

Ghana's Forests and Primates.
Report of Field Trip to
Bia and Kakum National Parks and
Boabeng-Fiema Monkey Sanctuary
in November 1993.

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1. Executive Summary

A brief survey of wildlife was conducted in Bia and Kakum National Parks, Ghana during November 1993. A one-day visit was also made to the Boabeng-Fiema Monkey Sanctuary (BBF).

The monkeys at BBF seemed well protected, but still require much more habituation before they will have potential as an important tourist attraction. Human impacts on the sanctuary include pole cutting and grazing of sheep. The new guest house under construction at BBF with funds from the European Community seemed inappropriate for tourists. A management committee is urgently needed to ensure effective long-term conservation of the sanctuary. A primate research and monitoring program is proposed for the game guards at BBF.

Primates in Bia occurred at low densities and were extremely shy. Five species (3 colobus, 1 guenon and 1 mangabey) previously known from Bia were neither seen nor heard. None of the park guards knew three of these species (Waldron's red colobus, Roloway's diana, and white-naped mangabey), which may be nearly, if not already, extinct. This is particularly disturbing because Bia was thought to be the last stronghold for these three subspecies, which are endemic to W. Ghana and E. Cote d'Ivoire.

Duikers and hornbills also appeared to be extremely rare in Bia.

Most of the Bia forest was either heavily logged in the last 10-20 years or appears to have been farmed some 50-70 years ago. As a consequence, the forest has been extremely degraded and fragmented throughout.

Evidence of poaching was abundant throughout the Bia Forest and has likely been a major factor in the decline of wildlife there. Law enforcement and antipoaching activities are in need of major improvements because the current system is ineffective. A number of recommendations are made including a bonus system for antipoaching by guards and civilians, conservation education, developing alternative supplies of forest resources, and revisions in legislation.

Wildlife censuses at Obuo in the middle of Kakum Park indicated higher densities of monkeys and duikers than in previous surveys made closer to the park boundary in April 1993. We have now confirmed the presence of 6 primate species in Bia. Large frugivorous birds were also abundant at Obuo.

Although the relatively higher densities of wildlife at Obuo suggest lower hunting pressure, poaching with shotguns still occurs there in spite of protection efforts. Most of the recommendations made for Bia also apply to Kakum.

A number of research projects are proposed for Kakum with an emphasis on studying the impact of intensive logging and improved protection against poaching on wildlife populations.

It is concluded that Ghana's wildlife resources have been seriously eroded through the combined forces of hunting, over-harvesting of timber and deforestation from agriculture. Species typical of old-growth forest are particularly threatened and a broad survey of W. Ghana is urgently needed to determine the status of the endangered forest wildlife that is endemic to this area. This is particularly critical for the primates.

2. Objectives

The objectives of this field trip were:

a) to conduct a preliminary assessment of the status of forest primates and other wildlife in 3 protected areas of Ghana, namely the Bia and Kakum National Parks and the Boabeng-Fiema Monkey Sanctuary.

b) to provide a preliminary evaluation of the major conservation problems confronting these areas, their forest primates and other wildlife.

c) to make recommendations for solving these conservation problems.

This reconnaissance was conducted under contract to Conservation International in conjunction with CEDECOM and MUCIA and funding from USAID.

3. Itinerary.

November 1993

6-7th: flew from Durham, NC to Accra.

8th: discussions with Mr. G.A. Punguse and Dr. John Grainger, Game and Wildlife Department (GWD) Accra; purchased supplies and drove to Kumasi with Afia Asamoah (GWD) and Mari Omland (CI) where we had discussions with faculty at the University of Science and Technology and the director of the Kumasi Zoo.

9th: Left Kumasi at 0430 hours for Boabeng-Fiema where we arrived at 0730 hours and spent most of the day observing monkeys and discussing conservation problems there with GWD personnel and village elders.

10th: 0545 hours left Boabeng for Bia National Park via Kumasi. Dropped off Afia Asamoah and collected Erasmus Owusu (GWD). 1600 hours reached Asampaneye (headquarters of Bia) and held discussions with Mr. John Naada, park warden.

11th-15th: Primate and other wildlife censuses conducted in 5 different parts of Bia National Park with J. Naada, E. Owusu, and M. Omland.

16th: 0600-1430 hours traveled from Asampaneye, Bia to Cape Coast. Purchased supplies in Cape Coast.

17th: Hiked into and set up camp at Obuo stream in Kakum National Park with E. Owusu and two game guards. Orientation walk in afternoon.

18-21st: Primate censuses on two 4-km. routes near Obuo camp.

22nd: Reconnaissance walk in forest then broke camp and hiked out of Obuo; drove to Cape Coast. Met with senior staff of Kakum National Park in evening.

23rd: Drove to Accra with Malcom Stark (C.I). Met with Mr. Punguse, Chief Warden and Ms. Denise Rollins of USAID. Departed for Amsterdam in evening.

24th: Returned to Durham, NC at 2330 hours.

4. Methods

Primate censuses were conducted by walking slowly (about one km. per hour) and quietly and stopping frequently to listen for animals. Whenever an association of monkeys was encountered, approximately 10 minutes was spent attempting to count and determine which species were present. The extremely shy nature of Ghana's forest monkeys often necessitated a longer observation period than 10 minutes.

When more than one observer was present, a distance of at least 25 meters was maintained between them. In all such cases, I led the progression and feel that the presence of other observers in no way influenced the results during the censuses of this trip.

In all encounters with primates and duikers I attempted to estimate the initial distance between myself and the animals, as well as the perpendicular distance between the animals and the transect.

4.1 Bia National Park

Five censuses were conducted in 5 different parts of the park. The transects were approximately linear and ranged in length from approximately 3 to 6.75 kms (excluding back tracking): 6.75 kms. from chimp camp to south of colobus camp; 4.8 kms. from marker 3C (near camp 13) to marker 3B; 3.5 kms. from near camp 10 (Anwiafutu); 3 kms. from near Mansoh camp; 3.75 kms. along logging roads near center of Bia. A total of approximately 21.8 kms. (excluding back tracking) was formally censused in 20 hours 47 minutes over 5 days. Most of the census route was covered a second time when leaving the forest, but the return trip was usually walked much more quickly than during the formal census. Censuses were begun between 0630 and 0717 hours and terminated between 0952 and 1315 hours.

4.2 Kakum National Park

Two established transects were censused over 4 days near the Obuo stream camp. This camp was located near the center of Kakum park approximately midway between the game guard camps at Antwikwa and Brisco II; about 6-7 kms. east of the western boundary and 9 kms. west of the eastern boundary (Oates 1993). Each transect was approximately 4 kms. in total length and square in shape (one km. per side). The two transects were each about 500 meters from the camp and about one km. from one another. Erasmus Owusu and I alternated days on each of these transects such that both of

us censused each of the two transects twice over the 4 days. I formally censused approximately 16 kms. in 22 hours and 23 minutes during 4 days at Obuo.

The same procedures were followed as at Bia, except that I conducted all censuses alone, whereas Owusu was accompanied by Mr. Labi, a game guard/trainee. Censuses in Kakum were begun between 0607 and 0613 hours and terminated between 1055 and 1212 hours.

Reconnaissance walks were made in other parts of the Obuo area each afternoon.

5. Boabeng-Fiema

5.1 Results

5.1.1 Wildlife

At least three species of non-human primates occur here. The game guards told us there were 10 groups of black and white colobus (Colobus vellerosus) living in these forests. We saw 6 different groups in one day. The other diurnal primate, Cercopithecus campbelli, was numerous, but much more difficult to observe and it is uncertain how many different groups we saw. The dwarf bushbaby, Galago demidovii, seemed abundant at BBF; three were seen and others heard in a short one-hour night walk. Tree hyrax were also heard at night, but no signs of duikers or bushpig were detected.

Although the monkeys at BBF were less shy than those I have seen elsewhere in Ghana, they require a much greater degree of habituation before they will have potential as an important tourist attraction.

5.1.2 Human activities

No gunshots or signs of trapping were detected. Sheep were often seen foraging in the sanctuary and evidence of pole cutting was fairly common.

5.1.3 Guest House for Tourists

We were asked by Mr. G.A. Punguse, Chief of the Game and Wildlife Department, to inspect the tourist/guest house which was under construction and nearing completion with funding from the European Community. We were told the building was being done by Nana Yao Kobi of Sunyani. The guest house has 6 large rooms and the total area is approximately 300 m². We had no information on costs, but I would estimate the total costs of this building at about \$50-60,000.

The structure has many basic problems, but perhaps the most serious is its unfortunate design. For example, the view from the 6 guest rooms is obstructed by a large structure housing two toilets and two bathing rooms and a communal hand water-pump. The building is lacking in aesthetics and was likened to both a rural clinic and a labor line. There are no kitchen facilities nor accommodation for a caretaker. The verandah is poorly designed and there is inadequate overhang on both the front

and back of the house, which means all windows must be closed during heavy rains. It is difficult to imagine most foreign tourists wanting to stay in a building like this.

In discussions with Mr. Daniel Akowuah, a school teacher at Boabeng who has played a major role in protecting the monkey sanctuary, we were told that no one of the local community was consulted about the location or design of the guest house. He also told us that no one knew to whom the building belonged or who would manage it.

5.2 Conservation Issues and Recommendations

5.2.1 Management Committee

Perhaps the most urgent issue facing the long-term conservation of the BBF monkey sanctuary is the need to create a management committee. This committee could be composed of individuals representing the two villages, the Game and Wildlife Department, paramount chief, regional government and other relevant institutions or groups with interests in assisting the sanctuary. This committee would deal with a variety of management issues, including uses of the forest which are compatible with its conservation and resolving conflicts between the two villages over priority of access and claims to the sanctuary.

5.2.2 Management Plan

A management plan is urgently needed to curtail human activities in the sanctuary which are incompatible with the long-term conservation of the area, such as sheep grazing and pole cutting. Alternative sources of trees, such as

woodlots, should be established by the villages outside of the sanctuary.

5.2.3 Access Road

The last 8 kms. of road into BBF was badly rutted and in need of grading, improved drainage, and culverts. This bad section of road acts as a deterrent to tourism.

5.2.4 Research, Monitoring and Habituating Primates

Five guards of the GWD are based at the BBF sanctuary. The paucity of tourists means that they have relatively little to do. I propose that they become involved in a basic ecological study of the black and white colobus. Each guard would be responsible for studying two social groups. Guards would be rotated between monkey groups, as a means of providing greater reliability and permitting each guard to become familiar with all groups. They would collect basic data on daily and home range size, group size and composition, births and deaths, diet, etc. This information would be invaluable for management and allow an objective evaluation of the effectiveness of the conservation activities there.

In the process of studying the monkeys, the guards would also better habituate both the colobus and the campbell's monkeys, which means the monkeys would become easier for the tourists to observe. A professional primatologist could probably provide the guards with the necessary basic training in 2-4 weeks. Binoculars,

compasses, stationery and mapping materials would be required.

6. Bia National Park

6.1 Results

6.1.1 Primates and Duikers

Anthropoid primates appear to have very low population densities in Bia. Only six associations (comprised of at least 8 social groups) of primates were encountered during the entire five days of survey in Bia (Tab. 1). The rate of encounter was 0.275 associations per km. and 0.289 per hour of formal census. No monkeys were clearly seen and only two were seen well enough to suggest what species they were (Cercopithecus petaurista). Loud calls of adult male C. campbelli monkeys were heard only twice.

As determined by vocalizations, only two diurnal primate species were encountered (within 50 m of transect) in the censuses at Bia: Cercopithecus petaurista (thrice) and C. campbelli (twice). A chimpanzee was heard once in the very far distance, but no chimp nests were seen anywhere in Bia. There was no indication of the other primate species which have been studied and/or reported for Bia, including Colobus vellerosus, Procolobus badius waldroni, Procolobus verus, Cercopithecus diana roloway, and Cercocebus atys lunulatus. The warden and game guards of Bia said there were still some C. vellerosus in Bia and perhaps a few C. diana, but they seemed not even to know of

the other species that had been previously studied there in the 1970s.

Dwarf bushbabies (Galago demidovii) were common throughout the areas sampled.

Duikers were encountered only three times during the formal censuses and only four times during the entire survey of Bia. None of the duikers were seen, but based on vocalizations and the sounds of flight it was guessed that 3 of the 4 were small (either Maxwell's duiker or Royal antelope) and one was large (Bay or Black duiker). In the formal censuses the rate of encounter with duikers was extremely low: 0.144 per hour and 0.14 per km. No duiker dung was seen and duiker tracks were seen only once near a wallow/pool on one of the 5 transects.

6.1.2 Other Wildlife

Other mammals seen or heard in Bia were:

Herpestes sanguineus (once) and Crossarchus obscurus (twice); Heliosciurus rufobrachium; unidentified squirrels (often); and elephants (dung and tracks on 3 of 5 transects). Elephant dung, tracks and sounds were most common in heavily logged areas, particularly near the center of Bia. Tree hyrax were commonly heard at night. Bushpig tracks were rare and only seen near one wallow/pool on one of the 5 transects. No sign of bongo was detected.

Large frugivorous birds were rare, presumably because of human hunting. No Ceratogymna hornbills were heard or seen. Only one Bycanistes sp. hornbill was seen or heard

and great blue turacos were seen but once and heard another time. In contrast, the white-crested hornbill (Tropicranus), which is not hunted by man, was heard and/or seen on 10 different occasions.

The unusual sounding Nkulungu rail (Himantornis haematopus) was heard once at night in the middle of Bia.

No crowned hawk eagles (the only avian predator of Africa's rain forest monkeys) were heard or seen.

6.1.3 Poaching

Evidence of current poaching activity was found on all 5 of the transects walked in Bia. Two poachers armed with 12 gauge shotguns were met within 500m to one km. of the Mansoh game guard camp; they fled upon seeing us. Ten gunshots (12 gauge) were heard during the formal censuses (0.47 per km.) and another 7 were heard during two nights of camping within and at the forest edge. Two empty 12-gauge shells and 7 wire snare traps (6 sprung and one set) were found on or near the transects. In total this amounts to one direct indication of poaching per km. of transect walked (21/21.8 kms.; excluding the gunshots at night). This suggests a very high incidence of poaching and supports the impression that the low densities of monkeys, ungulates, and large birds are largely the result of poaching.

An observation which clearly implicates some of the game guards in park violations was the discovery of a midden of snail (Achatina achatina, Achatinidae) shells estimated on the basis of sample counts to number at least 100,000

individual shells. This midden was found within 25-30 meters and at the end of a path from the game guard huts at colobus camp, more than 4 kms. into the national park. The shells were relatively fresh (discarded within the past 6-12 months), but small (about 8 cms. long) and apparently all immature. Another very large midden was found within 50 meters of this one. The shells here were of similar size, but were much older, more covered with debris and decomposed.

6.1.4 Vegetation

Most of the Bia forest was either heavily logged in the last 10-20 years or appears to have been farmed some 50-70 years ago. As a consequence, the forest has been extremely degraded and fragmented throughout.

Even the park area, which apparently has not been cut recently, was dominated by low stature and dense thicket-like forest. Although there were a number of very large and tall trees, they were usually widely spaced and rarely formed a continuous upper canopy. The middle story was usually absent. The overall impression was of a mosaic of small patches of tall forest interspersed amongst the low (8-10m), dense thicket forest. There were no extensive areas of old growth forest and this may reflect a long history of human agricultural activity in this area. It may also contribute in part to the absence or paucity of primate species more typical of tall, mature forest. The abundance of large specimens of Pycnanthus angolensis, a late

colonizing species, lends support to the idea that Bia was cultivated quite extensively in the not too distant past (50-100 years ago).

The areas of Bia which were logged in the 1980s were the most seriously and extensively degraded. For example, in the vicinity of the logging roads in the middle of Bia I estimate that logging activities removed approximately 50-70% of all trees (directly and indirectly through incidental damage). These areas were often dominated by the invading exotic weed, Eupatorium odorata. This weed appears to contribute to the problem of forest regeneration and finding a method to control or eliminate this weed in Bia is worthy of research.

6.2 Conservation Issues and Recommendations

6.2.1 Poaching and Incentives for Law Enforcement

Poaching is rampant in the entire Bia conservation area. As a result, several of the endemic primate subspecies restricted to western Ghana and eastern Cote d'Ivoire may now be extinct or nearly so in Bia. These include Waldron's red colobus, Roloway's diana monkey, and the white-naped mangabey. This is particularly disturbing because Bia was previously thought to be the last stronghold of these primates. The status of the olive colobus in Bia is less certain because it is such a secretive species under all conditions. Duikers, bushpig and large frugivorous birds, e.g. hornbills and turacos, appear to be similarly endangered in Bia.

The 65 game guards assigned to Bia are certainly adequate in number to enforce the law. My impression was, however, that they were essentially ineffective in preventing most, if not all, violations except agricultural encroachment, which does not seem to occur in Bia. The guards of Bia seem to spend little time patrolling and, when they do, it appears they tend to follow only a well-established and predictable route for a relatively short distance. Some of the greatest evidence we obtained for poaching was gathered near the Mansoh camp (13 gunshots and 2 armed poachers) and the Anwiafutu camp (numerous snares). Motivation would seem to be a central issue.

Although the guards were poorly armed (usually only one old shotgun per 4-5 guards), I do not believe more and better equipment would necessarily lead to an improvement in their effectiveness at law enforcement. Low salaries are certainly a very real problem. The guards responsible for law enforcement are generally paid between \$1 and \$3 per day. I do not believe an increase in salary alone is the solution. Instead, I would propose a bonus system based on performance. For example, bonuses would be paid to individuals responsible for arrests leading to the conviction of poachers and for the confiscation of shotguns and snares. Bonuses would have to be below the market value of the equipment being confiscated to prevent abuses of the system.

I would also propose that the bonus system be extended to the general populace. Any civilian who arrests or assists in the arrest of poachers that are subsequently convicted should also be financially rewarded. GWD officers informed me that a bonus system for game guards and civilians would have to come from private rather than government resources because of administrative complexities.

The critical status of Bia's wildlife necessitates that law enforcement be the first conservation priority. If this is not enacted, there will be little remaining to conserve in the future.

6.2.2 Conservation Education in the Villages

In addition to providing financial incentives, protection of Bia and law enforcement might be improved through education at the village level. Regular visits to surrounding villages to explain the importance of the park would be one approach. Establishment of wildlife clubs or societies would be another. Trained conservation educators would be needed to implement this program effectively.

6.2.3 Alternative Supplies of Forest Resources

Effective, long-term conservation of Bia would likely benefit from the development of alternative supplies of resources that are currently being illegally exploited in the park. Assistance with the development of animal husbandry (e.g. grasscutters and land snails) in villages around the park would reduce pressure on the forest animals. Cultivation of rattan cane (Calamus sp.) and trees for

building poles, pestles, etc. would reduce pressure on the forest plants. These types of projects would seem appropriate for organizations like the World Food Program and UNDP.

6.2.4 Revise Legislation

A number of changes in legislation could be made which would provide financial disincentives to poaching and, thereby, provide competitive incentives to encourage domestication of bushmeat and planting of trees and rattan. Increases in penalties for violations of the game act is one possible approach. Increased taxation on shotguns, ammunition, carbide, and carbide lamps is another. In fact, an argument could be made for a total ban on carbide and carbide lamps because night hunting is already illegal throughout Ghana.

The total ban of shotguns within one km. of the national park boundary might also assist law enforcement.

Is a total ban on monkey hunting throughout Ghana practical?

7. Kakum National Park (Obuo Stream Camp)

7.1 Results

7.1.1 Primates and Duikers

Densities of all diurnal primates combined were low, but not unusually so when considered at the species level. The density of associations and social groups, particularly for C. petaurista, were higher than found in surveys made closer to the park boundary in April 1993 (Struhsaker and

Oates 1993). Ten associations of monkeys were encountered during the 4 censuses made at Obuo (0.63/km., 0.45/total census time, 0.52/total search time [excludes observation time]). These 10 associations were comprised of at least 12 social groups. Some of the associations and groups may have been counted on both census days on the west route (Tab. 2).

Eight encounters were made with C. petaurista, 3 with C. campbelli and one with Colobus verus. Based on direct observations and low amplitude contact vocalizations, the spot-nosed monkeys (C. petaurista) would appear to be the most common monkey at Obuo. In terms of adult male loud calls, however, C. campbelli were heard most often and this is likely because their call is louder and given more frequently than that of C. petaurista. Transect censuses may underestimate C. verus because they seem to be less vocal than other species and perhaps more likely to use very dense thickets and remain silent there once they have detected humans.

In addition to the primates seen or encountered within 50m of the transect during formal censuses, a group of at least seven Colobus vellerosus (5 approximate adults, one clinging infant [adult color], and one medium juvenile) were seen on the northern census route on 17 November. Two widely separated sources of adult male roar calls of C. vellerosus were heard in the far distance on 21 November during a census of the west route.

Two prosimians (Galago demidovii and Perodicticus potto) were seen near the Obuo camp during a 2-hour night walk along the trail to Briso II. The vocalizations of G. demidovii were commonly heard every night around the camp, suggesting it is quite abundant there.

Duikers and Royal antelope were encountered 15 times during the formal censuses (0.94/km., 0.67/total census time, 0.77/total search time). None of these antelopes were clearly seen. Based on vocalizations and sounds made when fleeing, it was concluded that 12 of the 15 encounters were with Maxwell's duikers, one with a Bay or Black duiker, and one with a duiker of undetermined size. The Royal antelope was glimpsed once. Total encounter frequency of duikers at Obuo was as high as I have encountered in any rain forest and much higher than during the April 1993 surveys closer to the forest edge (one per 6.1 hours vs one per 1.5 hours at Obuo). This latter comparison should be interpreted with caution because the censuses at Obuo were conducted much more slowly, quietly and effectively than the April 1993 survey walks.

An impression I gained at Obuo is that the Maxwell's duiker differs in some basic ways from its close relative the Blue duiker of central and east Africa. The Maxwell's almost always gives an alarm whistle or wheez when fleeing, whereas the Blue rarely does so. Maxwell's seem to be very abundant in dense, low-stature and degraded forest, in

contrast to the Blues which seem to do best in tall, old-growth forest.

7.1.2 Other Wildlife

Squirrels (usually unidentified) were frequently seen and a group of 4 cusimanse (Crossarchus obscurus) was seen once during the censuses. Tracks of elephants and bushpigs were common, particularly so in the Raphia swamps. Tree hyrax were frequently heard at night. No signs of bongo were found.

It was encouraging to have detected crowned hawk eagles during 3 of the 4 censuses and to have seen another one as we left the forest on the 22nd November. This is Africa's largest forest raptor and, aside from humans, the most important predator of monkeys.

In contrast to Bia, the larger hornbills (Ceratogymna, Bycanistes cylindricus and B. fistulator) and great blue turacos were quite common at the Obuo site and indicates relatively lower hunting pressure. An unusual observation was the apparent absence of the white crested hornbill (Tropicranus albocristatus) from all of the monkey associations encountered at Obuo. This hornbill is very often found in association with monkeys in W. Africa and during our April surveys of Kakum in 1993 they were seen and heard quite often. There is no obvious explanation for its apparent absence from this set of censuses at Obuo.

The final note on birds at Obuo is the relatively high abundance of the Nkulungu Rail. Its peculiar and intriguing

calls were heard from several different sources in the hour before dawn on 4 of 5 mornings and at nightfall on 2 of 5 evenings.

7.1.3 Poaching

Although no wire snare traps were found, I located two relatively new 12-gauge shotgun shells within one km. of the Obuo camp. The most disturbing evidence of poaching was a series of gun shots heard near the Obuo camp, beginning with one in the afternoon of the 21st at about 1612 hours, 2 more near sunset and then 2 more in the very early morning (0015 to 0109 hours) of 22nd November. This was clearly carried out by one or perhaps more very confident poachers who knew the area extremely well and were not deterred by the presence of 6 of us working in the area.

7.2 Conservation Issues and Recommendations

Many of the same issues and recommendations described and suggested for Bia apply to Kakum. Similarly, the recommendations made in our April 1993 still appear to be appropriate.

7.2.1 Antipoaching and Law Enforcement

My initial impression is that the game guards in Kakum are more highly motivated than those at Bia, but poaching is still at an unacceptably high level in Kakum. The issue of a bonus system for the guards and civilians is very relevant to Kakum's problems, but this system should only be implemented if there is some assurance of a very long-term funding base, such as through a trust fund.

Particular attention should be given to gaining the active cooperation of the villagers living adjacent to the park. A combination of education and a bonus system for successful arrest of poachers and confiscation of shotguns by villagers could play a major role in reducing poaching.

If the Obuo camp is to become one of the main focal points for research in Kakum, then it is imperative that all poaching be stopped there immediately. Establishing a game guard camp near the Obuo study area would be one approach. I would suggest placing such a camp within a km. of the study grids, such as downstream of the present "research" camp or a km. east of the Obuo camp toward Brisco II.

I was told of a group of black and white colobus that can be observed near the Kuntan trail toward Abrafo. In order to protect and better habituate these monkeys for tourism, I suggest the game guards be organized to observe and map the movements of this group every day. The guards could be assigned to this task in pairs, with a rotation system in which each pair spends 2-3 days with the group two-three times each month.

7.2.2 Research

Given the very high level of logging and hunting in Kakum, a general theme for research in this forest should be the long-term response of the flora and fauna to this impact and to increased protection. Now is the time to obtain the baseline information so that long-term effects and responses can be determined over the next 10-20 years. Likewise, only

with baseline data on plant and animal populations can it be determined if the conservation activities are effective.

Any long-term research project would require input and oversight from experienced and qualified professional research biologists at all stages from planning to implementation.

Research projects that would be appropriate include:

1) plant regeneration studies:

Nested plots and line transects would be used to collect data for determining the status and dynamics of plant populations, i.e. stand curves (frequency distribution of size classes). Permanent plots would allow long-term monitoring. Attention would focus on tree species. Data collected should include information on the density of cut tree stumps in the study area to compare with official offtake records. Experimental manipulation of Eupatorium odorata thickets would be included here as means of finding ways to eliminate this exotic weed and to foster forest regeneration.

2) population dynamics of selected vertebrate species:

Long-term monitoring of primates, duikers, rodents, and large frugivorous birds (especially Ceratogymna hornbills) should be conducted on a regular basis. I have suggested these animal groups on the basis of my impressions about their relative sensitivity to forest degradation and hunting. Methods of study would depend on the species and include direct censuses, live trapping, radio telemetry, and

remote cameras. For example, giant rats (Cricetomys) and brush-tailed porcupines (Atherurus africanus) are often poached by wire snare traps. Live trapping and radio telemetry would be particularly appropriate for a study of their populations.

3) **Seed predation and browsing pressure:**

Heavy logging, such as that in Kakum, is expected to favor rodent and elephant populations because of the increase in herbaceous vegetation. Rodents can potentially have an enormous impact on the mortality of tree seeds and seedlings. Elephants, in turn, can have a negative impact on forest regeneration through heavy browsing and incidental damage to tree saplings and poles. Studies on this subject that were conducted in the Kibale Forest of Uganda could constitute a useful case study and model for Kakum.

7.2.3 **Mapping**

A more accurate map of the park is still needed. All existing access trails into the forest should be accurately mapped.

Primate census routes should be accurately mapped and marked at 50m intervals with more permanent markers, e.g. galvanized metal or aluminum plates; nails should be aluminum and driven in only half way to avoid problems of tree growth and elephants forcing the plate off.

Areas of the forest designated for more detailed and longer-term study will require a more extensive trail grid system. A master trail system should be planned in advance

to insure a logical trail numbering system. For example, north-south trails could be numbered sequentially and east-west trails lettered sequentially. Initially, trails are usually placed at 200m intervals. Areas within this grid that require more detailed study could have trails added at 100 or 50m intervals. The master grid plan would incorporate a trail numbering and lettering system down to 50m intervals whether all trails are established on the ground or not.

7.2.4 Progress Reports

Regular progress reports are important in terms of evaluating ones own progress and understanding the activities, issues and problems of colleagues. For those doing research, these reports are particularly important in terms of modifying research methods and determining trends and directions. I recommend 2-3 page monthly reports and more detailed reports for research projects every 3 months. The research reports should include data analysis and summaries, as well as a discussion on the implications of the results.

8. Concluding Remarks

8.1 *Loss of Forest Biodiversity in Ghana*

My impressions of Ghana's rain forests, based on field work in Kakum and Bia and discussions with forest managers and biologists, is that they have all been very seriously degraded through excessive logging and overhunting. It appears that the flora and fauna are being simplified

through the loss of species adapted to old-growth, mature forests and the persistence or increase of species that thrive in colonizing forest.

Among the primates this trend is evident with the persistence of secondary-forest species like C. petaurista, C. campbelli, and C. verus, while species dependent on tall, mature forest and particularly prone to hunting are disappearing rapidly, e.g. C. diana, C. vellerosus, P. badius.

The elephant is another species which seems to prefer colonizing bush. Less is known about ungulates, but it may be no coincidence that the most common duiker is Maxwell's, which apparently persists and may thrive in agricultural fallow bush.

Floristically, I have seen little evidence of regeneration of tree species typical of old-growth forest. The rapid and extensive invasion of logged areas by the exotic weed Eupatorium is another disturbing development.

8.1.1 Bia vs Kakum

It would appear that Bia may be experiencing the loss of flora and fauna through excessive logging and hunting more severely and rapidly than Kakum. Since 1977-78 when primate censuses were done by game guards in Bia (Martin and Asibey 1979 and Martin 1982), it appears that several species have declined in numbers and may no longer exist in Bia, e.g. diana, red colobus and mangabey monkeys. This decline in primates may even apply to those more common

species that generally persist in secondary forest, i.e. spot nose, "mona", and olive colobus. Although the censuses for Bia in 1977-1978 followed somewhat different procedures, such as having the observer move 2.4 kms./hour vs our protocol of one km./hour, the comparison indicates a tendency toward a decline in numbers over the past 15 years and lower numbers than we found in Kakum for these three secondary-forest species (Tab. 3).

8.2 The Crisis of Ghana's Endangered Primates: What to do?

The negative results of this preliminary survey in Bia Forest are particularly disturbing because it was believed that should the endemic primates that have been recorded only from western Ghana and eastern Cote d'Ivoire still exist, they would most likely be found in Bia where they were studied in the 1970s. Not only were we unable to detect any sign of most of them, but the game guards based in Bia had never seen and did not even know about three of these primates: Procolobus badius waldroni, Cercopithecus diana roloway, and Cercocebus atys lunulatus.

It would appear that during the past 13-15 years these three primates have greatly declined in numbers and may be extinct. This represents a *major crisis*. I recommend as a most urgent and *top priority* that a major survey be undertaken for these three primates in forests throughout western Ghana. Two teams, each consisting of one senior and experienced primatologist and two Ghanaian counterparts,

could conduct this survey in about 5 months. The objective would be to locate populations of these endemic primates, identify the immediate threats to their survival and to make recommendations for their conservation.

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Table 1

PRIMATE CENSUSES

Nov. 1993

BIA NATIONAL PARK & GAME PRODUCTION AREA

| Route & Distance | Date | Time | Perpend. Dist. (m) | Observ. Dist. (m) | Association | | | CHIMP |
|--|------|------|-----------------------|----------------------|-------------|-----|-----|-------|
| | | | | | PET | CAM | VER | |
| Chimp -- S. of Colobus Camp (6.75 km) | 11th | 0920 | --- | --- | | | | HJ |
| Benkasa Camp 13 3C - 3B (4.8 km) | 12th | 0656 | --- | --- | | | | HJ |
| | | 0733 | 20 | 20 | HV | | HV | |
| | | 1008 | --- | --- | | | | HV* |
| Camp 10 (Anwiafutu) (3.5 km) | 13th | 0726 | --- | --- | | | + | |
| | | 1010 | --- | --- | HV | | HV | |
| Mansoh Camp (3 km) | 14th | | | | | | | |
| Logging Rds. (Bia Central) (3.75 km) | 15th | 0841 | 15-20 | 15-20 | | | + | |

HJ = heard jumping

+ = seen

PET = C. petauristaVER = C. verus

HV = heard vocalizing

* = very far

CAM = C. campbelliCERCO = Cercopithecus

Table 2

PRIMATE CENSUSES

Nov. 1993

OBUO AREA, KAKUM NATIONAL PARK

| Route & Distance | Date | Time | Perpend. Dist.(m) | Observ. Dist.(m) | Association | | |
|---------------------|------|------|----------------------|---------------------|-------------|-----|-----|
| | | | | | PET | CAM | VER |
| North (4 km) | 18th | 0700 | 0 | 23 | + | | |
| | | 0854 | 5 | 25 | + | HV | |
| | | 0928 | 4 | 15 | + | | |
| West (4 km) | 19th | 0627 | 3 | 12 | HV | | |
| | | 0727 | 0 | 30 | + | | |
| | | 0748 | 22.5 | 22.5 | HV | | |
| | | 0900 | 0 | 15 | | HV | |
| North (4 km) | 20th | | | | | | |
| West (4 km) | 21st | 0811 | 0 | 25 | + | | |
| | | 0925 | 0 | 25 | HV(+) | | |
| | | 1015 | 25-30 | 25-30 | | HV | HV |

NOTE: 2 very distant sources of
Colobus vellerosus roars heard at 0630 hrs.

+ = seen

HV = heard vocalizing

(+) = poorly seen

Table 3

Abundance of Cercopithecus petaurista
and/or C. campbelli Associations

| Location | Year | # Associations/km |
|---------------------|-------------|-------------------|
| <u>Bia</u> | 1977-78 (1) | 0.335 |
| <u>Bia</u> | 1993 (2) | 0.275 |
| <u>Kakum</u> | | |
| Antwikwa | 1993 (3) | 0.833 |
| Obuo (west) | 1993 (3) | 0.875 |
| Obuo (west) | 1993 (2) | 0.875 |
| Obuo (west & north) | 1993 (2) | 0.625 |

1 = Martin & Asibey 1979
2 = Struhsaker, this report
3 = Oates 1993

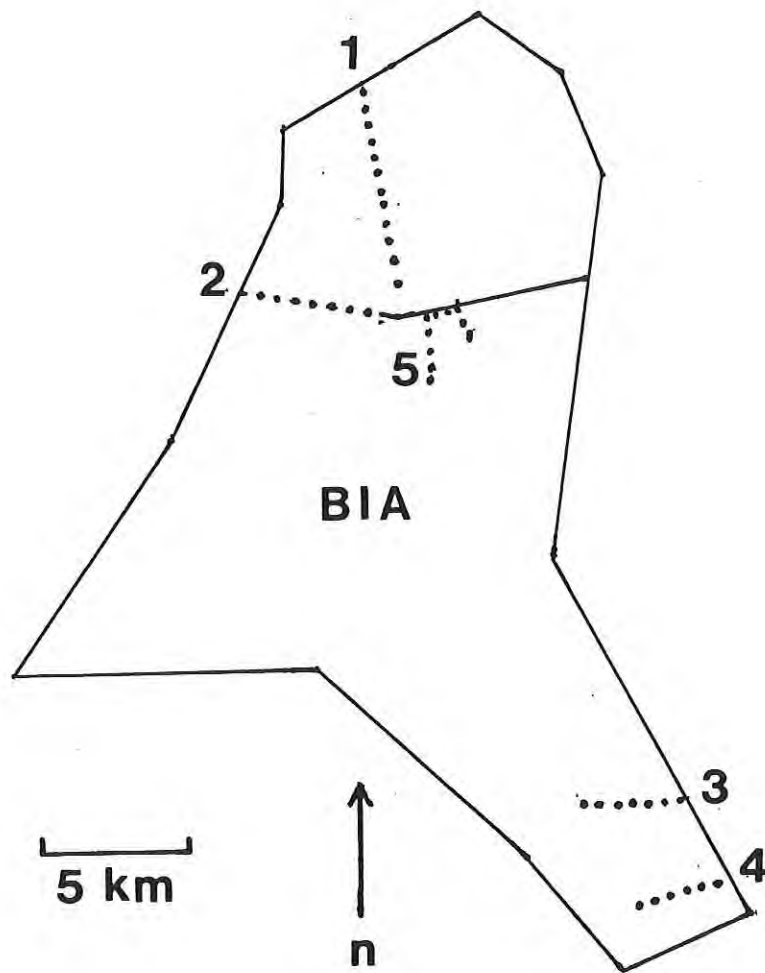


Figure 1 Location of census routes in Bia Forest.

1 = chimp to S. of colobus camp; 2 = 3C to 3B;

3 = Awiafutu; 4 = Mansoh; 5 = Logging Roads.



Figure 2 Location of census routes at Obuo Stream Camp in Kakum National Park.