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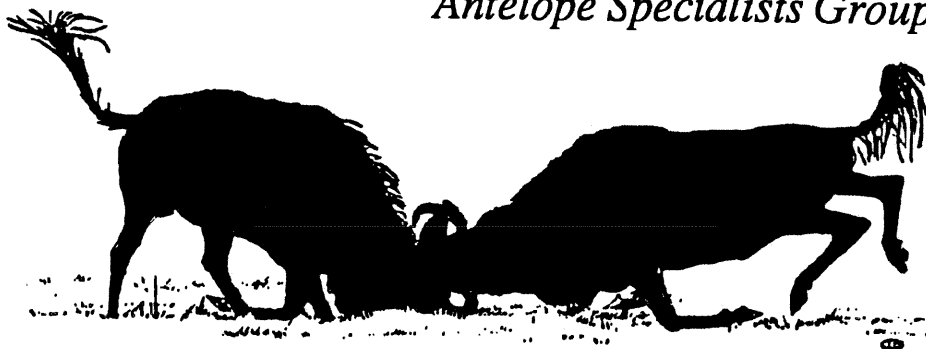
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GNUSLETTER

ASG NEWS

Why Was Vol. 13 No. 1 Delayed Until June?

... You may well ask. It was like this. My friend, Dan Otte, illustrator of *The Behavior Guide to African Mammals* and *The Safari Companion*, and now an ASG member, loaned me a digital scanner with an optical character reading (OCR) program that would enable me to scan not only pictures but also text and have it automatically converted into Microsoft Word 5.1. The prospect of saving days and days of keying in articles (with innumerable attendant typing mistakes) convinced me to replace my original Macintosh Plus with a new model (LC 520) that had the 4 megabytes of RAM required by the OCR software. When I ordered it in December, I was told it would be delivered within 48 hours. But January and February passed, then Apple informed me that the LC 520 was discontinued and would be replaced by the LC 550, which was due to be shipped at the end of March.

Great! The time I had set aside to write the newsletter was already gone. I had to drop everything else to complete the section on mammals for a forthcoming Audubon Society Field Guide to African Wildlife, due by the end of April. By the time I completed the last of the 75,000 word ms., it was mid-May.

When I finally received the new Macintosh in mid-April, it turned out that the OCR program needs not 4 but 5 megabytes of RAM. Having had no time to get the extra RAM installed, the scanner remains inoper-

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able. But fortunately, two friends and desktop publishing pros scanned most of the stories for the *Gnusletter* for me on their equipment, so two weeks were enough to finish a double issue of the long delayed *Gnusletter* before leaving on a five-week trip to East Africa on 3 June.

So that's the story, and I do apologize for the long delay, particularly to the authors whose articles have been gathering dust all these months.

Triennial Report of the Antelope Specialist Group, 1991-1993

MEMBERSHIP

At the end of the triennium the ASG has 120 members, including 42 from Africa, 5 from the Near East, 18 from Asia, 34 from Europe, and 21 from North America.

ASG PARTICIPATION IN ANTELOPE WORKSHOPS AND SYMPOSIA

3-5 January 1992. Meeting at The Living Desert, Palm Desert, California with Antelope Working Group of the Captive Breeding Specialist Group (CBSG) and the Taxon Advisory Group of the AAZPA to draft a Global Captive Action Plan for Antelopes.

Deputy Chairman Rod East, Coordinator and Editor of the four-part antelope survey (*Antelopes: Global Survey and Regional Action Plans*), played a pivotal role in identifying the species and subspecies that deserve the highest priority. He also presented a paper that forecasts the prospects of wildlife in general and antelopes in particular in each country of sub-Saharan Africa during the next century, based on current human population density, annual growth rate and doubling time, the percentage of antelopes currently at risk, and the overall level of wildlife protection and management. Apart from a few countries with low population densities and extensive, well-managed reserves, the prospects are dim—unless population growth rates decline and conservation effectiveness increases dramatically in the near future.

22-23 June 1992. Antelope workshop at the South African National Zoological Gardens, organized by CBSG. Review of the Conservation Assessment and Management Plan for Antelopes (CAMP document) produced by Karen Sausman, Chairman of the CBSG Antelope Working Group for Antelopes, and amendments to the Antelope Action Plan.

31 Oct-3 Nov 1992, Riyadh, Saudi Arabia. Arabian Gazelle Workshop and Symposium, arranged by the National Commission for Wildlife Conservation and Development.

3-5 Sept 1993, Antwerp Zoo, Belgium. Antelope Workshop, held during the annual meeting of the CBSG. Jelle Boef, representing the ASG, presented revised and updated CAMP sheets for Arabian antelopes.

ACTION PLAN PRIORITIES

Progress in carrying out action plans has been disappointing.

- Although a grant from the Peter Scott Memorial Fund was provided for an initial aerial survey of the hirola or Hunter's antelope (*Damaliscus hunteri*) in eastern Kenya, two years have passed with no action. Whether the risk of being shot at by renegade Somali troops, disagreement among Kenya Government and NGOs over jurisdiction, or

a combination of the two is behind the delay remains unclear.

- Similarly, funding and personnel (headed by Jeremy Anderson, Regional ASG Chairman for Southern Africa) have been ready these last two years to find out how many giant sable (*Hippotragus niger variani*) survive in Angola. In this case, continuation of the civil war is obviously the problem.

- Investigate the status of the mountain nyala (*Tragelaphus buxtoni*) and Swayne's hartebeest (*Alcelaphus buselaphus swaynei*) in Ethiopia. Although conditions appear to be peaceful and the Government has invited the assistance of the ASG and Canid Specialist Group, IUCN has yet to make the necessary arrangements for site visits.

- Investigate the status and develop conservation action plans for endangered duikers. Steady if slow progress has been made here, thanks to the efforts of ASG and other interested parties. Vivian Wilson and Harald Roth are continuing the country-by-country Pan-African Duiker Survey; Marcel Alers is investigating the status of Jentink's and zebra duikers (*Cephalophus jentinki* and *C. zebra*) while carrying out an EC-sponsored survey of coastal forest reserves in the Ivory Coast; and Ole Seehausen et al. surveyed the status of the Zanzibar red duiker (*C. adersi*).

ASG NEWSLETTER REPORTS ABOUT ANTELOPE CONSERVATION

One of the primary functions of the ASG *Gnusletter*, published three times a year, is to serve as a clearing house for information about the conservation status of antelopes in all the countries where they occur. During the past three years, news was published about antelopes in the following countries (numbers in parentheses denote multiple reports):

Sub-Saharan Africa: Angola (2), Botswana (5), Cameroun (4), Congo Republic, Djibouti, Eritrea, Ethiopia (3), Gabon (2), Ghana (3), Guinea-Bissau (2), Ivory Coast (3), Kenya (3), Liberia (2), Mali, Moçambique, Namibia (3), Niger (2), Rwanda (2), Senegal, Sierra Leone, Somalia, South Africa (4), Sudan, Tanzania (3), Zaire (2), Zambia, Zanzibar; North Africa: Algeria (2) Morocco, Tunisia; Arabian Peninsula: Israel (4), Oman (2), Saudi Arabia (4), Yemen (2); Asia: Afghanistan, China (2), India (5) Iran, Kazakhstan (2), Mongolia, Russia (2), Tibet, Viet Nam (3).

Of all these reports, I consider a series of three in-depth articles on Botswana the most

important. Based on interviews and documents collected during a 1991 visit, and on the results of an IUCN mission, these articles showed how Botswana's wildlife heritage has been nearly destroyed for the sake of the cattle industry and the enrichment of a few-hundred cattle barons, thanks in large measure to a subsidy by the European Community and loans by the World Bank.

The most extraordinary event involving antelopes during the last three—or even the last 40—years, was the discovery in 1992 of a new genus and species in Vietnam, *Pseudoryx nghetinhensis*, during a joint Vietnamese Ministry of Forestry/WWF survey of the Vu Quang Nature Reserve.

PART 4 OF THE ANTELOPE SURVEY

The Antelope Survey of North Africa and Asia is going forward and is expected to be published within the next two years. In place of Rod East, the ASG Chairman will serve as Coordinator and Editor. David Mallon, who prepared the accounts of 10 Asian antelopes for the (still-unpublished) *Antelope Red Book*, has kindly agreed to revise and reformat his data for this country-by-country survey.

Thank You, Holly Dublin

Dr. Dublin^{ASG}, Scientific Officer of the WWF Regional Office in Nairobi, responded to the appeal in the last *Gnusletter* for an ASG member to represent our group at the General Assembly. Although it was double duty for Holly, who is Chair of the African Elephant Specialists Group, to take on this additional chore, she was kind enough to read the ASG report during the SSC meetings preceding the General Assembly.

Steve Kingswood is Editor of Captive Breeding and Genetic News

Steve Kingswood, who with his wife, Arlene Kumamoto, is involved in the study of antelope cytogenetics at the San Diego Zoo's Centre for Reproduction of Endangered Species (see Kumamoto and Kingswood 1992. "Antelope cytogenetics and application to conservation." *Gnusletter* 11 (1&2):14-17), has volunteered to provide news about captive breeding and genetics of antelopes for the *Gnusletter* on a regular basis. He began in the last issue, with an article

on "The role of captive breeding in antelope conservation (page 11), and continues in this issue with "Species survival plans" (page). At his request, Alan Rost and Terrie Correll, Studbook Keepers for scimitar-horned oryx and addax, respectively, contributed news about survival plans for these two endangered antelopes.

Antelope Workshop in San Diego

by Steve Kingswood

During 8-12 March 1994, a workshop was held in San Diego to update the Conservation Assessment Management Plan (CAMP) and formulate Global Captive Action Plans (GCAPs) for antelopes. This workshop was convened by the IUCN/SSC's Captive Breeding Specialist Group (CBSG), the Antelope Specialist Group (ASG), and American Zoo and Aquarium Association's Antelope Taxon Advisory Group (TAG). Eighteen people participated in the workshop, including representatives of zoological collections in the United States, England, and Saudi Arabia as well as the Antelope TAG, CBSG, and ASG.

A CAMP is a preliminary definition of the scope of the problem facing a taxonomic or geographic group of organisms; it is the first step in the development of an action plan. The CAMP process attempts to compile information, particularly the volume of unpublished information, on populations of all taxa of a particular taxonomic group or geographic region in order to identify conservation priorities. It is a continually evolving process in which working documents are constantly undergoing revision; draft I of the

Antelope GCAP and draft II of the Antelope CAMP were published in 1992.

GCAPs are developed from information contained in CAMPs, and they summarize the captive status and management priorities for taxa recommended for captive populations by CAMPs. This system proposes that captive populations be treated as an integral part of the metapopulations being managed by conservation strategies and action plans. Viable metapopulations may need to include captive components. The IUCN Policy Statement on Captive Breeding recommends, in general, that captive propagation programs be a component of conservation strategies for taxa whose wild populations are below 1,000 individuals. It is proposed that captive and wild populations can and should be intensively and interactively managed with interchanges of animals occurring as needed and as feasible, after appropriate analysis. There may be problems with such interchanges, including epidemiologic risks, logistic difficulties, and financial limitations, but with effort these can be resolved. The bottom line is that strategies and priorities should try to maximize options and minimize regrets for species conservation.

Captive populations are support, not a substitute, for wild populations. A primary focus of GCAPs is on captive propagation programs that can serve as genetic and demographic reservoirs to support survival and recovery of wild populations in the future. The purpose of GCAP workshops is to provide strategic guidance to various regional programs [see Kingswood (1993) and Scott Carter's following report on the Antelope TAG meeting] that will facilitate their interaction toward truly global efforts. An important aspect will be the establishment of target population size goals (i.e., how many individuals to ultimately try to maintain) on a global basis and in each of the regions. More specifically, GCAPs recommend which taxa are most in need of captive propagation and therefore: (1) which taxa in captivity should remain there; (2) which taxa not yet in captivity should be there; and (3) which taxa currently in captivity should no longer be maintained there.

The GCAP report requires compilation of the following information: CAMP priorities and program goals, number of animals in captivity, management and breeding history in captivity, institutions holding the taxon, founders of captive populations, demo-

graphics of captive populations, and actual and potential space for the taxon. Once the information is assembled, the next phase of the process involves decision making, prioritization, and preparation of a first draft of the GCAP report. From the CAMP data there is an initial selection of regional species targets followed by determination of GCAP population priorities, target population numbers, and regional responsibilities. This information is tabulated and a review draft of the GCAP report is prepared.

The five days of the Antelope CAMP and GCAP workshop allowed barely enough time to rough out the worksheets for wild and captive populations of antelopes, totaling over 400 taxa. The herculean task of tabulating and editing this volume of information is being done by Karen Sausman, Terrie Correll, and other staff of The Living Desert, Palm Desert, California. Thanks to their hard work, a review draft of the GCAP report should be ready for circulation in the next few months.

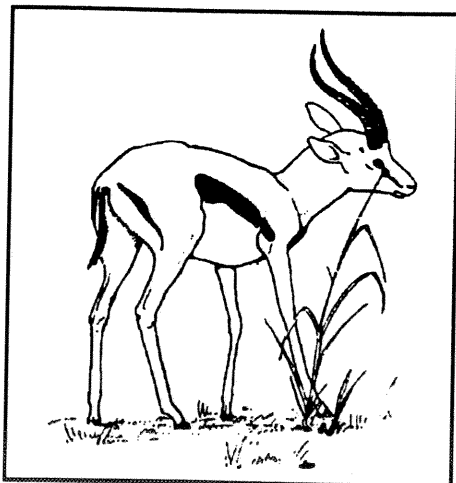
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Antelope News

Wild Arabian Oryx of Oman

Mark Stanley Price^{ASG}, who presided over the reintroduction of the Arabian oryx and went on to become Chairman of the Reintroduction Specialists Group, provided an update for *Gnusletter* on this population (3 Jan 1994) after returning from a four-day visit to confer on various technical matters.

The situation is that there are now known to be at least 260 oryx in the desert. They are completely free-living and receive no assistance from management at all. The total population range is 14,000 km² of the Jiddat-al Harasis. What is so striking now is that you can be driving across the Jidda', and you will spot one or more bright white dots far away in the distance. On approach they turn out to be oryx, going about their business. Most are still very approachable because of being visited by ranger patrols. The distribution of animals, group size and composition appear totally those of a natural population. In contrast to the relatively large herds of rigid membership that were released, and which served the purpose of staying together to facilitate monitoring, herds are now small, I suspect 3-8 animals, and there are many males living alone, and travelling widely in search of female groups.

Not surprisingly, the population structure is very heavily skewed in favour of young animals, so the reproductive potential is great. The breeding rate is clearly linked to the occurrence of winter rainfall. 1991 was dry and there was mortality of old animals and of young calves. However, the increase in 1993 to November has been 37%, and this is not an exceptional rate.

The data derived from the monitoring programme is detailed and accurate. In 1990 I helped design a monitoring protocol, at a stage when the oryx numbered about 85, when it had become impossible - and unnecessary - to know and track each individual, as we had been able to do from the first release in 1982. So, we designed a system based on focal animals, selected on certain criteria. Some of these were immobilised specially for marking with ear tags, which all the rangers can distinguish. Currently, in the population of 200 there are 54 focal ani-

mals, and there are 52 marked with collars, ear tags or ear notches.

Now that the population size is large, monitoring at this level is not practical and there is less need for such detailed information on all topics. The expansion of range used will tend to be derived on a population basis rather than on the sum of individual oryx. More significantly, the project has embarked on running in parallel total counts with sample counts based on the Petersen method. The latter is based on sightings of marked animals, and so tests are being run to see how many marked animals the growing population must contain to yield adequately precise estimates of population. To date, the censused total and estimated population tally very closely.

Planning ahead for the oryx project is exciting because a total of 250 animals by the end of 1994 is feasible, and over 300 in a year from then. The latter is the figure which I estimated some time ago as a secure and viable population. But, this needs revisiting under the present sex and age structure, and breeding system.

In the longer term it is clear to me that emphasis will evolve from being on the security of the oryx to monitoring and ensuring the suitability of the habitat. The first steps have been taken towards declaring the Jiddat-al-Harasis and a large surrounding area a World Heritage Site. This will require giving the area some protected status within Oman's legislation. The area is also seeing constant change as the number and lifestyles of the Harasis tribe change rapidly. The interplay of factors here is very complex, and there are changes which will be both beneficial and damaging to the continued productivity of the Jidda' as a very unusual desert ecosystem, and habitat for the oryx and the other diverse wildlife.

Overall, the management of the project is superb, with the re-introduction retaining an important role in the economic and social life of the Harasis tribe. The skill and experience of the Harasis rangers grows all the time: many have been on the project since 1980, and an increasing number are now turning in written reports from patrols or from radio duty at the base camp.

The project is an excellent example of how

an appropriate structure, efficient administration and adequate resources can ensure timely and responsible management under remote conditions. Moreover, there is a very large reservoir of information on the course of the project, the behaviour and performance of the oryx, etc. Two PhDs are now being written on selected aspects, and I would hope that the project will make available more widely information and observations about the re-introduction. This will become more useful and interesting as the project adapts to cope with the increasing number of oryx and changing conditions within its area of Oman.

Genetic Analyses of African Bovids

Grubb Comments on Kat's Preliminary Report

Pieter Kat's article in the last *Gnusletter* brought this response from bovid taxonomist Peter Grubb^{ASG}, 35 Downhills Park Road, London N17 6PE, UK (in lit 10 Jan 94).

Here are some comments arising out of Pieter Kat's very stimulating Preliminary Report on Genetic Analyses of East African Bovids.

Notes on Grant's Gazelle

The reported results on this species are of very great interest. Although it seems, "The genetic subdivision is also at variance with traditional taxonomy", there are grounds for believing quite the opposite and that they support the known pattern of geographical variation in this species.

A) TSAVO EAST GRANT'S GAZELLES

[They] are morphologically very distinct and there is evidence that they have been geographically separated from other populations of the species. For reasons which I do not understand, Jonathan Kingdon did not recognise Tsavo East gazelles as a valid subspecies, though all other authors have considered that they represent a distinctive taxon. As Leuthold has recently shown (1981), there are two morphologically distinct populations of Grant's Gazelle in the Tsavo National Park. Peters' Gazelle (*Gazella granti petersi* Gunther, 1884) oc-

curs in Tsavo East and what he calls *G. g. serengetae* occurs in Tsavo West. They were formerly separated by tracts of *Acacia-Commiphora* woodlands, but with the shift to grass-dominated vegetation the two populations have been able to come together, though Leuthold did not record any interbreeding.

Peters' gazelle was regarded as a distinct species in the older literature. It had a very restricted distribution between the Tana and Galana Rivers in Kenya but has recently spread to just south of the River Voi (Leuthold, 1981:50). In form, colour and colour pattern it is well differentiated from the more familiar populations of Grant's gazelle in southern Kenya. The horns are very straight and do not diverge much; the colour is a richer cinnamon shade; there is no dark nose patch; and the white rump patch does not continue across the rump in front of the tail—it is divided by a dorsal stripe of the body colour extending onto the tail.

The Grant's gazelle in Tsavo West was called *G. g. serengetae* by Leuthold but from his description they must be typical *G. g. granti*. In a letter to me, he emphasized that the Tsavo West Grant's gazelles have the white rump patch characteristic of most populations of this species. However, available information (records of horn measurements, museum specimens) indicates that the Grant's gazelles of southernmost Kenya, including Tsavo West, had some characteristics of Peters' Gazelle. The horns of males have been recorded as significantly narrower in span than in typical Grant's gazelles of the Kenya/Tanzania borderlands, and some museum skins show an intermediate (*petersi/granti*) rump patch, or even the fully-expressed colour and rump-patch features of *petersi* (in the holotype of the supposed subspecies *serengetae* and some other specimens).

The type locality of *G. g. serengetae* is, as Leuthold stressed, not the Serengeti Plain of Tanzania but plains of the same name near Taveta in Tsavo West, Kenya.

It looks as if prior to the recent contact between *Gazella granti granti* and *G. g. petersi* in Tsavo East, an earlier contact had occurred in and beyond Tsavo West, which led to some intergradation. This was not a complete integration as specimens very close to at least one of the parental forms (*G. g. petersi*) were also recorded (as *serengetae*). It seems that Grant's gazelles with *petersi* (or *serengetae*) characters may have disappeared

in the Tsavo West population, which is now wholly typical of *G. g. granti*, but this needs to be confirmed by accurate field work ("Field Systematics") and by DNA studies. Very little Field Systematics seems to have been undertaken.

Accurate scoring of horn size, and pelage characters in the more variable wild ungulates (giraffes, bushbuck etc.) would help in the understanding of their geographic variation and perhaps could iron out some problematic taxonomic issues.

B) SAMBURU/SIBILOI AND MASAI MARA/NAIROBI/AMBOSELI GRANT'S GAZELLES

The divergence between [these populations] is in accord with morphological variation in the species. North of the Mau Escarpment, Aberdares, and Mount Kenya are relatively smaller Grant's gazelles with rather straight horns. The correct name for these animals is not clear - in order of priority the possible names are *notata* Thomas, 1897; *brightii* Thomas, 1901; *lacuum* Neumann, 1906; and *raineyi* Heller, 1913. As mentioned in an earlier letter, the type specimen of *notata* is a long-haired skin, very dark in colour with intense dorsal, lateral and pygal bands of dark pigmentation. It may represent a unique localised population, possibly now extinct. There is scant evidence that the populations to which the names *brightii* and *lacuum* have been given are really different from *raineyi*. So these northern Grant's gazelles should probably be called *G. g. brightii*, rather than *G. g. raineyi*.

South of the Kenya Highlands, and (formerly) right through the valley of the Gregory Rift are relatively larger Grant's gazelles. They can be divided into a western population (*G. g. robertsi*) with more divergent horns, and an eastern population (*G. g. granti*).

According to maps in Hillman et al. (1988:47), Kingdon (1982:417), Simon (1962:229), and Stewart and Stewart (1963:26), there has "always" been a discontinuity between (A) *G. g. brightii* (including *raineyi*) and (B) *G. g. granti* and *G. g. robertsi*, except along the valley of the Gregory Rift. (In eastern Kenya the newly-established contact zone in the Tsavo National Park and the presumed older contact did not concern *brightii*, which is separated from *petersi* by the Tana River.) There is therefore a possibility that the *brightii* and *granti/robertsi* sections of the species have not exchanged

genes at all, or at least not significantly, in recent decades.

KIRK'S DIKDİK

It is very easy to suggest that further species should be investigated by new methods, forgetting the enterprise and initiative of the workers involved and the practical difficulties they have overcome. Nevertheless, it may be worth mentioning Kirk's Dikdik as a species which needs additional study. Since the work of Ryder et al. (1989), it has become apparent that Kirk's Dikdik *Madoqua kirkii* may really consist of two chromosomally different species. At first sight, candidates for specific status would be (a) a small-sized species, *M. kirkii* itself (central and southeast Kenya, southern Somalia, including *minor*, and a much larger species, *M. cavendishi* (southern Kenya, northeastern Tanzania) including *langi* and *thomasi*. However, the taxon *hindei*, including *nyikae*, is intermediate both in size and distribution. It would be interesting to determine whether the population on which the name *hindei* has been based is or is not the result of secondary intergradation.

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Antelope Captive Breeding

Edited by Steve Kingswood

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Species Survival Plans

In the last issue of the *Gnusletter*, I mentioned the Species Survival Plan (SSP) as one program assisting in the conservation of antelopes through captive breeding. The first SSPs were initiated by the American Association of Zoological Parks and Aquariums, now known as the Association of Zoos and Aquariums (AZA), during the early 1980s in an effort to preserve the gene pools of as many threatened species as possible. By collectively managing all individuals of a given species held in all AZA member institutions, the effective population number (N_e) is increased, permitting a higher percentage of that species' genetic diversity to be preserved. Theoretically, when $N_e = 500$, for example, it may be possible to preserve over 90% of that population's genetic variability, even over 50 generations. It would be virtually impossible for a single zoo, or even a few, to maintain 500 individuals of a particular species; thus, the task is made possible by the collective management of all specimens in AZA institutions. However, SSPs do not simply attempt to manage captive populations to their highest possible numbers. The limited space in zoos dictates that a population be managed at the lowest level that will still allow most of the genetic variability to be preserved. To keep more than the minimum number needed only deprives other threatened species of valuable space.

There are, of course, variables that determine the actual population size needed to preserve a certain percentage of that population's genetic variability. A larger founder population size and a longer generation time allow a higher percentage of genetic variability to be preserved over time. Founders are wild-caught animals, but in the case of regional captive populations, they can include animals born in captivity in another region, such as Europe-born antelopes sent to North America. Founders are theoretically considered unrelated to any other individual in the captive population, but in reality, this is usually not the case, as Alan Rost and Terrie

Correll have pointed out in the following articles on scimitar-horned oryx and addax. Other criteria that must be met to maximize the preservation of genetic variability include: expanding the population as rapidly as possible from the founder population to the determined carrying capacity and keeping it stabilized at carrying capacity; equalizing the representation, or number of reproducing offspring, of each founder; minimize genetic drift and inbreeding by regulating family sizes, sex ratios, age structure, and matings between related specimens; and avoiding artificial selection.

Accurate pedigree data are critical to effectively manage a SSP; a studbook is a necessity. Terrie Correll and Alan Rost are studbook keepers for addax and scimitar-horned oryx, respectively. Their efforts have been vital to the SSPs for these two endangered antelopes. The following articles should give you a better idea about some of the complexities of running an SSP. I welcome any news or questions about the captive breeding of antelopes for inclusion in future issues of the *Gnusletter*.

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Scimitar-horned Oryx Species Survival Plan

By Alan Rost

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In September 1982, the scimitar-horned oryx (*Oryx dammah*) became one of the first species for which a North American Species Survival Plan (SSP) was organized. At that time, there was a fairly large population in zoos, but probably only about 1,500 survived in the wild. A North American regional studbook was begun in 1983 to provide data for management of the captive population.

Initial data collected for the studbook in-

dicated the North American population was derived from as many as 35 founders; 30 wild-caught specimens and five specimens that were captive-born outside North America and later imported. Eventually, the number of founders actually contributing offspring was found to be 30. The other five specimens had either not contributed surviving offspring or had produced surviving offspring that had been lost to the SSP. While 30 founders is a pretty acceptable number to most SSPs, there were three problems with the founder population. These problems were the impetus for the scimitar-horned oryx being named a SSP species.

The first problem was one of origin. All of the North American founders or their ancestors were captured in the same general area of Chad during two expeditions. Three animals, including two founders, were imported in 1963. The remaining wild-caught specimens were captured in 1966 and imported between 1967 and 1969. The five captive-born founders, imported during the early 1970s, were descendants from animals captured during the same 1966 expedition. There is no question that most of our North American founders must be inter-related, but we do not know the degree to which they are related. The SSP has considered each founder as unrelated to the others.

The second problem is common for most species in which the entire captive population is not being managed as a group. The number of offspring contributed by each founder is often skewed. A few founders have made major, even dominating, contributions to the gene pool; others have made little genetic contribution. This was obvious in spite of record-keeping problems, the third problem with the founder population. The available records made it quickly apparent that most oryx could not be traced completely back to founding stock. Even the parents of many animals were unknown.

Although these problems greatly impacted the early years of the scimitar-horned oryx SSP, they have now been largely resolved. Three additional founders have been imported; captive born-animals from Europe (0.2) and Cairo (1.0). This has increased our potentially effective founder base to 33. We continue to struggle with the imbalance of

founder contributions, but have made major inroads in bringing the SSP population more into balance. Additionally, we examined all animals in the population with questionable lineages. In many cases, the number of possible parents was limited and we could determine the potential input of bloodlines. Therefore, we really did know something about many of these animals, even if the information was imperfect or limited. Those animals that were complete "black boxes" with no known information were surplus by the SSP. Since we knew nothing about these animals, we were not concerned with losing them. A megapopulation of scimitars already exists on ranches across the country, especially in Texas, that could always be drawn upon if needed to bolster the SSP population.

The primary objective of the scimitar-horned oryx SSP is the maintenance of at least 90% of the species' genetic variability for 150 years. This can be accomplished by: maintaining a minimum viable population (MVP) of about 400 animals, continuing to seek additional founders, and continuing to equalize the representation of existing founders. Our holding capacity has held fairly steady with about 22 or 23 institutions participating in the SSP plus the J. David Bamberger Ranch. Each year as the SSP participants remove stock not needed by the SSP, we continue to increase the proportion of specimens that are needed for the MVP. We are getting close to the MVP goal of 400 specimens (Table 1).

Currently unique to the scimitar-horned

oryx SSP is the use of a private ranch facility as the focus of the SSP. The J. David Bamberger Ranch became involved with the SSP in 1983, and the ranch program took off about 1985. The ranch has been instrumental in stabilizing the SSP: because of its higher holding capacity, up to 80 scimitars can be held without negatively impacting the natural vegetation of the paddocks. Located in the beautiful Texas Hill Country near Johnson City, it features huge, wide-open paddocks, with innovative handling chutes, and excellent quarantine areas. Calf survival at the ranch is phenomenal, and parentage of every one is known. With almost all of the 33 founders to the North American population represented here, the ranch almost certainly has the most genetically diverse herd of scimitar-horned oryx in the world today.

One captive management concern that continues to plague this SSP is the management of bachelor herds. The ranch has maintained as many as 48 males in one herd, but not without negative repercussions. Broken horns and injuries are quite common.

As most of our goals for the SSP population seem within reach, greater emphasis has been placed on research that will, hopefully, lead to an in situ project in Niger. The government of Niger is very interested, but the project has been placed on hold during the last 2 years due to rebel activity in the project area. Our principal goal this year will be to fund and implement a behavior project at the Bamberger Ranch in preparation for the Niger project. Our plans call for using ranch animals in the Niger project. Not only are the

ranch animals genetically diverse, but these oryx are experienced at fending for themselves when confronting problems such as coyotes. The ranch oryx are also experienced at finding the various plants they like and need; zoo specimens are not experienced. This "survival sense" should increase their chances of survival in any release project.

Research projects of the Addax Species Survival Plan

By Terrie Correll

The Living Desert, Box 1775, Palm Desert, CA 92260, USA

The addax (*Addax nasomaculatus*) is the most desert-adapted of the antelopes. Once moving back and forth across the Sahara following the rains, it is now limited to the most remote pockets of its original range. Addaxes reproduce well in captivity and more exist in captivity than in the wild (Correll, 1992). In 1989, the AAZPA, now the Association of Zoos and Aquariums (AZA), designated addax to its Species Survival Plan (SSP). The primary goal of the Addax SSP is to establish and maintain a genetically diverse and demographically stable captive population. The ultimate purpose is to provide animals for reinforcement of wild populations or for re-introductions to their former range.

Over the years, addaxes in North American zoos were frequently herd-managed and identities of important founders were lost. This resulted in a poorly defined genealogy and made genetic analysis of the captive population difficult. There were 14 identifiable founders traceable to wild-caught animals from Chad and zoo stock from the Hannover and Khartoum zoos (Correll, 1989). Since the first Addax SSP Masterplan in 1989, substantial progress has been made in both the development and initiation of research projects which focus on addax. These projects, which include genetics, behavior and reproductive physiology, are outlined below.

ELECTROPHORETIC ANALYSIS

Robert Lacy and staff at Brookfield Zoo (Chicago) analyzed 18 blood proteins for variation from several captive addax herds (Brookfield, Fossil Rim, Oklahoma City, Omaha, and St. Louis) for an initial assessment of the amount of genetic variation remaining in the SSP metapopulation. Results showed little genetic variation among the animals sampled. This low level of genetic

Table 1. Scimitar-horned oryx SSP population

	1989	1990	1991	1992	1993
Participating institutions	22	22	22	23	23
Captive population (♂♂, ♀♀)	144,278	110,237	126,248	156,298	150,308
# SSP animals managed	212	283	283	371	388
# animals not needed for SSP	0	67	99	83	77
# animals not in SSP, but desirable to SSP	1	0	0	0	0
SSP animal births	110	117	114	136	76
# surviving to 1 year	89	97	97	115	62
# of SSP-recommended births	110	117	84	78	51
# of non-recommended births	0	0	30	58	25
SSP animal deaths	47	37	41	39	43
SSP animal imports	1	1	0	0	1
SSP animal exports	0	0	3	0	0
Founders w/ SSP descendants	31	32	32	32	33

variability most likely reflects a long history of inbreeding; however, it may represent a lack of diversity among founder animals.

DNA FINGERPRINTING

Two pilot studies were begun to assess the applicability of DNA fingerprinting to determine pedigrees in addax. In the first study, John Patton of Washington University evaluated DNA samples from two addax herds, Fossil Rim (Glen Rose, Texas) and St. Louis. Results showed a moderate amount of variability within these herds, and major dissimilarity between them. The second study, conducted by James Jacobson of the University of Houston, looked at samples from three animals at Fossil Rim. DNA fingerprints of these animals showed similar patterns for two individuals, thought to be sire and offspring. These patterns were dissimilar from that of the third individual, thought to be unrelated to the other two. These studies suggest that DNA fingerprinting is a valuable adjunct to other methods used to reconstruct SSP addax pedigrees.

MITOCHONDRIAL DNA (MTDNA)

Over a 3-year period, research was conducted on the semi-free-ranging herd at Fossil Rim Wildlife Center by Ed Spevak* of Fossil Rim and the Bronx Zoo. These studies focused on genetic variability at the Major Histocompatibility Complex locus DR-3, variation within the D-loop of mtDNA, and paternity analysis through evaluation of microsatellites and behavior. Spevak examined 174 individuals; 111 from Fossil Rim and 63 from other institutions. Among the animals sampled, seven alleles were found for DR-3. This compares with nine alleles found in a sample of 39 scimitar-horned oryx (Spevak, unpub. data) and over 30 alleles which have been identified in domestic cattle (Van Eijk et al., 1993). Evaluation of the frequency of occurrence of these alleles in different herds awaits further sampling of the SSP population.

Interestingly, the Fossil Rim herd appears to be significantly more heterozygous than other herds examined. It may be that addax in a multi-male/multi-female social group select mates that are genetically different from themselves and therefore, maintain a higher level of heterozygosity than animals in tra-

ditional captive breeding schemes that utilize only one male at a time (Potts and Wakeland, 1990). Future analyses will attempt to determine the effect of male genotype on reproductive success. The DR-3 locus in addax, even with its lower levels of variability, is also useful in resolving questions of paternity and pedigree analysis (Spevak, unpub. data).

Maternal inheritance and its lack of recombination, make mtDNA a particularly effective marker for: tracing maternal genealogy; determining recent evolutionary history, including colonization or founder events and introductions into existing populations; and documenting population bottlenecks (Harrison, 1989). Laboratory analysis of the variation in the D-loop of the mtDNA of the Fossil Rim addax was conducted. Since mtDNA is only inherited from the dam, it is valuable for examination of the number of surviving female lineages. Currently, it is possible to identify lineages that originated either in Khartoum (1930s importation) or Chad (1960s importation; Spevak unpub. data). Future studies will provide critical information for improving equalized representation of those lines within the population.

Paternity analysis of the microsatellite regions of the addax genome has begun. This study will look at segregation patterns of a number of microsatellites and establish relationships between individuals by the presence or absence of different alleles. This should permit evaluation of "close-order" familial relationships (e.g., parent-offspring, full-sib), and will permit determination of paternity and maternity within certain herds. This technique is most useful in multi-male/multi-female herds or herds with poor historical information.

BEHAVIOR

Because diminished numbers of addax remain in the wild, and their native habitat is inaccessible, little is known about their natural behavior. Studies of addax behavior have been limited to small groups held in relatively small areas (Mackler, 1984; Manski, 1979, 1982; Rice, 1974). A better understanding of behavioral patterns is important, both to provide more effective management of these animals in captivity, and to evaluate the success of future reintroduction programs. A multi-year study of behavior in a large, semi-free-ranging herd was initiated by Ed Spevak in 1990. This study evaluates two different groups of addax held at Fossil

Rim, a large (60-70 animals) mixed herd with multiple males and a bachelor herd of 10-12 animals. This study, integrated with Spevak's genetics study, will help elucidate the basic behavioral repertoire of addax, male and female reproductive success, mating strategies, and social structure.

REPRODUCTIVE PHYSIOLOGY

The SSP addax herd is genetically compromised (Correll, 1990). A gene drop analysis reveals a Founder Genome Equivalent of only 3.8 individuals (Lacy, 1989). Traditional methods for adding genetic material to a captive population, such as importation of new founder animals from the wild, cannot realistically be considered for addax. Removal of addax from the wild would potentially harm dismally small and fragmented populations. Also, the animals that do remain in the wild are in remote areas where capture is nearly impossible.

The problem of a low number of founder equivalents was discussed at the Captive Breeding Specialist Group (CBSG) World Conference on Aridland Antelope (Seal et al., 1989). The CBSG concluded that the future success of international captive breeding programs for addax relied, in part, on the development of gamete/embryo collection and cryopreservation techniques to facilitate the transfer of genetic material between subpopulations and to allow the incorporation of greater genetic diversity into the captive population as a whole.

A collaborative effort has formed to develop assisted reproductive technology in addax. Initial trials at Fossil Rim, Texas A&M University, and Omaha's Henry Doorly Zoo resulted in more than 30 attempts to collect embryos. Several methods of estrus synchronization and superovulation have been attempted. Non-surgical techniques for uterine flushing and collection of ova and embryos from several individuals have been successful. Review of data generated by these studies indicates that it is difficult to synchronize the estrus cycle of the females. In addition, addax females appear to have a longer than expected estrus cycle.

St. Louis Zoo has initiated follow-up studies, using progesterone implants to modify the synchronization protocol developed in the initial studies. Trials followed endocrinological changes in response to a modified synchronization protocol (35-day, time-release progesterone implants). Several animals were followed through pregnancy

* NB Ed Spevak^{ASQ} submitted an article for *Gnusletter*, "MHC genetics, fitness, and antelope conservation," which includes an account of the research reported here by Terrie Correll. His article will appear in the next *Gnusletter*.

with ultra-sound imaging and hormonal profiles. Currently, activity telemetry is being used to correlate with estrus and parturition, and temperature telemetry is being correlated with progesterone which is elevated during the luteal phase of the cycle and during pregnancy.

The information gained from these studies should help clarify pedigrees within the Addax SSP population. Consequently, they will allow us to examine how animals have moved throughout the captive population, and to determine relationships between herds and individuals. In addition, protocols developed through reproductive physiological research will enable the SSP to recruit additional founders. This will be important information in managing the SSP population for maximum genetic diversity.

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Antwerp Antelope Working Group GCAP

Report by Jelle Boef, Postjesweg 111-3e
1057 DZ Amsterdam Holland.

From September 3-5, 1993 the Captive Breeding Specialist Group (CBSG) held its annual conference at the Antwerp zoo. An Antelope Working Group was scheduled to review progress made to date with formulating captive-breeding policies for Antilopinae and developing a Global Captive Action Plan (GCAP) on the basis of the recently completed Conservation Assessment and Management Plan (CAMP) document. ASG Chairman, Dick Estes, who was unable to attend the meetings, invited another ASG member, Mr. Jelle Boef, who would attend the CBSG conference, to represent the ASG and report back to the ASG.

Dr. Karen Sausman, the CBSG Antelope Working Group chair, fell ill quite unexpectedly and it proved impossible to find a replacement at short notice. However, an impromptu meeting was convened at the request of several conference delegates with an interest in antelope captive-breeding—conservation and Dr. James M. Dolan, (San Diego Zoo and WAP) agreed to take on duties as chairman.

In preparation for the meeting, [Boef] revised CAMP sheets for Arabian antelopes, incorporating the latest available data on their status with the intention to present these for plenary discussions. The revised CAMP sheets were drawn up to ensure decisions made with regard to Arabian and other Antilopinae would reflect their wild status, while also promoting closer liaison and collaborative management of both captive and wild populations as advocated by CBSG. At the Antelope Working Group meeting these sheets were handed to Dr. Frank Rietkerk (ex-KKWRC) [King Khalid Wildlife Research Centre], Mr. Bill Flavell (KKWRC laboratory manager) and Dr. Marc Ancrenaz (NWRC) for examination and approved the documents followed recommendations made at the NCWCD November 1992 workshop and incorporated additional data from other GCC nations not available before.

The CAMP sheets for Arabian Antilopinae taxa were duly presented to acting chair Dr. James M. Dolan to be forwarded to Karen Sausman for inclusion into the final CAMP-GCAP.

In addition, a strong representation from individuals involved in gazelle conservation and captive-breeding in the Arabian Peninsula allowed an important initiative linking both disciplines to be highlighted at the Antwerp conference.

At the NCWCD [National Commission for Wildlife Conservation and Development of Saudi Arabia] workshop on gazelle conservation in November 1992, gazelles from Yemen were identified to be of specific interest to gazelle conservation. The Yemen is a biologically diverse nation representative of every habitat type to be encountered in the arid Arabian region with some remarkable Oriental and Palaearctic faunal elements. The degree of endemism is particularly high.

With regard to gazelle taxa highly at risk, both *G.bilkis* and *G.saudiya* may yet remain, while both *G. gazella* and *G. subgutturosa marica* have been demonstrated to still occur in the less densely populated regions of Yemen. *G.bilkis* has not been reported since its discovery in 1951 by Sanborn & Hoogstraal and its current status in the Yemen needs to be looked at most urgently, in particular its relationship to *G.gazella erlangeri*.

THE YEMEN GAZELLE SURVEY

A collaborative effort has been proposed between Sana'a University and the National Wildlife Research Center, Taif, Saudi Arabia that will survey gazelle distribution and status in Yemen and identify sites of particular interest for individual taxa. The aim is to recommend conservation measures on completion of the survey to the appropriate authorities, and in a follow-up project to plan protected areas for gazelles and other wildlife and initiate a captive-breeding program in-country. Genetic and taxonomic analysis will be attempted when the opportunity arises. Efforts are afoot to involve King Khalid Wildlife Research Center, the foremost gazelle research and conservation establishment in the region.

The briefing book accompanying the CBSG conference had included an outline on the proposed project and Jelle Boef informed the 30-odd delegates who had gathered for the AWG meeting on progress to date. His presentation introduced AWG delegates not previously acquainted with a project inter-linking conservation and captive-breeding and was pleased to note approval among several delegates present.

Miscellaneous

Other issues discussed briefly at the meeting concerned a serious wildlife disease with major implications for Antilopinae management and inquiries from the Antwerp zoo director, Dr. Martin van Puyenbroeck, on the subspecific status of the Arabian gazelle in his care at Planckendaal, the zoo outstation. Since Dr. Karen Sausman, the principal investigator in the Antelope GCAP, could not attend, Dr. James Dolan deemed it impossible to conduct more discussions on the Antelope GCAP and dissolved the AWG accordingly.

ARABIAN PENINSULA CAPTIVE BREEDING GROUP

The APCBG has been established to promote active cooperation among different zoos and captive breeding programs in the region. Specific goals for the group include: 1) cooperative captive breeding programs, 2) re-introduction programs, 3) personal training and educational programs, 4) contribution to research programs on Arabian fauna, 5) other activities that may contribute to conservation of Arabian taxa and habitats. Prime focus is development of a Regional Action Plan in close collaboration with other national and international conservation societies. The working party for this initiative is Al-Areen Wildlife Park, Dubai Zoo and NCWCD in Saudi (CBSG News, Vol 3,1).

Dr. Reza Khan (Dubai Zoo, United Arab Emirates), APCBG Chairman, held an informative talk during the Antwerp CBSG conference on recent developments in zoos and wildlife parks within the region. He highlighted two major events that took place inside the region over 1992-1993. Kuwait Zoo, which had been completely overrun and lost most of its animal inventory, has been fully rehabilitated thanks to assistance from other GCC nations and staff from London Zoo. Moreover, he mentioned [that] the workshop for gazelle conservation convened by the Saudi National Commission for Wildlife Conservation and Development had provided a framework to develop initiatives aimed at regional cooperation in wildlife conservation issues, their captive-breeding and re-introduction.

AL AREEN ARABIAN FAUNA CONSERVATION SLIDE SHOW

A major event for CBSG antelope specialists at the Antwerp conference will surely have been the slide show presentation or-

ganised by Al-Areen Wildlife Park's Curator of Mammals, Mr. Ali Mohanna Mubarak al-Dosary, on its captive-breeding and conservation program. The Al-Areen Wildlife Park was established with the specific aim to breed rare and endangered fauna from the Arabian Peninsula and promote their rehabilitation in the entire region. Prime focus has been on intensive management of Arabian oryx (*Oryx leucoryx*), Nubian ibex (*Capra ibex nubiana*) and selected gazelle taxa. Currently, 17 gazelle taxa are maintained and bred, including native Sand gazelle (*G. subgutturosa marica*), mountain gazelle (*G. gazella cora*) from Oman and the highly endangered Saudi gazelle (*G. saudiya*), for which a regional breeding program is a high priority.

Al-Areen's intensive management of gazelle species has enabled staff to conduct valuable research into Antilopinae. Studies in progress include the ecology of wild sand gazelle with Bahrain University (Dr. Saeed A. Mohamed) and semen collection and preservation in Arabian oryx in collaboration with the Institute of Zoology, London.

It is hoped their close collaboration with the Saudi National Commission for Wildlife Conservation and Development and its research out-stations at Thumamah and Taif will stimulate more initiatives for basic gazelle research to be implemented for the region's endangered gazelle fauna.

Mubarak al-Dosary's talk signified Al-Areen Wildlife Park's strong commitment to conservation of Arabian Antilopinae and other related fauna (e. g. addax *Addax nasomaculatus* and scimitar-horned oryx *Oryx damah*) and offered their full cooperation with any planned or proposed reintroduction schemes using captive-bred individuals from al-Areen's programs. For further information contact Mr. Ali Mohanna Mubarak al-Dosary, P.O. Box 28690, Bahrain.

Antelope TAG Meeting in Oklahoma City

by Scott Carter

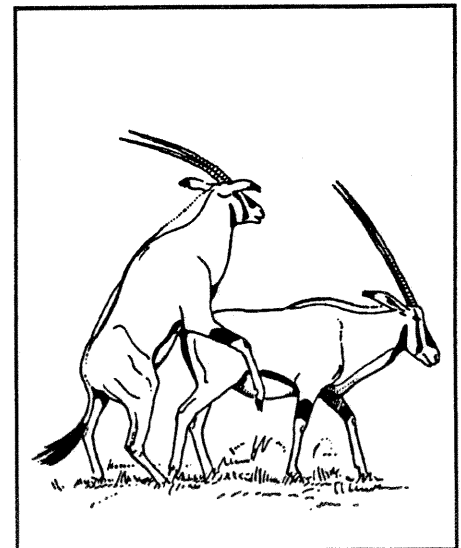
Detroit Zoological Park, POB 39, Royal Oak, MI 48068-0039, USA

The Antelope Taxon Advisory Group of the American Zoo and Aquarium Association (AZA) met during the AZA Central Regional Conference in Oklahoma City on 4-5 March 1994. Taxon Advisory Groups (TAGs) function primarily to optimize the

utilization of space in captivity that is available for the conservation of a taxonomic group, usually a family or order. This is accomplished through the development of Regional Collection Plans. These plans are based on several considerations surrounding the various taxa of a taxonomic group, such as the need for conservation, available space in captivity, viability of existing captive populations, availability of additional founders, husbandry/research needs or problems, and the ability of a captive population to effect a positive impact on in situ conservation through propagation efforts or public education programs.

The Antelope TAG was formed in 1990 and is currently in the process of developing a Regional Collection Plan. One of the goals of the meeting in Oklahoma City was to finalize the criteria by which the many taxa of antelopes are evaluated for inclusion in the Regional Collection Plan. The criteria include status of wild populations, status and viability of captive populations, educational value, institutional interest, and husbandry needs.

Using the above criteria on several taxa of antelopes currently in captivity, the evaluation process was given a test-run at the TAG meeting. This process allowed TAG members to discuss and fine-tune the criteria and to examine the overall effectiveness of the evaluation process. Like other dynamic processes, it is anticipated that the selection process will continually evolve as more information becomes available, particularly information regarding trends of wild populations and their habitats.



Regional Rundown

NIGERIA

Biodiversity in the Niger Delta

By C. B. Powell

Biodiversity Unit, Institute of Pollution Studies, Rivers State University of Science and Technology, PMB 5080, Port Harcourt, Nigeria

The following letter, addressed to "Simon Stuart or alternative" at IUCN HQ (10 Oct 93) was copied to the chairmen of the various listed taxa. It is wonderful in both senses of the word that so much of Nigeria's profoundly depleted flora and fauna has survived in this watery wilderness.

Specialist Group collaboration on Niger Delta swamp forest/mangrove biota

This letter is a follow-up to a message I hope you received from elephant-man Dr. Chris Thouless, who visited here in mid-August. He was to ask your help in contacting specialist-group members who might want information and specimens, etc. from the Niger Delta.

The Delta fauna is poorly collected/documented, as shown by Thouless's 'discovery' of unrecorded elephants and mine of red colobus not previously recorded from Nigeria. Hunters' accounts suggest the Delta forests contain an assemblage of high-forest taxa otherwise known only from Upper Guinea and Cameroon eastwards.

Another point of interest is that the Delta is part of the purported boundary between subspecies of many mammals.

The groups which seem most promising or interesting for study are:

Primates: colobus monkeys (probably to be studied by John Oates); chimps.

Pangolins.

'Squirrels': anomalurids and high-forest squirrels.

Genets & 'otters': the Benin genet; several 'otters' (up to 4 otter-like animals according to local names, no specimens seen yet).

Cats: maybe the golden cat, not recorded in Happold (1987).

Manatee: apparently good population.

Pygmy hippo: certainly still present (ample local accounts but no specimen); the prime site for it is slated for an EEC-sponsored swamp drainage scheme for lowland oilpalm plantations.*

Hippopotamus: a coastal form, living in beach-ridge swamps and seen wandering on sea beaches. I can't find any reference to such an ecology for hippos; could it be something new?

Pigs: perhaps the giant forest hog.

Antelopes: Jentink's duiker(?), zebra duiker(?) A few interesting stories, perhaps mistaken but worth pursuing.

Crocodiles: including slender-snouted; there are several 'sacred crocodile' lakes, etc.

Monitor lizards: the two 'subspecies' of *Varanus niloticus* co-occur.

Turtles: especially side-necked turtles and tortoises.

Assorted invertebrates: including achatinid snails and Indo-Pacific exotics (sea-urchin *Temnopleurus*, prawn).

This is not to say we here are interested only in the above groups. Far from it! We are planning towards field bases within the Delta, from where systematic collections of almost any group could be obtained, if there is someone ready to give guidance and-or work up the material. As anyone familiar with Nigeria since 1980 will understand, our biggest problem is literature and communication.

I myself am thinking in terms of cooperating with individual specialists. In case of organizations and associated red tape, links could be made with the federal Natural Resources Conservation Council¹ (recently merged with the Federal Environmental Protection Agency), for whom I have been doing a survey which produced the red colobius; or this Unit/University; or the Niger Delta Wetlands Foundation² (a local NGO organized by academics with strong grassroots connections and long experience in the Niger Delta).

¹ PMB 0176-Garki, Abuja FCT, Nigeria

² P. O. Box 7390, Port Harcourt, Nigeria; attn Prof. T. T. Isoun and Dr. Miriam Isoun.

*Readers are referred to an article on the livestock fences of Botswana in *Gnusletter* 10.2&3 for another example of the EEC's penchant for funding projects that speed the destruction of Africa's remaining natural areas and wildlife.

SUDAN

A Hopeful Research and Conservation Initiative

Ibrahim M. Hashim, Director of the Wildlife Research Centre, P. O. Box 16, El Mourada, Omdurman, submitted a proposal to the WWF Regional Office for Eastern Africa last December, entitled "Abundance and distribution of Soemmering's gazelle (*Gazella soemmeringii*)". He was turned down because, as Jean-Pierre d'Huart, Regional Representative, told him (in. litt. 21 Dec 93), "Unfortunately, we are not in a position to fund this project in a foreseeable future, since our immediate conservation efforts are focused on different priorities. But, in order not to leave you with this sad note," he told Dr. Hashim he was forwarding copies of the proposal to "two organizations whose activities are much closer to your proposed research": NYZS The Wildlife Conservation Society and the ASG.

A sad note is right. What conservation efforts are of more immediate importance and deserve higher priority, I wonder, than a conservation project in the Sudan? Here we have the largest country with the most significant and diverse migratory herbivore populations left in Africa (notably white-eared kob and tiang), where civil war and authoritarian rule have resulted in a near-total breakdown of wildlife conservation since the early 1980s. Now along comes this Sudanese conservationist, with a PhD in wildlife science and range management (New Mexico State University, 1984), and asks for only \$15,000 to fund a two-year effort to bring back a formerly abundant gazelle from the edge of extinction. The main part of Hashim's proposal is presented here, in hopes that some other international conservation organization or government agency will seize the opportunity to begin reviving wildlife conservation in Sudan.

II. Project Description

1. OBJECTIVES:

a. To determine the numbers and distribution of Soemmering's gazelle in eastern Sudan.

b. To develop a management plan for conserving Soemmering's gazelle.

2. Background and Justification

Soemmering's gazelle is a large gazelle, weighing about 45 kg; the female is similar to the male, but with thinner horns (Dorst and Dandelot, 1970). The habitat of the gazelle is mainly bush and acacia scrub in hilly country (Dorst and Dandelot, 1970; MacKenzie, 1954). The gazelle lives in small herds and sometimes congregates in large herds up to 100 animals or more, and they migrate seasonally, seeking the best pasture.

Soemmering's gazelle occurs in the eastern part of Sudan, beyond Atbra River, and in the southeastern part in the vicinity of Dinder and Rahad rivers (Fig. 1 [map, not included here]). Thousands of these gazelles were reported in Dinder National Park (Harrison, 1905). Nimir (1983) cited Forbes (1950) and Mason (1924) who noted that Soemmering's gazelle was very common in Dinder NP and around Erief el Dik, 30 km north of the park.

Soemmering's gazelle moves seasonally between the breeding habitat in eastern Sudan and the dry-season habitat in Dinder NP. The ... Park is characterized by the presence of mayas (meadows) that support large populations of wildlife during the dry season, including Soemmering's gazelle (Holsworth 1968, Dasmann 1972, Hashim 1987a, 1987b, Abdel Hameed 1980, 1985, Awad, 1985). Like many migratory wild animals, Soemmering's gazelle makes seasonal movements between Dinder National Park and Butan plains (Fig. 1).

Numerous agricultural schemes have been demarcated along the migratory route of Soemmering's gazelle, so it was heavily poached during its seasonal movement. Poaching also extended to the wet-season breeding habitat in Butana. This resulted in the disappearance of the gazelle both from the Dinder NP and Butana Plains. The last 12 gazelles were reported in the Dinder NP by Dasmann (1972).

Recently, scant information was available that pockets of Soemmering's gazelle still existed in scattered forests in eastern Sudan. A survey is therefore needed to confirm this information so a management plan for conserving the gazelle may be developed. This survey requires the maintenance of two 4WD vehicles available with the Wildlife Research Centre.

3. Activity and Timetable

This study is expected to be completed within two years. During the first year, an ex-

tensive survey will be made, using questionnaires about the distribution of Soemmering's gazelle in eastern Sudan. Habitats where this species is expected to exist will be surveyed for confirmation, and a progress report will be written.

During the second year, an intensive survey will be made, covering all habitats in which the Soemmering's gazelle is confirmed; their numbers will be estimated and the extent of their seasonal movement will be assessed. Activities and timetable should be as follows:

- August 1994. Preparation for the trip will be completed, including the maintenance of the two vehicles.
- January 1995. The extensive survey will be conducted during the dry season, which extends from December to June.
- January 1996. An intensive survey will be made both during the dry season and the wet season.

The survey will be led by Dr. Ibrahim M. Hashim in collaboration with the anti-poaching unit of the Wildlife Administration, unless donors think otherwise.

4. Output

A management plan for conserving Soemmering's gazelle will be developed, and possible factors threatening its survival will be mitigated.

Mitigation measures should include the conservation of the remaining habitats with emphasis on the sustainable utilization of the resources in these habitats. Education programmes will be given high priorities. Attempts would be made to allow migratory corridors of Soemmering's gazelle through the agricultural schemes.

5. Expected Follow-Up

Quarterly reports should be circulated to donors and institutions concerned. Visits (or leadership) are encouraged from donors.

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III. Marginal Aspects of the Project

1. BUDGET:

- 01) Salaries: to be paid by the government.
- 02) Daily paid assistants, labourers, guides: to be paid by the Wildlife Research Centre.
- 03) Consultants: may be paid by the donors
- 04) Travel and subsistence, £s 500,000.
- 05) Maintenance of 2 vehicles, £s 2,000,000.
- 06) Capital equipment: available with the Wildlife Research Centre.
- 07) Project running expenses: computer £s 1,750,000.
- 08) Education, training £s 1,000,000.
- 09) Printing, publication and distribution: To be paid by the Wildlife Research Centre.

Total £s 5,250,000 (US\$15,000)

Dinder National Park

Khusal Habibi^{ASG} was in the Sudan at the beginning of the year to prepare a project document for possible UNDP/Global Environmental Fund support for biodiversity conservation and management of the Dinder NP. If these two projects could be combined, clearly the benefits for the park and any remaining Soemmering's gazelles would be greatly enhanced. Here is Dr. Habibi's report:

The 8960 km² Dinder National Park in Sudan is the only refuge for a number of an-

The status of antelopes in Dinder National Park.

Soemmering's gazelle	<i>Gazella soemmeringii</i>	Extinct
Red-fronted gazelle	<i>Gazella ruffronds</i>	Rare
Bushbuck	<i>Tragelaphus scriptus</i>	Rare
Greater kudu	<i>Tragelaphus strepsiceros</i>	Rare
Tiang	<i>Damaliscus lunatus tiang</i>	Rare
Oribi	<i>Ourebia ouribi</i>	Common
Reedbuck	<i>Redunca redunca</i>	Common
Roan antelope	<i>Hippotragus equinus</i>	Common
Waterbuck	<i>Kobus ellipsiprymnus</i>	Common

elope species in northern Africa surviving in an area surrounded by agricultural development, overgrazing, and a high influx of settlers who have come to the area to escape the ravages of continuous droughts and civil war. Vegetation of the park is composed of savanna grasslands, woodlots, and riverine forests along the drainages of the Dinder and Rahad rivers. Numerous wetlands which are formed by meanders and oxbows along the banks of the rivers provide the most nutritious food to the antelopes. Of particular importance are the perennial grasses which are a source of high quality food during the most severe part of the dry season.

Of the nine species of antelopes known from Dinder, the Soemmering's gazelle is believed to be extinct in the area. It was common in the 1960s but numbers decreased drastically due to vast expansion of mechanized agriculture in its wet-season habitats outside the park. A decrease in the number of tiang and waterbuck during the mid-1970s was also attributed to the shrinking of wet-season habitats and competition with livestock. The addition of approximately 2500 km² to the park in 1982 somewhat improved the situation.

Despite these setbacks, there are healthy populations of oribi, reedbuck, roan antelope, and waterbuck in the park. It is not uncommon to see dozens of these animals while driving through the park.

The Sudan Environment Conservation Society and the Wildlife Research Center have been instrumental in conducting research on the biology of the animals and the revitalization of the wetlands, despite a severe lack of funds. It is hoped that, with the assistance of international conservation agencies, funds will be made available to foster the park's management and speed up rehabilitation of its habitats. The park is not only important and vital to the survival of a large number of

wildlife species, but use of its resources on a sustainable basis is also crucial to the subsistence of the local communities.

SOMALIA

Observations and Trends in Wildlife Dynamics in the Sanag Region of Northern Somalia

By **Mohamud Ahmed Ayan**,
Executive Director

Somali Development and Relief Agency,
P. O. Box 2244, Djibouti, Republic of Djibouti

1. Introduction

In the period November, 1993 to February, 1994, the Executive Director of SDRA conducted a general and preliminary investigation of the wildlife resources of the Sanag Region of Northern Somalia. This was done in conjunction with relief and rehabilitation activities implemented by SDRA in the region. This report summarizes the findings and trends in wildlife resources of the area, and makes recommendations on future wildlife conservation efforts in the area, including the need for further surveys and/or investigations.

2. Methodology

Prior to initiating the field work, limited literature survey on the wildlife resources of the area was conducted in Djibouti, where the international office of SDRA is located. Since most of the literature on resources of Somalia was destroyed in the war, very few sources were available to the author. The works of Stevensen (1980) and Hunt (1947) were found most relevant and useful for the survey.

This was followed by actual field work. In

the field inquiries were made with local inhabitants who were asked to describe the location, types, and numbers of wild animals they have come across in the past two years or even in more recent times. They were then asked whether they felt that wildlife numbers have increased or decreased in recent times. The interviews were conducted at different villages to give a much larger sample. Following these interviews, several areas were selected for actual field visits and for more intensive observations.

Visits to the areas selected were done with the help of several interested and knowledgeable local people. A professional photographer to record on video any wildlife spotted also accompanied the mission.

In each area visited the number and species of animals observed were recorded and filmed. The ecology and the land use of the area were also described. The visible characteristics of the animals were also noted. Shyness of the animals toward people and vehicles was noted, while general physical condition of the animals was also noted. These findings were assembled on data sheets used to develop this report.

3. Description of the Sanag Region

The Sanag region covers an area of 55,906 km² and lies between latitude 9° and 11° 20' N, and longitude 45°S and 49° E. The region has three distinct topographical features: The coastal plain, the mountain chain, and the Ogo Plateau. The climate of the area is hot and arid, with temperatures varying from over 35°C in the coastal areas to between 10° and 18°C in the mountains. Rainfall varies from less than 100 mm at the coast to nearly 800 mm in parts of the mountain areas.

The flora and fauna of the area is influenced by several factors including physical features, climate, and intensity of land use. Natural vegetation is dominated by dwarf shrubs and bushes with a large number of species and subspecies including numerous endemics. Wildlife resources of the area traditionally comprised a variety of species, some of them endemic to the area. However with proliferation of firearms in the area in the last two decades, the number of wild animals has decreased substantially.

4. Summary of Results of Interviews with the Local People

Most of the people interviewed felt that wildlife resources of the area have suffered tremendously in the past decade due largely

Table 1. Animals reported to be present in the area by the local people.

Species	# People reporting	Area Seen	Mean # reported	Decreasing (-) Increasing (+)	Remarks
Spotted hyena	Many	All over the region	1-5	+	Stock predator, increasing due to lack of poison, drugs
Striped hyena	Many	Coastal areas	1-2	+	Stock predator
Foxes	Many	All over		+	
Leopards	Very few	Mountain	1-2	+	Stock Predator
Speke's gazelle	Many	Ogo Plains & coast	2-50	+	Range expanding
Beira antelope	Very few	Mountain areas	2-4	?	Range little known
Ostrich	Very few	Ogo Plains	6	+	Killed for medicinal purposes
Gerenuk	Very few	Ogo Plains	2	+	Meat not consumed
Cheetah	Many	Ogo Plains	1-5	+	Young one reported
Baboons	Many	Mountains and coast	20-60	+	
Jackals	Many	Everywhere	2-4	+	Stock predator

Table 2. Wildlife species spotted by the author during the trip.

Species Local Name	Common name	Areas seen	Numbers	Remarks
Beira	Beira	Mountains with sparse cover	5	Extremely shy; video records made
Dero	Speke's gazelle	Coast, Ogo Plains	2-60	Extremely shy
Gududane	Caracal	Ogo Plains	2	Seen only at night
Haramad	Cheetah	Ogo Plains	2	One a juvenile
Dhurwa	Spotted hyena	Everywhere	2	Many complaints about its predatory behavior
Dhidar	Striped hyena	Coast	2	Very often seen on out skirts of villages
Shimbiro	Birds	Coast and mountain	Many	Variety seen but species not identified
Gorayo	Ostriches	Ogo Plains	Eggs	Nest found in likely ostrich habitat
Dayeer	Baboon	Everywhere	Many	
Dofar	Warthog	Everywhere	Numerous	
Sayoro	Dik-dik	[Widespread]	Numerous	High survival capacity

to the increase in firearms. The primary motive which caused the killing of animals was to test gun capability and shooting ability of the gun holder, and not to get animal meat. The use of game meat is not very popular as people have access to meat from domestic animals which are found in large numbers in the area. The

use of automatic weapons resulted in the elimination of large herds in a very short period. [Emphasis added. Further comment unprintable. Ed]

Despite these drastic reductions in wildlife numbers in the past decade, most of the people interviewed felt that wildlife numbers and variability is again improving thanks to

recent trends in the area which shows a growing dislike for guns. As hostilities between tribes is decreasing, carrying guns is not very popular in the area at present.

The major problems highlighted by the local people were deterioration in vital habitats and increase in competition with domestic livestock. Clearing of bush lands to produce charcoal for export is destroying breeding grounds of wildlife. Lack of shelter exposes animals and their offspring to potential predators including humans.

Recommendations

1. Most of the people reported that despite a drastic reduction in game numbers in the past, there are indications that wildlife is increasing gradually in the area. This is probably due to less intense poaching than in the past. It is therefore recommended that conservation effort should build upon this positive trend.
2. A more comprehensive survey to map the territories of the beira antelope and to know more about the animal is recommended.
3. The work of experienced wildlife specialists will be much needed to conduct more professional surveys of the wildlife resources of the area and to identify species.

KENYA

The Drought of '93 in the Masai Mara

Dr. Holly Dublin^{ASG}, Project Ecologist of the Friends of Conservation/WWF Masai Mara Ecological Monitoring Programme, sent a copy of her November 1993 report on the effects of the recent drought, "A dry season total count of elephant and buffalo in the Masai Mara National Reserve and adjacent pasture lands." In a fax memo (14 Dec 93), responding to the call in the last *Gnusletter* for contributions from ASG members, she gave this account of topi mortality during the drought.

Believe it or not, the ASG has been on my mind of late, especially after flying a dry-season count in the Mara late last month. I am still completing the photo count analysis but this is by far and away the worst drought I have seen in the Mara during the 13 years since I began work there. It puts the 1984 dry period to shame. In fact, we first alerted the authorities to the die-off earlier in

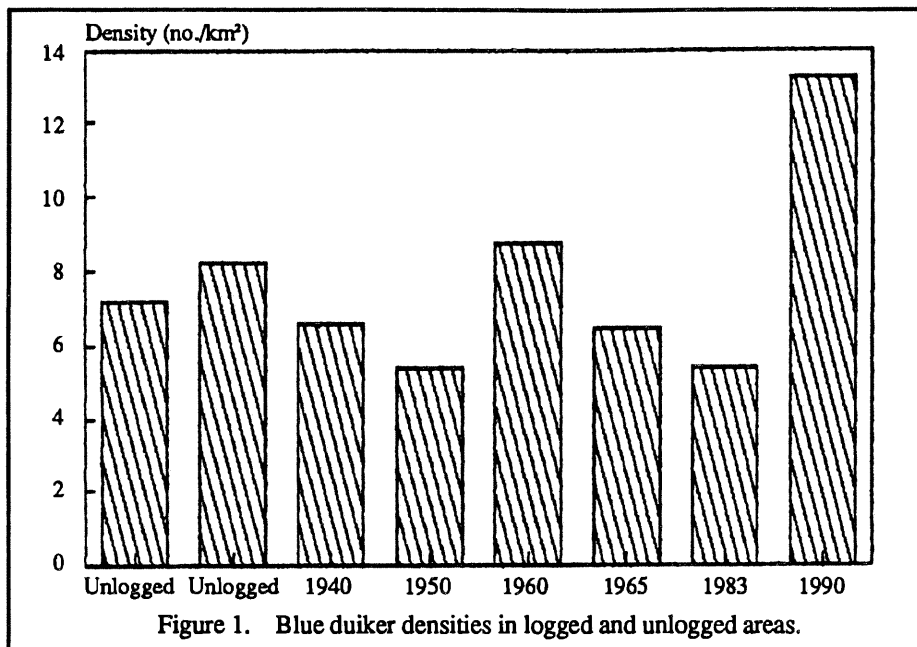


Figure 1. Blue duiker densities in logged and unlogged areas.

the dry season and the Kenya Wildlife Service vets were summoned to the Mara to test some of the buffalo who appeared to be 'dropping over dead.' No pathogens were isolated and it was decided that they were just in very poor condition due to food shortage. Recently, during our routine aerial total count, we saw literally dozens and dozens of buffalo carcasses. I also saw dead waterbuck, topi, and giraffe from the air. Dead elephants have been reported as well. I will not be able to substantiate the buffalo losses until the results are fully analysed and, perhaps, not even before I get the chance to fly again in the next wet season. We most clearly saw the effects of the 1984 failed rains in the rainy season of 1985. I will get back to you to let you know the outcome of the recent aerial survey.

On the ground, I noted a couple of other interesting things. The topi appear to have virtually lost all of the 1993 calf crop which were born in September/October. This may be true for other herbivores as well but should become clear when we get through with the analysis of our monthly age and sex counts. Adult buffalo, bulls and cows, were literally being bowled over by lions everywhere. The tourists were in seventh heaven—multiple kills per day. In fact, one evening we landed and as we were backtracking down the runway at Keekorok, we watched as 16 lions (from young to old) practised hunting techniques on an old lone bull buff. With lion cubs hanging off him, lit-

erally, in all manner of positions (like a bad Gary Larson cartoon), he ambled off into the bushes looking none the worse for wear... survival of the surplus taking precedence over survival of the fittest!

In the above-mentioned report, Holly notes that the total count of 6590 buffalos is the lowest ever recorded, nearly 50% below the 1992 dry-season count. The severity of the drought can be judged by comparing mean monthly rainfall figures with the 1993 totals, in the following table. Serengeti NP and Ngorongoro Crater suffered through the same drought.

Month	'89-'92	'93
Jan	88.79	110.49
Feb	120.66	121.44
Mar	108.51	68.54
Apr	136.75	56.74
May	126.36	68.16
Jun	78.67	93.25
Jul	36.95	6.07
Aug	56.66	40.01
Sep	52.91	16.93
Oct	72.98	33.25
Nov	50.27	20.61
Dec	114.42	45.5

Mean rainfall (mm) in the Masai Mara, from Dublin's report on the 1993 drought.

UGANDA

The effects of long-term selective logging on blue duikers in the Budongo Forest Reserve

By Andrew Plumtre

The Budongo Forest Reserve is a semideciduous tropical moist forest located on the edge of the Rift Valley in western Uganda. Budongo has been harvested for timber on a sustainable-yield basis since the mid 1920s, with four species of mahogany (*Khaya anthotheca*, *Entandrophragma cylindricum*, *E. angolense*, and *E. utile*) forming the bulk of the wood extracted. Diameter limits of 1.1 m were initially used to ensure that only the oldest trees were removed and these have been reduced to 80 cm for the second crop of trees. Detailed records exist describing the management operations conducted, the volume of timber removed, and arboricide treatments which aimed to open the canopy and encourage the regeneration of the light-demanding mahoganies.

Egging (1947) described the forest types that occur in Budongo and suggested that they followed a successional sequence from colonising forest, found at the edge of the forest block; to a mixed-species forest, where the mahoganies occur; and finally to *Cynometra* forest where the "ironwood", *Cynometra alexandrii* dominates the canopy. A recognisable ecotone exists between these last two forest types called *Cynometra-mixed* forest. The arboricide treatment (using "agent orange") was successful in reducing the amount of *Cynometra* and *Cynometra-mixed* forest types and increasing the amount of mixed forest (Plumtre and Reynolds in press). Finally, swamp forest occurs in the valleys along streams.

Studies at the Budongo Forest Project have been investigating the effects of this long-term selective logging on the primates and have shown that most of the primates have benefitted from the forest management (Plumtre and Reynolds in press). Whilst censusing the primates, I took the opportunity to census other species including the blue duiker (*Cephalophus monticola*). Standard line transect techniques were used (Buckland et al. 1993), fitting the Hazard Rate curve to the perpendicular distance data,

to census this species in eight areas of the forest. These areas were chosen to provide areas logged at approximately 10-year intervals since 1940 to the present and two unlogged areas. In each area repeated censuses were carried out on five transects each month over the period of a year totalling a distance walked of about 200 km for each area. The forest type was noted for each duiker sighting allowing the calculation of densities for each forest type also.

Figures 1 and 2 show the results obtained for the eight areas and the five forest types, respectively. The densities of blue duikers are not significantly different between any of the eight census areas logged at different times (Fig. 1). The densities in the different forest types do not differ either, although there seems to be a trend towards increasing density in the more mature forest (*Cynometra* and swamp forests). It would appear therefore that selective logging and arboricide treatment in Budongo has had little measurable impact on the blue duiker population.

Red duikers and bushbucks also occur in Budongo but sightings were too few to calculate a density.

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TANZANIA

Antelopes and the Selous Conservation Program

Ralph Baldus^{ASG}, who served from 1987-1993 as Coordinator of the Selous Conservation Programme funded by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), sent in a bunch of publications after returning to Germany last December (change of address under ASG News). Most of the 10 titles are in English, including two illustrated booklets, *Selous Game Reserve*, a Guide to the Northern Sector (no date), *People and Wildlife. Experiences from Tanzania*.

(1991, with H. Krischke, V. Lyamuya, and I. F. Ndunguru), and a bibliography of papers on the Selous Reserve (1994, with Neil Stronach).

Baldus was considerate enough to write a separate report for *Gnusletter* on the status of antelopes in the Selous. In addition, he wrote a brief history of the Selous. The history one is published here, as essential background; the one on antelopes will be published in the next issue.

Baldus and his associates have succeeded in bringing this most-important wilderness back from a poacher's happy hunting ground to what it had been under the management of Brian Nicholson, the famous warden who devoted 20 years of his life to creating and managing it. The policies that rescued the Selous are a model for conservation of African wildlife preserves, demonstrating that winning the support of the local people offers the only real hope for the future.

In his covering letter (2 Dec 93), Baldus offers this rationale for handing over the Selous Conservation Program:

"In my early days as a student of economics, I learnt that the marginal productivity of any additional input to production increases until it reaches a maximum. Thereafter it declines.

"Applying this to my work, I want to avoid decreasing productivity and instead make room for a new face after six years in the Selous Conservation Programme. I have enjoyed working in the Selous, and it is not easy to say farewell to many friends and colleagues. However, my departure is made easier knowing that the Selous Conservation Programme will continue with substantial new funding from the German Government."

Some Notes on the Selous Conservation Programme, Tanzania (1988-1993)

The Selous Game Reserve in Tanzania with a size of about 50,000 km², is one of the world's largest protected areas. At the same time it is also one of the last great stretches of unspoiled African wilderness, which is vanishing quickly. It also is a hunting reserve where classic big game safaris are still being organized.

Having suffered for two decades from an unprecedented wave of poaching, the reserve was recently rehabilitated with bilateral as-

sistance of the German Government. For the first time since the seventies the elephant population, for which the reserve used to be famous, is stable again. The reserve, which had been declared an UNESCO "World Heritage Site" has been termed recently a "success story" by the same organization.

The origins of the Selous Game Reserve can be traced back to German colonial times. Three small game reserves were established in the area before 1912. The British Government increased their size, connected them and named the reserve after the popular big game hunter and adventurer Frederick Courtney Selous. He fell in action in 1917, chasing the German troops under Lettow von Vorbeek. Travellers can still find his grave near Beho Beho in the northern part of the Reserve.

The protected area gained in size until the early Seventies. The intention was to offer a safe range for elephants. This was because up to 5000 elephants were shot every year outside the reserve by government game scouts for crop protection. The structure of the elephant herds was heavily disturbed by such a high rate of indiscriminate shooting, which left only a few old bulls with large tusks. Brian Nicholson, the last European warden of the reserve, said it took two decades of proper protection and management in the fifties and sixties . . . for good bulls in the Selous to reappear. Even hundred-pounders were plentiful again in his day. Nicholson had built up a proper infrastructure and first-class management. He was also responsible for one major decision: the introduction of hunting. The revenue from safari hunting financed the management structure Nicholson had built. At the same time it offered the Government an economic reason for protecting such a huge tract of land, approximately 6% of the whole country, which until that time had not been utilised.

However, after 1967 both the economy and wildlife conservation went rapidly downhill. Poaching reached its peak in the mid-Eighties. An aerial count of elephant in the ecosystem in 1986 showed that the former more than 100,000 elephants had been reduced to less than half; and only a few of the former 3,000 rhinos had survived the massacre.

Tanzania asked for international support. In 1987, a "Selous Conservation Programme" was agreed upon between the German and the Tanzanian Governments as part of their Development Cooperation. The year

1988 was characterized by efforts to get an unmotivated and badly equipped troop of 400 game scouts back to patrol work [to] begin anti-poaching. Vehicles were acquired and serviced, drivers and mechanics trained and a network of radio communication established. The huge area and the inaccessibility of the reserve requires use of an aeroplane and a network of small bush airstrips to combat poachers. If signs of poaching are seen from the air a group of seven game scouts with two tents and a bag of maize flour is landed at the nearest airstrip. They chase the poachers on foot and later march back to the station. Some of these groups are more than four weeks in total wilderness, unable to communicate with their station.

From the air signs of poaching could be seen everywhere. Hardly a flight passed without detecting elephant carcasses on which the vultures were still feeding. A typical poaching gang consisted of 20, 30 occasionally 50 men, of whom, however, only a few were armed. The others carried food into the reserve and brought smoked meat and ivory back to the villages. But then success set in. Many poachers were arrested. Kalashnikovs, big bore rifles and hundreds of muzzle loaders were confiscated.

This emergency program later was extended into a systematic rehabilitation and development programme for the Selous, based on an overall management plan. Game scout stations and houses were built, roads graded and the boundaries of the reserve demarcated. Training was provided at all levels. The real bottleneck, however, is—as often in Africa—management. The central question is, how can the Selous be financed in the long run? The most important source of income now is tourist hunting. The prospects for photographic tourism are limited because Tanzania has many more parks which are easily accessible and more suitable for photographic safaris.

To stop hunting would therefore endanger the very existence of the Selous. Presently, hunting earns approximately US \$1 million per year in fees and royalties for the Government. Only 1/4 of the area is being hunted and even the rather low quotas are not fully utilized. A greater demand by hunters from Europe or the United States could easily be satisfied and would result in higher revenues. In the past all income went straight to the Treasury and the Selous received its funds through regular budget allocations from the

Ministry. Funds amounted to \$100,000 a year, equivalent to about \$2/km². Hardly enough to pay salaries of \$15 per game scout per month; not even sufficient to pay fuel for the vehicles which were donated from Germany.

The German project started with a common understanding that half of all hunting revenues would be reinvested into the reserve through a retention scheme. This has been achieved and the reserve will be able to stand on its feet financially in the future. Major problems, of course, remain to be solved. One of them is the badly organized system of elephant shooting for crop protection, which results in the destruction of high numbers of elephants outside the reserve.

Efficient wildlife conservation and management cannot confine itself nowadays within the boundaries of protected areas. Poachers come from the villages surrounding the reserve. To root out this evil, one has to go into the villages and involve the population. Law enforcement will always be necessary. But experience shows that this is not sufficient in itself to stop poaching. After all, Africans have been living on game for centuries. In order to win their confidence, the project starts with assistance towards self-help activities like building wells, fish ponds, schools, or establishing tree nurseries or cottage industries. Half of all necessary investment has to be paid in cash by the villagers themselves, as spoon-feeding must be avoided.

Villagers are advised to establish their own Wildlife Management Committees. These are responsible for the protection and hunting of wildlife on village land and also for anti-poaching and crop protection. The latter is an especially important topic, because up to now farmers do not benefit at all from wildlife, except by poaching. They would prefer that all elephants, crocodiles, lions and other "vermin" be exterminated. The Committees also select young men to work as village game scouts in the Village Wildlife Management Areas which are being established. On the request of the villagers the project surveys village land, facilitates official recognition of village boundaries and assists the village in land-use planning. Such plans also make provision for wildlife areas where no agriculture is practiced. Instead, such land is reserved for wildlife. In this way a buffer-zone is created around the reserve. Since 1991 the villages receive a quota for subsistence meat hunting. The quota is very

conservative and consists of nine wildebeest and buffaloes per village per year. Meat is needed by the people in the buffer-zones. Because of the tsetse fly no livestock can be kept there. It is planned that the villages can sell their quotas to safari companies in the future, as hunting provides the highest return per unit of land from wildlife. Such community wildlife management requires revisions of the Wildlife Act, which are presently under way.

The concept has now been adopted by the Tanzanian government as a national policy. This programme is an appeal to self-interest.

If people benefit personally from wildlife, they are interested in its conservation and sustainable use. We are concerned that agitation by animal rights groups against this form of sustainable safari hunting might endanger the economic prospects that wildlife conservation offers the villagers. If rich and well-fed Westerners destroy the value of wildlife for poor peasants, it would be not only a new form of neo-colonialism, but also would result in the quick destruction of these wildlife resources.

ZAMBIA

Richard Jeffery^{ASG}, writes from the WWF Country Office (14 Dec 93).

Concerning antelope work in Zambia, there has not been very much, although we (myself and WWF) continue to carry out some wildlife population monitoring surveys in support of the National Parks and Wildlife Service.

Amongst these surveys this year are included specific censuses of Kafue, black and red lechwe, tsessebe and situnga, and some general reconnaissance surveys of areas earmarked for game capture operations.

In the case of the former specific censuses, we are generally trying to hand over the task of census reporting to field biologists who have been undergoing training for some years now. Inevitably, this will lead to delays in publishing results whilst the biologists develop their confidence in report-writing.

However, I can tell you that the Kafue lechwe show a general trend of slow population increases from about 46,000 in the early 1980s to about 65,000 currently. The black lechwe population showed increases between the 1970s and 1983 reaching about 40,000; thereafter the population declined to

about 30,000 where it seems to have stabilised. The red lechwe population of the Banganga swamps in Kafue National Park has shown dramatic increases since the 1960s to current levels between 4,000-5,000 (1993 data not yet processed). No surveys of red lechwe on the upper Zambezi Floodplains have been conducted. Red lechwes are still present in the Lukango Swamps of the Kafue system.

The tsessebe population of the southern Bangweulu Swamps appears to be stable to increasing slowly; the population currently stands around the 3000-4000 mark (data analysis still to be completed).

Sitatungas are known to be common in many parts of Zambia, particularly [in] the Bangweulu Swamps. WWF is attempting to train biologists to carry out localised ground and aerial censuses, which may then be extrapolated for censusing wider areas.

Problems Arising from Game Capture Operations

Concerning our general reconnaissance flights of areas earmarked for game capture, these developed from our, the Department's and the public's concern that game capture activities were being sanctioned before any meaningful analysis of the capacity of populations to withstand the offtakes. In fact, prior to these flights, roan, sable and hartebeest had already been captured from within Kafue National Park for various export deals with foreign private interests. The public was extremely concerned about this because:

1. there was no evidence that research had been undertaken to show that the populations could sustain the offtake;
2. there were fears that populations would be severely reduced or disturbed, thus affecting local tourism operations and jeopardising further investments;
3. there were fears that preferential access to foreign buyers would jeopardise the newly established Zambia game ranching industry;
4. there have been concerns expressed that populations of roan and sable are already beleaguered without subjecting them to further pressures from capture;
5. the capture of roan, sable and hartebeest resulted in significant mortality amongst the captured animals;
6. there were fears that Zambia would not actually make any substantial gains by exporting valuable species such as roan and sable.

In the event, following the reconnaissance flights, the Department, Tour Operators' Association of Zambia and Wildlife Producers' Association agreed that Kafue National Park generally had insufficient wildlife stocks to support any capture activities; capture operations for local game ranchers were subsequently centered to the west . . . and outside the Park.

There is overall concern that poor licensing and hunting returns administration is resulting in bad management practices for valuable antelopes (and other) species in Zambia. It is hoped that through various aid schemes this aspect of wildlife management will be greatly improved in the next few years.

Sadly, there continues to be a dearth of field-based wildlife management expertise in Zambia, which we also hope will be addressed by aid schemes.

Finally, Dr. Rory Nefdt completed a PhD study of lek breeding in Kafue lechwe in 1992 (Darwin College, University of Cambridge).

I hope this gives you at least a sketch of our activities and problems here. I would obviously welcome appropriate outside interest that would strengthen our work on antelopes in Zambia.

INDIA

Gurarat High Court's Decision on Chinkara Reserve

From Times of India News Service.

New Delhi, December 17. Governments are supposed to protect forest and wildlife against commercial exploitation but the Gujarat government did otherwise. It de-notified the Narayan Sarovar Wildlife Sanctuary, reducing its area from 765.79 sq km to 94.87 sq km, in order to lease out the rest of the sanctuary area for mining purposes and other commercial ventures.

But for the [intervention of] nongovernment organisations (NGO) like the World Wide Fund for Nature-India (WWF) and the Consumer Education and Research Society, Ahmedabad and the state high court, the Narayan Sarovar Sanctuary (NSS), which had already been reduced to a sanctuary existing in patches of a few square kilometers, would have disappeared altogether with its habitat.

The Consumer Society had petitioned the Gujarat High Court challenging the de-notification. The WWF had also intervened through their counsel, Mr Raj Panjwani, who vehemently urged the court to restrain the state government from destroying the fragile eco-system of the region in and around the sanctuary.

The single judge Mr Justice K. R. Vyas of the state high court then ordered for maintenance of status-quo, on December 10. This means that the boundary of the NSS sanctuary, also called the "Chinkara Wildlife Sanctuary," would remain unaltered as per its original notification of April 14, 1981, whereby it was declared that this sanctuary would have an area of 765.79 sq km.

RARE SPECIE[S]: This sanctuary which is located in Kutch district, got its popular name from a rare and highly endangered specie of deer* called *chinkara* which had been sought to be reared here. Besides the 1,400 *chinkaras* here there are a number of other endangered wild animals, like the *caracal*, the desert cat, the Indian wolf, the pangolin, the great Indian bustard, the peafowl and other migratory birds.

*The chinkara is the Indian gazelle, *Gazella bennetti*. Its status is not as desperate as indicated in the article, "Last Chinkara stronghold under siege," (*Gnusletter* 12.3:14-15). Asad Rahman notes in the letter he sent along with the above newspaper clipping that the newspaper articles overstated the case. In his article on the "Conservation status of antelopes in Asia and the Middle East, Part 2, published last year in *Species* 20, Rod East noted that the chinkara remains widespread in the northwest (Rajasthan) and in protected areas in central India. "Total numbers of this species exceed 10,000." A year earlier, in the draft data sheets on Asian antelopes prepared for the Antelope Red Data Book, David Mallon^{ASG} noted that, "In Gujarat, chinkara were once abundant but have since greatly declined. The remaining population was 1304 in 1990, mostly in protected areas, where they were said to be increasing, though falling elsewhere in the State (R. L. Java, 1992, in litt.)." This is about the same number of gazelles that the Times of India News Service reported (28 July 93) as the estimated population of the Narayan Sarovar sanctuary.

In any event, it is heartening news that the Rajasthan government was prevented from opening the sanctuary to industry.

