby, would have their share. The question being asked now is what will those who have not yet benefited do in the mean time? Answer: "we will depend on the forest till it is our turn. Let's see who will stop us." Meanwhile, those who benefit are still going in, anyway.

- A CBAG chairman even demanded ¢10,000.00 from all CBAG members under the pretext of going to Sekondi to lobby for more funds, and has since not been heard of. He allocated a greater part of the money for himself.

Conclusions

The communities do not think it will be difficult to protect the reserve (i.e., bar entry to anyone). However, they think it would be impossible, in that event, to replicate the supply of things like medicinal plants, snails (on the scale they know of), and pestles. It is questionable whether they have the requisite skills to manage the money and the alternative livelihood ventures as true businesses. Collectively, they agree on the following:

1. There is a general perception that FSD staff themselves are not really committed to effectively combating illegal activities; in fact, they may be actively abetting crime.

2. Some of the current CBAG members should be formally recruited by the FSD, and the number of the rest be increased to ensure better coverage of the FR.

3. Fulfillment of promises to provide protective clothing (including arms), field equipment and allowances will help boost the morale of CBAG members.

4. Although membership is voluntary, more people should be recruited and a rotation system be put in place to ensure that members have adequate time for their personal activities

5. Until then, people will probably continue exploiting the reserve as in the past.

Bia NP And RR Community Meeting At Kumkumso WD Post (31 January 2006)

Local recollection of the history of Bia NP and RR

Brief history of Bia National Park was given by the chief of Debiso: "It was somewhere in 1967 that Dr. Asibey in the company of other prominent people came and consulted me on the need to make this place a wildlife reserve. The aim was to conserve fauna/flora for posterity. Other prominent chiefs of the Sefwi traditional area like Bontan Chief were also consulted. The initial size of the area given out for demarcation was 73,880 Acres."

Management problems

Following this introduction, the following issues were discussed and conclusions reached included:

- Different locations have different cultures, traditions etc. and hence different ways of looking at the same thing. The fame of Bia regarding tropical fauna/floral diversity is quite enormous as a result of publications by previous researchers and managers. However, the most recent faunal inventory (this study), which is even less than 1 month old, shows drastic defaunation, a result of management failure and community greed.

- The negative attitude of some workers to their work, poor working conditions, and management failures, etc. have all contributed to staff inability to do better enforcement, leading to poachers entering the reserve indiscriminately.

- Contrary to the many fine promises used to convince them to release land for the Park, the people of fringe communities have not seen any meaningful benefits since its establishment. They cited the benefits that the chiefs and people gained from the deforestation and farming of Sukusuku and Bia-Tawya FR's and wondered whether they have been too lax and trusting. Seeing the apparent lack of capacity by the WD to manage the land, they wondered why it cannot be given back to them to put the land to more profitable use. "The reserve has nothing except snails and a few animals, why don't we de-reserve it for cocoa farming?"

- All the same, they were willing to show commitment to the meeting and find appropriate solutions to the problems. They believed a strengthening of the old system of law enforcement where arrests and confiscation of firearms were the order of the day may be a good option after all, with the general community playing the role of watchdogs. "Ghanaians worship laws and not human beings and hence stringent laws should be enforced".

- Since their chiefs and the government officials had already entered into agreements that were irreversible, they have no option than to try to assist, despite their misgivings. However, only a vigorous creation of employment avenues by the WD would ensure their continued support. The park should spearhead the establishment of job creating avenues, even though they realized the WD did not have a job-creating mandate. Simply put, "people have no jobs; that is why they enter the reserve to hunt". The government could help by establishing fish ponds, grasscutter rearing, and also snail farming.

- The Kumkumso Chief wondered why the Park has not kept its promise of building schools, a clinic and other amenities on the big tract of land they allocated for the headquarters. The school which bears the name of the Park was in a deplorable condition yet no official help has been given. To them, they regret giving away so much land and would not bear any more promises.

- There was confusion as to whether the Park belongs to the Whiteman and his descendants, since any major activity appeared to be initiated by whites. For instance, one researcher made promises of jobs and funding for their livelihood support ventures (such as is being enjoyed by those near Krokosua). "Whiteman no lie, so why are you Park managers keeping the money meant for us?"

- There was lots of pent-up anger and misconception about unpaid compensation for land acquisition, despite attempts at clarification by Debiso chief. A probable solution was for them to be convinced to adopt the stance of the Nzema chief that he and his people will forgo any outstanding compensation in exchange for a share in any revenue that the Ankasa reserve will generate.

- Leaders of the various local communities go through a hectic time trying to acquire permits during the snail season but at the same time people from all sorts of places, including their own people, are seen in Bia collecting snails without permits ("During the snail season

more than 200 people enter the reserve but not even a single one is arrested; what is the staff doing?"). Issuing of permit should be facilitated during the season, and strictly controlled by the WD staff, otherwise there will continue to be abuses.

- On the question of whether granting of all the concerns raised by the communities would guarantee their abiding by the rules (not entering the reserve), there was a massive "yes". As to how they would ensure that all community members would ensure compliance, they advocated:

    - Giving scholarships to some school children to enable them to acquire knowledge of conservation issues, which they will impart to the communities, as well as growing up to be more law-abiding.

    - Allocating more job opportunities to Sefwis, so that they will have better empathy for enforcing the law. The reserve falls within Sefwi but a critical look at the staff shows a negligible percentage of Sefwis employed.

    - Transferring staff regularly, e.g., not spending more than five years at a post. Staff staying too long at a particular place makes them become part of the problem.

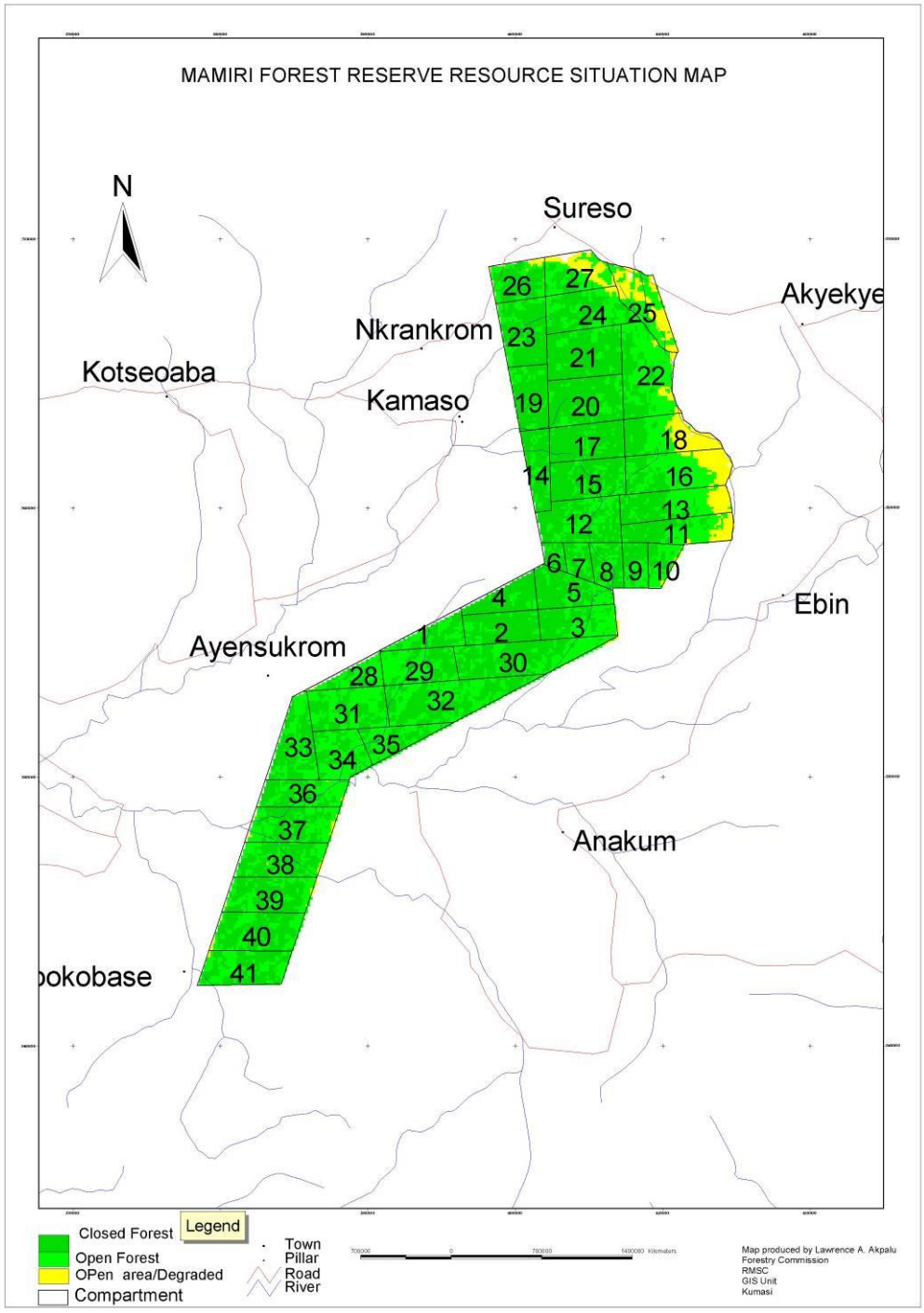
    - Controlling the snail-gathering season to entice animals that have now moved to the other parts of the Resource Reserve to be attracted back to the National Park for better protection. How to do that should come from a wider consultative meeting.

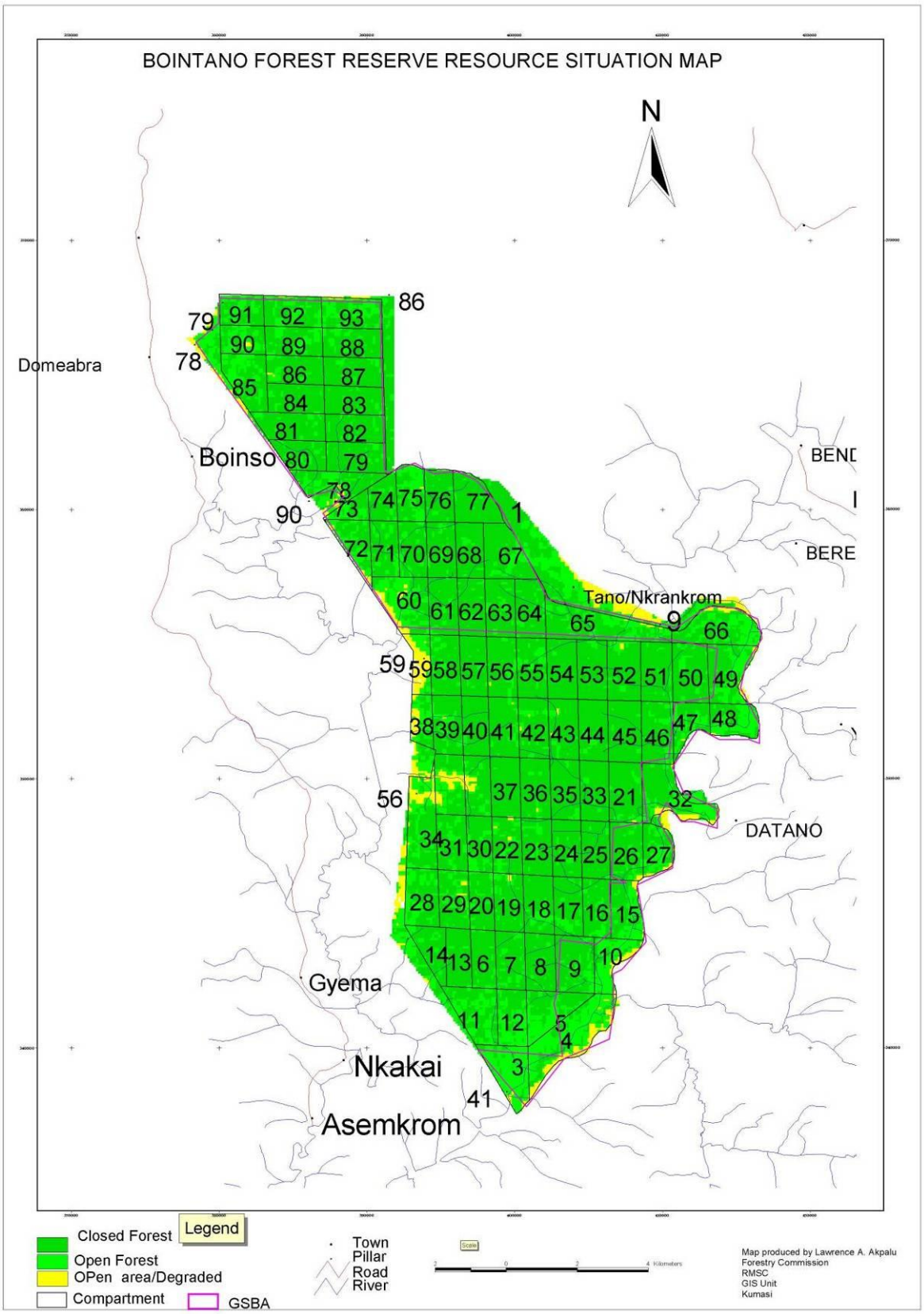
    - Supplying free fingerlings to anybody that wants to go into fish farming. This offer by the Debiso chief (chairman of the meeting) was met with muted agreement. However, they had no idea of how to really make it profitable, even assuming they had start-up capital.

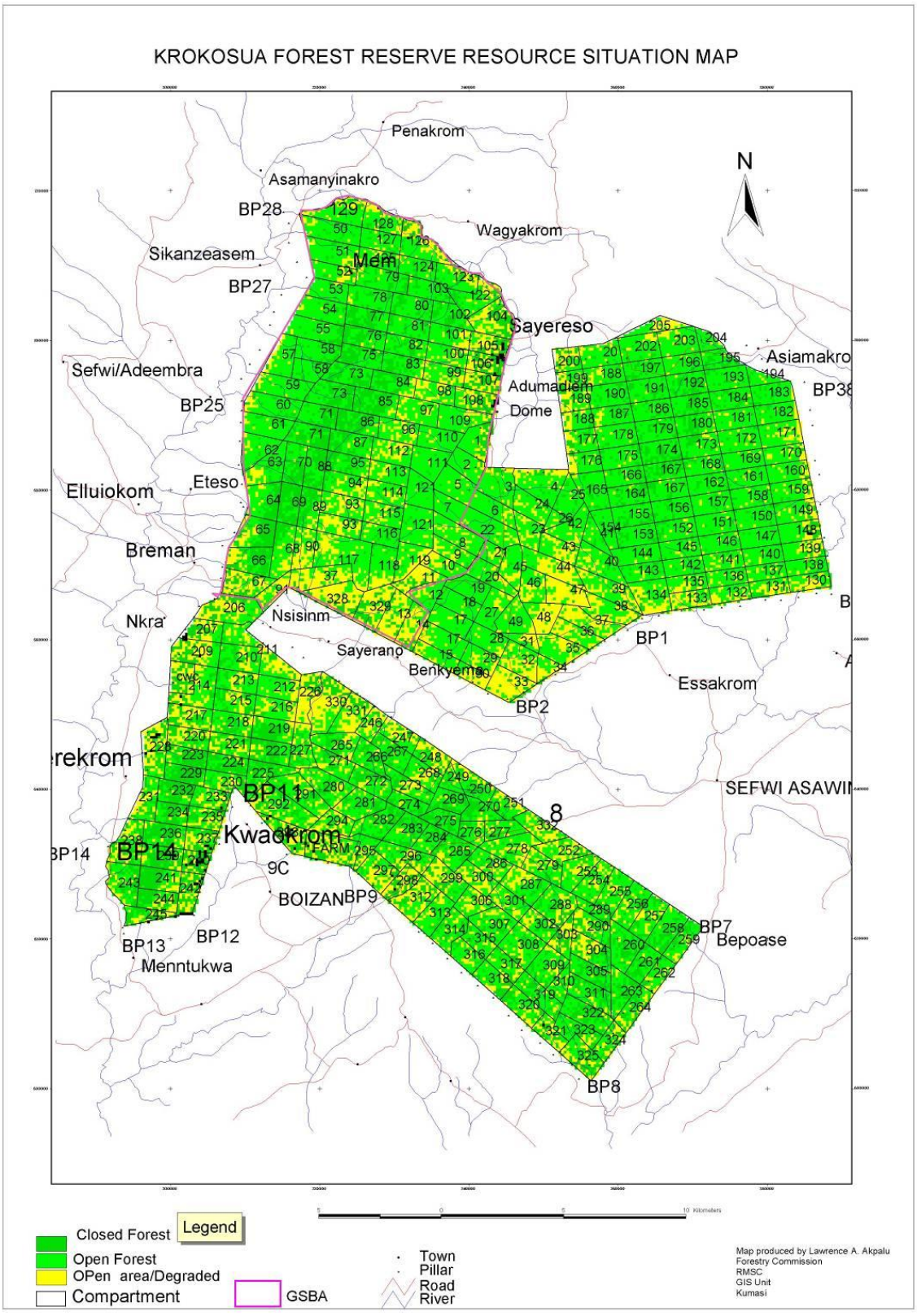
APPENDIX 2

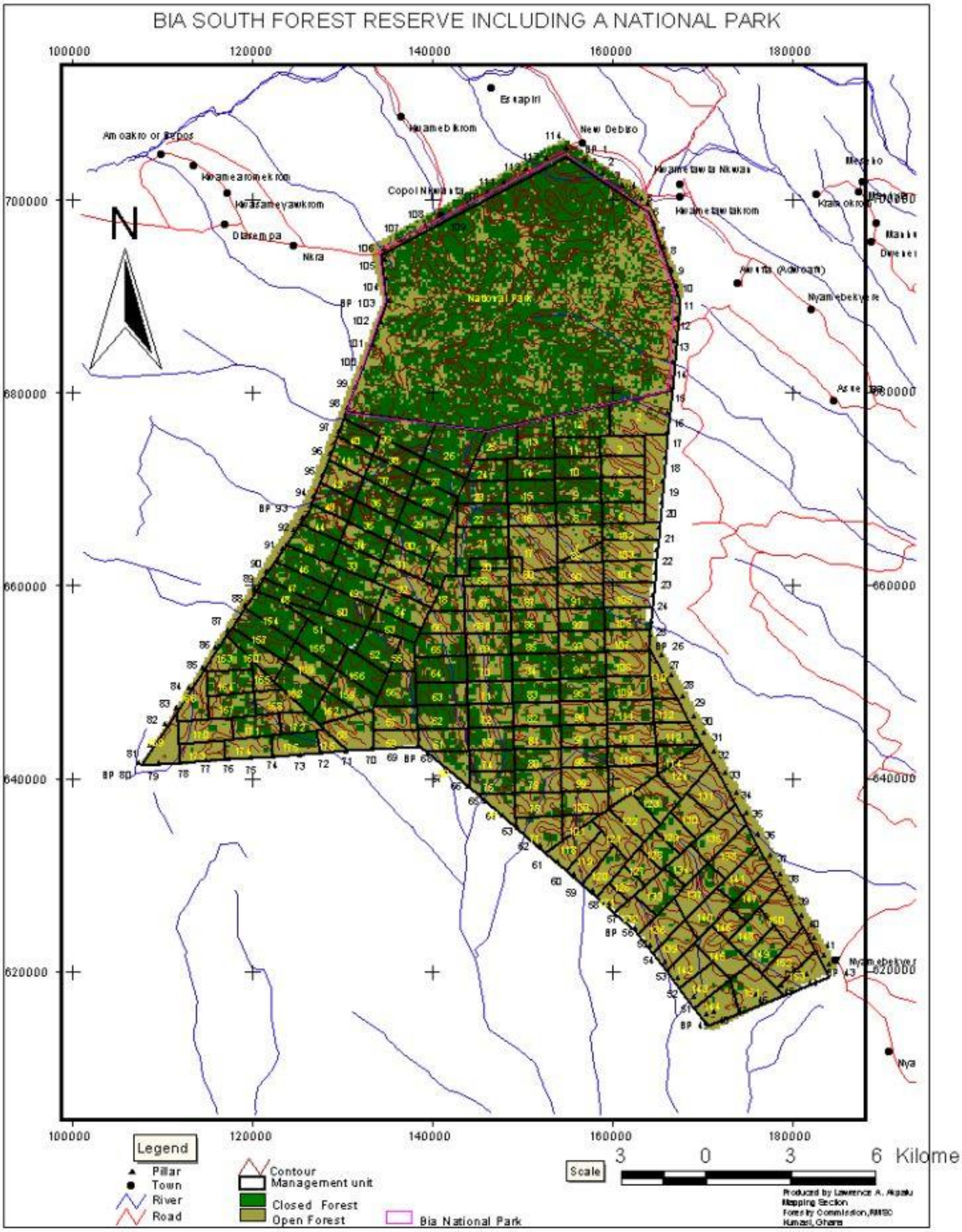
Maps of Target Reserves

Provided by Surveys, Digital Mapping, Remote Sensing and GIS Unit – Resource Management Support Centre, Forestry Commission, Kumasi




BOINTANO FOREST RESERVE RESOURCE SITUATION MAP
N
Domeabra
Boinso
Tano/Nkrankrom
DATANO
Gyema
Nkakai
Asemkrom
Legend
Closed Forest
Open Forest
OPen area/Degraded
Compartment
GSBA
Town
Pillar
Road
River
Map produced by Lawrence A. Akpalu
Forestry Commission
RMSC
GIS Unit
Kumasi


KROKOSUA FOREST RESERVE RESOURCE SITUATION MAP
Penakrom
Asamanyinakro
BP28
Wagyakrom
Sikanzeasem
Mem
BP27
Sayereso
Sefwi/Adeembra
Asiamakro
BP25
Adumadiem
Dome
BP38
Elluiokom
Eteso
Breman
Nkra
Nsisinm
Sayerano
Benkyem
BP1
Essakrom
BP2
SEFWI ASAWIN
BP11
Kwaokrom
BP14
9C
BOIZAN
BP9
BP7
Bepoase
BP13
BP12
Menntukwa
BP8
N
Legend
Closed Forest
Open Forest
OPen area/Degraded
Compartment
GSBA
Town
Pillar
Road
River
Map produced by Lawrence A. Akpalu
Forestry Commission
RMSC
GIS Unit
Kumasi


BIA SOUTH FOREST RESERVE INCLUDING A NATIONAL PARK
N
National Park
Legend
Pillar
Town
River
Road
Contour
Management unit
Closed Forest
Open Forest
Bia National Park
Scale
3 0 3 6 Kilome
Produced by Lawrence A. Akpalu
Mapping Section
Forestry Commission, RMSC
Kumasi, Ghana