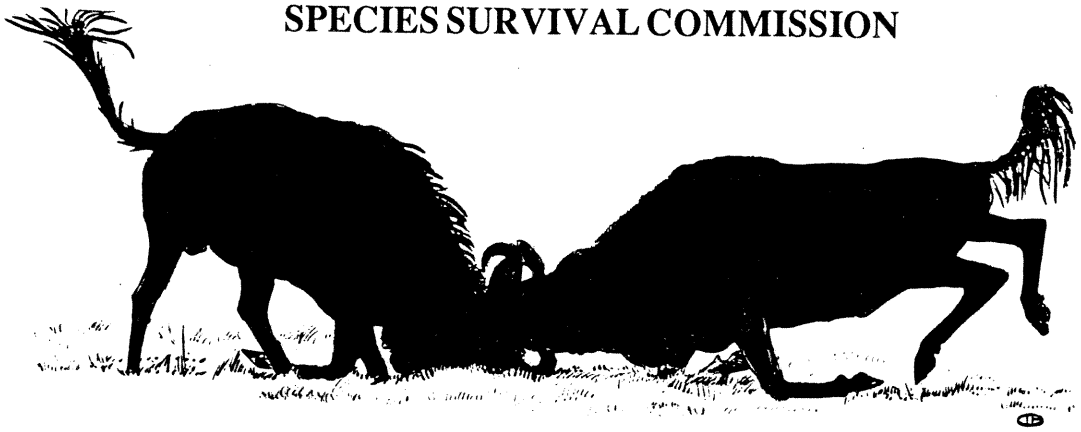
INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

SPECIES SURVIVAL COMMISSION



ANTELOPE SPECIALIST GROUP
GNUSLETTER

Volume 8 • Number 3 **September 1989**

EDITED BY RICHARD D. ESTES, CHAIRMAN 5 GRANITE ST., PETERBOROUGH, NH 03458, USA

PUBLISHED WITH ASSISTANCE FROM THE WORLD WILDLIFE FUND–U.S.

IN THIS ISSUE

ASG NEWS 2
- Species Survival Commission meeting and International Theriological Congress in Rome 2
- ASG progress report to SSC: Summary of sub-Saharan antelope survey results 2
- ASG workshop 5
- Highlights of the ITC 5
  - Plenary lecture by Stephen Cobb 5
  - Review of symposium papers and posters: 5-7

  Overstocking fails to slow reproduction of springbok and blesbok, R. C. Bigalke • Ecological notes on blue and red duikers in Natal, A. E. Rowland, M. R. Perrin • If you want to save it, eat it: productivity of three Indian ungulates, R. Kyle • History of the relationship between eland and man in Africa, J. Skinner • The Ascania Nova eland herd, T. M. Yu • Natural diet of reem gazelle on Bahrain Island, S. Mohammed et al. • The last slender-horned gazelles in Egypt, M. A. Saleh • Ecopyhsiological characteristics of large Saharan ungulates, C. J. Grenot • People power in wildlife management, E. D. Lungu
- A reprieve for the Hopcraft Ranch? R. Ruggiero is the new research/teaching director 7
- Michael Keep retires from Natal Parks 8
- Funding sources for antelope research and conservation projects 8
- American screwworm outbreak in Libya threatens African wildlife and livestock, M. Woodford 8

ANTELOPE NEWS 9
- CBSG Aridland Antelope Workshop 9
- Dibatag 11
- Gazelle bibliography available from C. Thouless 11
- Jentink's duiker sighting in Liberia's Gbi National Forest, M. Taylor 12
- V. J. Wilson set to breed yellow-backed duiker at Chipangali 12
- Four-horned antelope, U. Karanth 12

REGIONAL RUNDOWN 12
- Central African Republic: report on preliminary duiker survey in Dzanga-Sangha, V. J. Wilson 12
- Kenya: roan antelope straggles on in Shimba Hills National Reserve, M. Ben-David 12
- Uganda: Eric Edroma takes over as Director of National Parks 13
- Botswana: Central Kalahari Game Reserve facing new forms of commercial exploitation 13
- Algeria: gazelle distribution detailed in K. de Smet's doctoral dissertation 13
- Israel: status of the two gazelles, G. Ilany 13
- USSR... Antelopes of Kazakh and Mongolian Republic, V. Sokolov 14
- Tibetan Plateau: Notes on distribution of the Tibetan antelope, G. B. Schaller 14

ASG NEWS

SSC MEETING IN ROME

The search for someone to represent the ASG at the 64th Meeting of the Species Survival Commission in Rome, conducted in the last two *Gnusletters*, ended well—I went myself. Late in July, The Center for Field Research offered to send me to the International Theriological Congress (August 22-29 Aug), to scout *Earthwatch* projects involving large mammals, especially in Africa (see below under Funding Sources for Antelope Research and Conservation). I was thereby enabled to attend the preceding SSC meeting, too, where I presented a summary report on the work of our specialist group; I also convened an Antelope Conservation Workshop during the Congress.

Hot and sticky weather during August accounted for the availability of lecture and dining halls at the University of Rome, plenty of hotel rooms, and closure of all but a few restaurants—all the Romans who can, evacuate the city for the month. The heat was tolerable by day, but those who had signed up to stay in the student dormitories or in hotels without air-conditioned rooms suffered without respite at night until the weather cooled off abruptly during the last three days of the month.

ASG Progress Report to SSC

With the completion of Part 3 (West and Central Africa), of *Antelopes, Global Survey and Regional Action Plans*, the antelope survey of Africa south of the Sahara is done. Although North Africa and the vast stretches of Asia where antelopes dwell remain to be surveyed, the main part of the Antelope Specialist Group's first mission has been accomplished, as the great majority of the bovids called antelopes are found in the Ethiopian Faunal Region. Only a dozen of the 84-88 (depending on whose classification you follow) species occur in North Africa and Asia, and precious few of these antelopes still survive in substantial populations.

Publication of Part 3 (probably by mid 1990) has been deliberately delayed in order to include the results of surveys in the Central African Republic, Congo, Zaire, and Cameroon. There is so little quantitative data on the status of antelopes in the forested regions of these countries that Rod East, Compiler and Editor of the Antelope Survey, decided to wait for these surveys before putting the finishing touches on his manuscript. However, the results of the survey of antelopes south of the Sahara are summarized in a chapter entitled, "Conservation of antelopes in sub-Saharan Africa," which Rod prepared as an introduction to the forthcoming *Red Data Book on Threatened Antelopes of Africa and the Middle East* to be published by the World Conservation Monitoring Centre. This report is drawn mainly from that chapter, which is excerpted, summarized, and paraphrased below.

List of threatened antelopes in Sub-Saharan Africa

The following species are currently in danger of extinction or likely to become endangered within the near future:
Aders' duiker, *Cephalophus adersi*
Abbott's duiker, *C. spadix*
Jentink's duiker, *C. jentinki*
Beira, *Dorcatragus megalotis*
Dibatag, *Ammodorcas clarkei*
Slender-horned gazelle,*Gazella leptoeros*
Dama gazelle, *G. dama*
Scimitar-horned oryx, *Oryx dammah*
Addax, *Addax nasomaculatus*

In addition, the following 10 species are potentially at risk because of a very restricted distribution or because they are not well represented in protected areas:
Ogilby's duiker, *C. ogilbyi*
Piacentini's dik-dik,*Madoqua piacentinii*
Speke's gazelle, *G. spekei*
Red-fronted gazelle, *G. rufifrons*
Soemmerring's gazelle, *G. soemmerringii*
Mountain nyala, *Tragelaphus angasii*
Giant eland, *T. derbianus*

Subspecies

Of the small number of distinctive subspecies singled out in the Antelope Survey, the following are currently or likely soon to become endangered:
Ruwenzori black-fronted duiker, *C. nigrifrons rubidus*
Western klipspringer, *Oreotragus oreotragus porteousi*
Heuglins gazelle, *G. rufifrons tilonura*
Tora hartebeest, *Alcelaphus buselaphus tora*
Giant sable, *Hippotragus niger variani*
Western mountain reedbuck, *Redunca fulvorufula adamauae*

Other subspecies potentially at risk:
Haggard's oribi, *Ourebia ourebi haggardi*
Pelzeln's gazelle, *G. dorcas pelzelni*
Mongalla gazelle, *G. thomsonii albonotata*
Swayne's hartebeest, *A. b. swaynei*
Kenya hartebeest, *A. b. cokei* x *lelwel*
Korrigum, *Damaliscus lunatus korrigum*
Coastal topi, *D. l. topi*
Bontebok, *D. dorcas dorcas*
Black-faced impala, *Aepyceros melampus petersi*
White-eared kob, *Kobus defassa leucotis*
Red lechwe, *K. leche leche*
Kafue lechwe, *K. l. kafuensis*
Black leche, *K. l. smithemani*
Western giant eland, *T. d. derbianus*
Eastern giant eland, *T. d. gigas*

It is noteworthy that 6 out of the 9 presently endangered species and 4 of the 6 potentially endangered ones are antelopes of the Saharan region, found in the Sahel, the Sudanian and Somali arid zones. The addax, scimitar-horned oryx, dama and slender-horned gazelles, now four of the rarest mammals in Africa, were formerly dominant herbivores in a vast region extending around the Sahara. Accessibility to motorized vehicles has been a key factor in the relentless destruction of the arid-land antelopes.

The country with the largest number of endemic, rare, and endangered antelopes is Somalia, where the beira, Piacentini's dik-dik, dibatag, Speke's and Soemmerring's gazelles, and hirola occur, as well as the Pelzeln's gazelle.

Although relatively few species of the sub-Saharan region are yet endangered and in fact many remain locally abundant, wildlife habitat continues to shrink as mankind increases. Apart from a few species like the bushbuck and gray duiker, which have a remarkable ability to persist in settled areas, the distributions of most antelopes are contracting and their numbers declining outside protected areas.

The value of African bovids, including the majority of the most recent, diverse, and successful group of ungulates on earth, as dominant members of the herbivore community in all African ecosystems, and as a source of human protein in every African country, is incalculable y et generally ignored by ecomomic planners. To squander such a major portion of the world's heritage of large mammals would

be a tragic loss for all mankind and most of all for the peoples of Africa and their descendents. It is particularly unfortunate that most of the presently endangered antelopes, both in Africa and Asia, are species that were reduced to relict populations before ever being studied. The opportunity to comprehend the ecological and sociobiological forces that shaped them may already have been lost.

Yet antelope conservation cannot be an end in itself. It must be "part of an overall environmental conservation strategy which takes full account of, and is integrated with, human development needs... The long-term survival of viable populations of antelopes and other wildlife depends upon:

1. Adequate protection and management of representative examples of the full range of ecosystems which include major antelope communities. There is a need to maintain in perpetuity large national parks and reserves in areas of exceptional abundance and high species diversity, with smaller reserves where necessary for species with localized distributions.

2. Development of forms of land use which enable human and wildlife populations to coexist to the greatest degree possible,. e. g. in buffer zones surrounding strictly protected conservation areas, and over more extensive areas where the predominant form of land use (e. g. pastoralism) is not inimical to the existence of large wild animals.

3. Greater public awareness of the need for and value of wildlife conservation, including establishment at the local level of wildlife utilization schemes which allow rural populations to benefit materially from conservation."

Summary of Regional Action Plans for Antelope Conservation

An overview of the major priorities spelled out in the regional action plans that are included in each part of the sub-saharan African antelope survey is presented here under two discrete, equally important operational levels: political and government action, and field action.

Examples of political and government action that is internationally important to antelope conservation include:

•Establishment of conservation areas in Somalia. The combined effects of uncontrolled hunting and extensive habitat degradation caused by overgrazing and drought have severely reduced Somalia's unique arid-adapted fauna. However, viable remnants of most antelope species persist in scattered localities in the northern mountains, plateaux and coastal plain, the central coast and coastal hinterland, the lower Shabelle and Juba Rivers, and the southern tip of the country. Establishment of an effective system of conservation areas in Somalia in the near future is essential to prevent the decline of the country's rich antelope fauna from culminating in the extinction of many species. This would be to lose an invaluable natural resource which could be of major importance to Somalia's future development. IUCN should actively explore the possibility of supporting ecological studies and conservation of Somali antelopes.

•Establishment of arid and semiarid conservation areas in the Sudan. There are no conservation areas in the desert, arid steppe and dry savanna which cover the northern half of the Sudan. This area is an internationally important habitat for up to five species of arid-zone gazelles. Conservation areas may be impractical in much of the remote, sparsely populated northern Sudan, where wildlife is scattered widely at very low population densities. The Red Sea hills and Jebel Marra are among the few places in this region where it is feasible to establish wildlife conservation areas. This is most likely to be achieved by a political commitment by the Sudanese Government to the establishment of conservation areas in the north of the country.

•Support for conservation in Equatorial Guinea, Angola, and Mozambique. International support should be offered to these countries to reestablish their protected-area systems, as opportunities permit.

•Development of national conservation strategies. National Conservation Strategies for the integrated development and conservation of natural life-support processes, upon which the survival of both man and wildlife depend, should receive high priority. The educational value of preparing such policies may be as important as the final documents. National Conservation Strategies should be developed as an integral aspect of National Development Plans, in which the Conservation Strategy is synonymous with government policy. Development of strategies for the conservation of renewable natural resources is unlikely to succeed if it is carried out in isolation. Land-use zoning, for example, is necessary to integrate wildlife conservation with other forms of land use, such as agricultural, livestock and industrial production. National Conservation Strategies should be prepared by country nationals working within their countries' appropriate government systems (with technical advice from expatriates if necessary), and must be developed and implemented by the government hierarchy, from the top policy-making level to the local level (districts, provinces, etc.).

•Regional cooperation in wildlife conservation. IUCN should continue to promote inter-governmental cooperation between national agencies responsible for the conservation and management of antelope populations in ecosystems which traverse international boundaries. Examples of outstanding international importance for antelope conservation include the Serengeti-Mara ecosystem (Tanzania and Kenya), Kalahari Gemsbok National Park—Gemsbok National Park—Mabuasehube Game Reserve (South Africa and Botswana), and Arli National Park (proposed)—Penjari National Park—"W" National Park and adjacent reserves (Benin, Burkina Faso, and Niger).

Field action recommended in the antelope survey of sub-Saharan Africa involves two types of activity: (a) surveys to identify conservation needs of specific taxa or antelope communities, and (b) improvement of the management and protection of existing and proposed conservation areas.

a) Surveys

•Duikers and other forest antelopes. Forest duikers (*Cephalophus* spp.) are among the least known antelopes scientifically, yet they are an important source of meat and hides in many countries. Extensive field surveys are required to clarify the taxonomy, distribution, and conservation requirements of this important group of antelopes. The recently initiated "Ten-year pan-African survey of duikers" (Wilson 1987) provides a framework for this action is a high priority in

international antelope conservation. There is also a need for more detailed knowledge on the distribution and conservation requirements of other forest antelopes, such as bongo *(Tragelaphus euryceros)* , royal and Bates' pigmy antelopes *(Neotragus pygmaeus* and *batesi).*

•Arid-zone antelopes. Surveys are required to assess precisely the current distribution and status of arid-zone antelopes in parts of sub-Saharan Africa where it may be feasible to establish protected areas, e. g. Somalia (beira, dibatag, Soemmerring's, Pelzeln's and Speke's gazelles) and the northern Sudan (dorcas, Soemmerring's, red-fronted, and possibly dama and slender-horned gazelles).

b) Management of conservation areas

Almost all African countries have gazetted substantial areas as national parks and reserves. On paper, the existing network of conservation areas in sub-Saharan Africa is more than adequate to ensure the survival of most species of large mammals (East 1981a, Parker 1984). In practice, the protection and management of these areas ranges from highly effective to non-existent, with finance a major limitation. Many of these areas are threatened by such factors as expanding human settlement and illegal hunting, livestock grazing and woodcutting; there is an urgent need to upgrade their protection and management. In their extensive review of conservation requirements in the Afrotropical realm, MacKinnon and MacKinnon (1986) concluded that it will cost on the order of US $1 billion (current values) over the next decade to develop and manage an adequate network of protected areas to conserve the realm's natural heritage. While national budgets will continue to be the primary source of funds for nature conservation (Bell & Clarke, 1986), international financial assistance will also be essential. MacKinnon and MacKinnon point out that the next decade may provide the last chance to develop a successful formula for man and wildlife to coexist in Africa.

"Conservation of antelopes in sub-Saharan Africa" summarizes conservation problems and priorities in each of the 16 major biogeographic divisions of the Afrotropical Realm: the Guineo-Congolian, Zambesian, Sudanian, Somali-Masai, Cape, and Karoo-Namib Regional Centres of Endemism; the Afromontane Archipelago-like Regional Centre of Endemism; the Guinea-Congolia/Zambezia Regional Transition Zone and the Guinea-Congolia/Sudania Regional Transition Zone; the Lake Victoria Regional Mosaic; the Zanzibar-Inhambane Regional Mosaic; the Kalahari-Highveld Regional Transition Zone; the Tongaland-Pondoland Regional Mosaic; and the Sahel Regional Transition Zone. These divisions are shown on a map of Africa, along with some 65 protected areas identified as having outstanding international importance for antelope conservation—and therefore high priortity for international assistance.

Theimportance of very large units

"The assessments of antelope conservation priorities in the Antelope Survey and regional Action Plans highlight the exceptionally high international importance of the relatively small number of very large conservation areas (≥ 18-20,000 km2), such as Serengeti—Ngorongoro—Mara, Tsavo—Mkomazi—Umba, Ruaha—Rungwe—Kizigo, Selous, Kafue, Etosha, Namib-Naukluft, Hwange—Matetsi—Kazuma—Zambezi, Kruger, Central Kgaligadi—Khutse, Arli—Pendjari—"W", and a few others. Most of these areas are also of outstanding importance for other large herbivores, e. g. elephant, zebra, giraffe, hippopotamus, and/or buffalo, and for large carnivores, in accordance with island biogeographical, genetic and ecological considerations (Soule et al 1979, East 1981a, b, 1983, Soule and Simberloff 1986).

"Strategies for Antelope Conservation

Most antelope species in sub-Saharan Africa still occur in substantial populations, at least locally. The long-term persistence of these species will require effective protection of key conservation areas which contain representative examples of major antelope communities. Strict protection of conservation areas in isolation, without regard for the needs of local people, is unlikely to be successful in the long term. There is a need for compromise between the esthetic ideals of conservationists and the shorter-term economic motives of rural people (Bell 1986). The major value of antelopes to rural people is as sources of meat and other products, such as hides. In many cases, enhancement of public support for conservation will require direct participation of local people in conservation decisions and some utilization of natural resources within protected areas, preferably in buffer zones around core areas of high conservation priority. Conservation cannot be expected to compete successfully on economic terms with other forms of land use, since conservation and short-term economic interests are fundamentally in conflict (Bell 1986). From a conservation vierwpoint, the maxim that wildlife must pay its way or be eliminated is false, as it renders conservation areas vulnerable to any alternative form of land use which is more profitable (Eltringham 1984, Bell and Clarke 1986). Nevertheless, local communities (as well as central governments) must benefit materially from wildlife conservation, at least in the short term, if it is to succeed. National conservation agencies must attempt to reconcile their objectives with short-term economic interests, and encourage generation of material benefits for local rural people by any means that do not conflict with conservation goals (Bell & Clarke 1986).

Options for revenue-generating/consumptive use of antelope populations include tourism and sustained-yield utilization (game farming on fenced land, game cropping in unmodified natural ecosystems, subsistence hunting, and multiple resource use). The most appropriate and feasible strategy for antelope conservation in particular, and the conservation of natural ecosystems in general, will depend on local circumstances and opportunities.

Two major projects which have been initiated recenly may provide guidelines for the development of land-use plans which successfully integrate wildlife utilization with agricultural development: the Communal Area Management Plan for Indigenous Resources (CAMPFIRE), and the Luangwa Integrated Resource Development Project in Zambia's Luangwa Valley (Bell & Lungu 1986). The success of these projects in reducing the conflict between rural people and wild animals, and providing incentives for local people to discourage illegal hunting, could have major implications for the future direction of wildlife conservation in Africa.

References

Bell, R. H. V. 1986. Problems in achieving conservation goals. In Bell, R.. H. V. & E. Caluzi-McShane (eds.), *Conservation and Wildlife Management in Africa.* Washington, DC, U. S. Peace Corps, pp 32-41.

Bell, R. H. V. & J. E. Clarke 1986. Funding and financial control. In Bell, R. H. V. & E. Caluzi-McShane (eds.), *Conservation and Wildlife Management in Africa.* Washington, DC, U. S. Peace Corps, pp 543-55.

Bell, R. H. V. & F. B. Lungu 1986. The Luangwa Integrated Resource Development Project: progress of phase I and proposals for phase II. Chipata, LIRDP.

East, R. 1981a. Area requirements and conservation status of large African mammals. *Nyala* 7:3-20.

East, R. 1981b. Species-area curves and populations of large mammals in African savanna reserves. *Biological Conservation* 21:111-26.

East, R. 1983. Application of species area curves to African savanna reserves. *Afr. J. Ecol.* 21:123-28.

Eltringham, S. K. 1984. *Wildlife Resources and Economic Development.* Chichester & New York, Wiley.

Martin, R. B. 1986. Communal area management plan for indigenous resources (project CAMPFIRE). In Bell, R. H. V. and E. McShane-Caluzi (eds.). *Conservation and Wildlife Management in Africa.* Washington, DC, U. S. Peace Corps, pp. 279-95.

Parker, I. S. C. 1984. Conservation of the African elephant. In Cumming, D. H. M. & P. Jackson (eds.), *The Status and Conservation of African Elephants and Rhinos.* Gland, IUCN, pp. 69-77.

Soule, M. E & D. Simberloff 1986. What do genetics and ecology tell us about the design of nature reserves? *Biological Conservation* 35:19-40.

Soule, M. E. , Wilcox, B. A., Holtby, C. 1979. Benign neglect: a model of faunal collapse in the game reserves of East Africa. *Biol. Conser.* 15:259-72.

Wilson, V. J. 1987. IUCN/SSC Antelope Specialist Group and Chipangali Wildlife Trust pan-African duiker survey and action plan for duiker conservation. Bulawayo, Chipangali Wildlife Trust.

ASG WORKSHOP

Because this workshop was added at the last minute, long after the ITC program had been printed, and was relegated to a lecture hall in a different building, only about a dozen people attended. However, practically all of them contributed information, in a Saturday morning session that lasted from nine until noon. Some of the information recorded in my notes is included in the Regional Rundown. Those in attendance included (asketisks identify ASG members):

Saudi Arabia: Hany Tatwany, Director, and Christopher Thouless, Ecology Officer, King Khalid Wildlife Research Centre.

Oman: *Tim Tear, Office of the Adviser for Conservation of the Environment.

Bahrain: J. Abbas, S. Mohamed and M. Saleh, Biology Dept., University of Bahrain.

Israel: Giora Ilany, Senior Zoologist, Nature Reserves Authority of Israel.

Egypt: Mostafa A. Saleh, Dept. of Zoology, Al Azhar University, Cairo.

Algeria: *Sellami Mahdi and *K. de Smet, Dept. of Forestry and Nature Protection, National Institute of Agronomy.

Niger: *John Newby, WWF/IUCN West African Regional Representative.

South Africa: John Skinner, Director, Mammal Research Institute, University of Pretoria.

USSR: Vladimir Sokolov, Director, Institute of Evolutionary Animal Morphology and Ecology, USSR Academy of Sciences.

U. K.: *Alexandra Dixon, Zoological Society of London.

France: *Phillipe Chardonnet, Wildlife Consultant, Institute d'Elevage et de Medecine Veterinaire Tropical, Maison, Alfort.

Canada: *John Fryxell, Zoology Dept., University of Guelph.

USA: *Michael Woodford, Chairman, SSC Veterinary Specialist Group.

HIGHLIGHTS OF THE ITC

ASG member **Stephen Cobb** delivered one of the five plenary lectures, which were presented each morning at 11:30 following the poster sessions. The title of his lecture, according to the program, was "Mammalian conservation from the Niger to the Nile: a new niche for the political animal." But while getting away from it all on a Mediterranean island the week before his lecture, Steve decided to focus, instead, on the problem of preventing the African elephant from suffering the same fate as the black rhino. As a charter member of the African Elephant and Rhino Specialist Group and Coordinator of the Ivory Trade Review Group, Steve spoke with authority and challenged fellow mammalogists to become more effectively engaged in conservation.

Noting that the number of books and theses on African mammals has declined dramatically in recent years, and that only 10% of all books on African wildlife deal at all with conservation, Cobb suggested that African mammals have helped the careers of mammalogists more than vice versa.

Among the measures that mammalogists could take to help save elephants and other African wildlife, Steve suggested revitalizing African research facilities and programs, holding the next Theriological Congress in Africa, and making this only international society of mammalogists into a more effective force for mammal conservation—starting by giving it a name understandable by the general public, such as The International Mammal Society.

Numerous papers and posters of particular interest to antelope specialists were presented in the 18 different one-day symposia. Reviews (abstracts of the abstracts) of about half of them are presented here, under the title of the associated symposium. Others will be reviewed in the next *Gnusletter.* The full abstracts are contained in the two-volume *Abstract of Papers and Posters* that were given ITC participants. To find out if extra copies exist, write Dr. Luigi Boitani, Department of Animal and Human Biology, Viale dell 'Universita' 32, 00185 Rome, Italy.

Population Ecology of Ungulates, convened by Bertram Georgii and Josef Hamr.

•"How important is resource limitation for antelope reproductive success?" R. C. Bigalke, University of Stellenbosch.

Isolated, inbred populations of blesbok *(Damaliscus dorcas)* and springbok *(Antidorcas marsupialis)* continued to have high reproductive rates and low juvenile mortality despite overstock-

ing and drought. "Work elsewhere shows that severe drought leads to sudden mass mortality of springbok, indicating the absence of marked declines in reproductive success in response to deteriorating environmental conditions. These observations have implications for models of density-dependent population regulation in antelope."

•"Some ecological notes on two forest duikers: *Cephalophus (Philantomba) monticola* and *C. natalensis,*" A. E. Rowland and M. R. Perrin, Department of Zoology, University of Natal.

Both red and blue duikers are declining over much of their range in Natal, due mainly to destruction of their densely wooded habitat and to disturbance. Both species are diurnal and have a similar diet consisting primarily of freshly fallen leaves and fruits; they may be considered ecological equivalents, though they coexist in some areas. However, home range size and land-tenure systems appear quite different. Blue duiker live in permanently mated pairs on fixed, non-overlapping home range/territories averaging 0.75 ha, whereas red duiker home ranges of ca. 9.0 ha are undefended and overlap extensively, up to 100% in densely populated areas.

Domestication and Wildlife Utilization, convened by J. Skinner and P. Jewell.

•"If you want to save it, eat it—exploitation of the Indian ungulates," Russel Kyle, 1 Lyne Rd., Kidlington, Oxford OX5 1AE, U. K.

At least three Indian ungulates have economic qualities which could make them extremely valuable for meat production. The nilgai *(Boselaphus tragocamelus)* is the largest ungulate in the world (250 kg) that regularly produces twins every year. "The blackbuck . . . *(Antilope cervicapra)* is also capable of a very high level of production. With a gestation of only 5 months and conception occurring one month after the last birth, they can produce 2 fawns every year." Compared to the red deer *(Cervus elaphus)* and fallow deer *(Dama dama)* often bred for hunting or venison, the axis deer *(Axis axis)* has a higher potential productivity, as its breeding is perennial rather than seasonal.

These three Indian species are more numerous in Texas than in India. The fact that half the "exotic" ranches keep them simply for their esthetic appeal, something only people in the most developed countries could afford, "illustrates an interesting quirk of the conservation of animals in the wild. In some cases their conservation management might be more secure in a developed country away from their original habitat, than it could be back in their native habitat within a developing country."

•"History of the relationship between man and eland *Taurotragus oryx* in Africa and their present day role in animal production," J. D. Skinner, Mammal Research Institute, University of Pretoria.

". . . eland have two main biological advantages over domestic animals in Africa, namely, a higher reproductive rate and a better physiological and behavioral adaptation to a hot, semi-arid environment. Substantial research into the productivity of eland has been conducted during the past three decades."

[However, it appears that the only continuing, longterm effort to domesticate and/or utilize the eland is still in Russia; see following abstract. Ed]

•"Domestication of *Taurotragus oryx* Pallas in Ascania Nova," Treus M. Yu.

There are presently about 50 eland in the Ascanian Zoo. They are pastured on the steppe from late April to mid-October and spend the rest of the year in stalls where they are fed hay, alfalfa, fodder beets, corn silage, and concentrates. Starting a century ago with 36 imported animals, 770 eland have been reared. Cows become sexually mature by the second year and bulls by the third or fourth year. Gestation is 276 ±5 days. Beginning in 1947, 65 cows have been trained for milking; the record output is 6.9 kg per day with a year's total of 642 kg, or almost double a calf's need of milk.

"Eland milk is like cream, tasty and nutritious. It contains on the average 11% fat, 8.8% albumin, 23.5% dry matter, and up to 5.6% lactose. Eland milk is rich in such ash minerals as calcium and phosphorus.

"In Ascania Nova the first commercial farm of dairy eland is being established. Broad opportunities for. . .eland domestication exist in some African countries (Kenya, South African Republic, Zambia, etc.). Efficacy of eland milk in prophylaxis and treatment of gastric, intestinal, skin, and other diseases has been proved by clinical experiments. Thus, eland milk appears to be a valuable nutritious and medicinal product."

Feeding and Digestive Strategies of Small Herbivores, convened by I. D. Hume and G. Bjornhag.

•Natural diet of the Arabian reem gazelle *Gazella subgutturosa marica*, S Mohammed, J. Abbas, M. Saleh, Department of Biology, University of Bahrain. A second paper on this species by the same authors is listed below under Conservation Biology).

The feeding habits of the Arabian reem, previously unstudied, were observed in a small herd inhabiting a 10 km^2 range on Bahrain Island. Fecal analysis based on a reference collection of epidermal tissues of the local plants showed that the reem eats a varied diet of browse and grass. Analysis of plant caloric value indicated that the gazelles fed selectively according to abundance and nutritional value.

A second paper by the same authors, "On the habitat and ecology of the Arabian reem gazelle *Gazella subgutturosa marica,*" considers distribution, ranging, and social organization of this population.

Conservation biology of mammals, convened by U. Seal and A Smith.

•"The imminent extinction of the slender-horned gazelle *Gazella leptoceros leptoceros*, Mostafa A. Saleh, Dept. of Zoology, Al Azhar University, Cairo.

By 1985 only one relict population of this Egyptian subspecies, which formerly inhabited the northern part of the Western Desert south of the Mediterranean coastal desert, was known to exist. A few scattered animals survived in the extensive dune complex of Wadi El Raiyan, 100 km southeast of Cairo, where they could not be hunted from vehicles. But since then over 80% of the dune habitat has been inundated by the rising waters of manmade Lake El Raiyan, and the rest is expected to be submerged when the lake is full.

"Remote areas south of the Qattara Depression where the slender-horned gazelle may possibly still exist are currently

subjected to extensive oil exploration and production activities...At Sitra Oasis, one of the larger, mostly pristine habitats in the Egyptian Western Desert, with a possible population of the slender-horned gazelle, an airfield and a large oil facility are being built... The excessive, uncontrolled hunting and habitat destruction have put the very small remaining population of slender-horned gazelle in immediate danger of extinction. Saving it, if at all possible, will require a major effort and should at least include the protection of the habitat of Wadi El Raiyan as well as an immediate captive breeding program."

[What will be left to protect once the lake is full is unclear, Ed.]

•"Wildlife management: ecophysiological characteristics of large Saharan mammals and their effects on [the] ecosystem," Claude J. Grenot, CNRS-URA 258, Laboratoire d'Ecologies, Ecole Normale Supérieure, 46, rue d'ULM 75005 Paris.

"The main objective of this paper is to recommend measures for range rehabilitation in arid land which are based on a proper understanding of the causes of degradation and desert encroachment. During the drought wild ungulates, but also some domestic species do not respond significantly to the changing climatic conditions. They are relatively independent of water and hence of overgrazed areas. The development of techniques to estimate forage availability and determine offtake rates which will not lead to forage degradation is most probably the key step toward a solution. For... conservation, it is now necessary to evaluate the capacities of ungulate water economy in relation to their energy metabolism in the field."

In addition to the better-known water and energy-conservation adaptations of desert ungulates (concentrating urine, dry feces, labile body temperature, resting in shade, aligning the body axis parallel with the sun in the absence of shade, feeding at night), Grenot stresses the importance of daily water turnover rates (WTR) in determining the ability of wild and domestic ruminants to keep feeding during extended droughts and to range beyond the zone of degraded vegetation created by cattle, in particular, around permanent water holes. "Wild ungulates require usually less water than domesticated species. Distribution of body water varies with T° and seasons as well as with kind of feed and physiological condition. The daily. . .WTR in their natural habitat [varies] between 6% of the animal's body mass (camel, dorcas gazelle) and 14% (bedouin goat). Water flux is highly correlated with body mass, but interspecific variation can be large, the highest WTR often exceeding the lowest by 6-8 times."

"In the wild, camels and goats forage far away from the water sources and drink only every few days. When nutritional conditions deteriorate, infrequent drinking helps these animals to maintain their energy balance by improving the digestion of low-quality feed, more efficiently than in nondesert breeds. During summer, after 3-4 days of water deprivation, goats, like... camels lose 30% of their body mass, but they continue to graze the dry roughage while the dorcas gazelles stop eating altogether and become moribund. When they have access to water, goats and camels gulp down volumes that often exceed 40% of their body mass, while gazelles consume only 15%. The capacity of bedouin goat and Awassi sheep to store water does not seem to be shared by camels and wild ruminants. In the rehydrated goats the kidneys help to conserve water solutes, by a drop in urine flow. The water is gradually released into the other body fluid compartments. In gazelles the water obtained in this way exceeds their WTR and may remove the need to drink. In addition, they forage during the night, when air humidity is high and plant material more hydrated.

"The camel's WTR (82 ml) and metabolic rate... are about half those of a cow living in a similar arid area. The camel and the bedouin goat have the capability of converting poor quality arid rangeland forage into milk and meat, even in [the] dry season. They can produce milk of good composition and quantity (2 to 3 kg per day) even when water is restricted. . .Lactation doubles the WTR in the bedouin goat while the total body water is increased by 35%. A bedouin family of 12 needs 11 camels to meet its daily calorie and protein, respectively."

"[Like] wild herbivores, [the] camel and bedouin goat have a role to play in the modern world, by virtue of the fact that they can continue to produce food for people living in a degrading environment and achieve this with minimal impact on and disturbance of the ecosystem."

Mammal Conservation Problems in the Developing World, convened by Per Wegge and Jane Thornback:

•"People power in wildlife management," E. D. Lungu, Co-Director Management, LIRDP, Box 510249, Chipata, Zambia.

About the Luangwa Integrated Resource Development Project, of which ASG member Richard Bell is co-director (see May, '87 *Gnusletters).*

No more space is available here to review papers, but two others that were presented in this symposium are of special interest and will be discussed in the January 1990 *Gnusletter.*

•"Wildlife conservation in the Ngorongoro Conservation Area, Tanzania: social and ecological implications of the increasing pastoralist and the declining livestock populations," J. T. Boshe, WWF Regional Office, Nairobi.

•"Conflict between conservation interests and the local people: the case of Lake Burungi area in northern Tanzania," E. B. Kapela, Ruaha National Park, and S. R. Moe, Norwegian Centre for International Agricultural Development.

A REPRIEVE FOR THE HOPCRAFT WILDLIFE RANCH?

Richard Ruggiero, ASG member who spent five years in the Central African Republic's Gounda-St. Floris N. P.earlier in the decade, is returning to Africa to continue research on antelopes. His new address is c/o Field Studies Group, International Wildlife Ranch and Research, Ltd., Box 47272, Nairobi.

"I have completed my [PhD] graduate work at Rutgers University," Richard writes (12 Aug 89), "and have accepted a position as director of a teaching/research effort in Kenya. Our main facility is located on the Hopcraft Ranch, and I will therefore have the good fortune to be able to continue studying antelope under some extraordinary circumstances. I plan to be there for two or three years but will be back in the states from time to time, most likely during each December and May."

What the extraordinary circumstances

are is unspecified. However, according to a "Fact sheet" circulated last March by David Hopcraft, "The Kenya Government has placed a compulsory acquisition order on a large part, including the complete operational centre, of the Hopcraft Demonstration Game/Wildlife Research Ranch, at Athi River, Kenya." Apparently Hopcraft's efforts to have the Government rescind the decision to appropriate this land have been successful, and the effort to prove that mixed cattle and game ranching can be profitable in East Africa, begun eight years ago, will be allowed to continue.

Michael Keep, ASG member from Natal, has retired from Natal Parks. His new address is P. O. Box 55, Balgowan 3275, South Africa.

FUNDING FOR ANTELOPE RESEARCH AND CONSERVATION

The Center for Field Research . This is currently one of the best sources of funding for research and conservation projects involving large mammals. At a time when grants for field studies and surveys of antelopes are harder and harder to come by, CFR is actively seeking projects that can be supported through the participation of Earthwatch Volunteers (see under SSC Meeting). The volunteers are mostly college graduates, many with advanced degrees, who are willing to pay for the opportunity to assist scientists in their field work for a period of 10 to 25 days. In addition to paying all the costs of his/her travel and maintenance in the field, each volunteer makes a contribution of $600-900 to the research project. To be viable, African and Asian projects would need to field three or four teams of 6-8 people for two to three weeks. At the minimum, researchers who arranged to use three teams of six people for a total of six weeks would gain $10,800 to use the rest of the year; the maximum (four teams of eight people for a total of 12 weeks) would yield $28,800). Of course, the project must be such as to appeal to the readers of *Earthwatch* magazine, in which some 113 expeditions selected by the CFR (through the peer-review process) were offered in 1989.

To qualify for support, Principal Investigators must present a research design that integrates non-specialist volunteers into the field research.agenda. Support may be requested for one to three years at a time, with the possibility of renewal. First-time projects are normally funded for one year, with renewal contingent on project productivity.

I used to feel that providing transport, lodging, and food for teams of Earthwatch volunteers was more trouble than it was worth. But then I was working in Tanzania, at a time when even the bare necessities were scarce and getting research grants was a lot easier. Now I see using volunteers as not only feasible (even in Tanzania) but also desirable for such purposes as carrying out faunal surveys and transect counts, capturing, marking, and radio-tracking study animals, collecting samples, 24-hour activity studies, and behavioral observations. In any case, two months spent working with Earthwatch Volunteers, some of whom may become lifelong friends and supporters, is not a bad way to earn the money to keep doing your research for the other 10 months of the year.

ASG members and other *Gnusletter* readers who have or are thinking of research or conservation projects that could be funded in this way should contact the Center for Field Research, 680 Mount Auburn St., Watertown, MA 02272, USA.

Durrell Institute of Conservation and Ecology. ASG member and Chairman of the Gazelle Research Group, Chris Furley, has joined the Durrell Institute of Conservation and Ecology, Rutherford College, University of Kent at Canterbury, Kent CT2 7NX, U. K. Chris writes (4 Jun 89) that he is "the in-house specialist in large mammals, especially ungulates of course. The institute puts on courses for both part-time and full-time students of ecology (for diplomas, M.Sc., Ph.D., etc.). One of the major lines of work will be on overseas projects of various types. These are funded by the World Bank, the European Economic Community, industry, foreign governments, etc. and all relate in some way to ecology, be it faunal surveys or environmental impact assessments. My brief is to attract or generate projects in my own field, encompassing conservation, management of parks, wildlife censuses, etc."

An example of the kind of project the Institute is seeking is the huge Jonglei Canal dig in the Sudan. "We have specialists of all kinds in the institute" Chris notes. "If you have any such ideas or proposals, with or without funding, I would be interested to hear of them. Likewise if any members of the [ASG] have pressing needs we may be able to help in some way."

Conservation Consultancy Fund. Stephen Edwards, Coordinator of the Species Survival Programme, sent the following notice to specialist group chairmen (dated 16 Aug 89):

"Two Trust Funds have been stet up by Finland and Norway to provide Finnish and Norwegian experts for field conservation activities. IUCN can draw on this fund to cover the total cost of using these consultants on missions, projects or other IUCN assignments.

"As your Specialist Group has extensive contacts with field projects I thought you should know of the availability of this source of help. If you wish to make use of this facility, please supply a short description of the proposed assignment, simple terms of reference, an indication of the special qualifications sought, and the proposed date and duration of the assignment. I can then submit the proposal for consideration."

Danish Ministry of the Environment. Another Scandinavian source of possible research support is the Agency for Forestry and Nature of the Ministry of the Enviornment, according to Birgith Sloth, with whom I spoke briefly at the SSC meeting. For further information write her at the Ministry, Slotsmarken 13, DK 2970 Hoersholm, Denmark.

AMERICAN SCREWWORM INTRODUCED TO AFRICA

The introduction of the American screwworm fly *(Cochliomyia hominivorax)* in Libya could be almost as devastating for African wildlife and domestic stock as the rinderpest epizootic that swept the continent in the 1890s. IUCN received the bad news last May by telex from FAO, which notified all member nations of North Africa, southern Europe, and the Near East. Mike Woodford, Chairman of the Veterinary Specialist

Group, called attention to the seriousness of the problem in his report to the SSC. The substance of the telex, which was reproduced in the Veterinary Group Newsletter No. 4, April, 1989, is summarized and quoted below.

Breeding populations of the screw-worm, native to tropical and subtropical America, have become established in Libya, after being introduced, apparently, by imported sheep. "This serious obligatory parasite of warm-blooded animals could have very serious consequences for livestock, wildlife and perhaps even human populations in Africa, the Middle East and southern Europe."

". . . the female screwworm fly is attracted to wounds, however minute, where she deposits a batch of eggs which rapidly hatch into larvae. These then penetrate the flesh, increasing the size of the wound, [to] which other female flies are attracted, quickly aggravating the situation and leading to secondary infection. Non-treatment of affected animals results in the debilitation or even death of animals, but particularly severe are consequences resulting from infestations of the umbilicus of newborn animals. The screwworm could be particularly damaging to wildlife where inspection and treatment of individual animals is not possible.

"Livestock can be treated and cured, but frequent inspection and treatment of wounds with insecticides is required to prevent losses. . . Since exotic insects may initially breed slowly, some countries may be infested with screwworm without yet being aware. Myiases of animals or man are not now notifiable diseases in most countries."

The only known way to eradicate screwworm is to breed and release millions of sterilized males, which cause the females they mate with to lay infertile eggs. In this way, screwworm was finally eradicated in the southern and southwestern part of the United States, but at an enormous cost. Even if the millions of dollars needed to wipe out the screwworm in Libya were available, Mike Woodford says that in the time needed to build the facilities, breed, sterilize and release large numbers of male screwworms, this pest could well have spread over an enormous area.

ANTELOPE NEWS

THE CBSG ARIDLAND ANTELOPES WORKSHOP

The Captive Breeding Specialist Group held a workshop on aridland antelopes at the Bamberger Ranch, Johnsonville, Texas on 14-15 September, before a weekend meeting of the CBSG in San Antonio. At the invitation of Ulysses Seal, CBSG Chairman, I attended the workshop and presented an overview of the antelope survey and action plans covering most of the same points as the SSC report I gave in Rome.

Four endangered species were the focus of the workshop: scimitar-horned oryx, addax, and dama gazelle. A session was held on each, during which captive populations, status in the wild, reintroduction efforts or plans, and integration of captive and wild populations were considered. Some 40 specialists attended, including population geneticists, reproductive physiologists, wildlife veterinarians, studbook keepers, zoo directors, and curators/breeders of major zoo- and ranch-bred collections.

The brief accounts of the four species given here incorporate notes I made during the workshop, the ITC symposia, and the antelope conservation workshop, plus copies of reports, abstracts, and recently published papers collected on those occasions. Particularly valuable sources are the "Survey of desert antelopes in captivity" and the "Survey of artiodactyls in captivity," both prepared by Karen Sausman, Director of The Living Desert zoo in Palm Desert, California, and the "Scimitar-horned oryx Species Survival Program Masterplan" (anonymous).

A few generalizations apply to all four of these endangered antelopes.

1. The holdings of captive-bred animals are impressively large: from 350 dama gazelles to possibly 2000 scimitar-horned oryx. Except for the dama gazelle, captive-bred specimens far outnumber their wild counterparts.
in the wild.

2. However, these stocks have been produced from a very small number of founders:< a dozen in three of the four species.

3. To safeguard a captive population from extinction through happenstance (random stochastic events) and to maintain 90% of the genetic heterozygosity of the founder populations for a period of 200 years (a common captive-breeding goal) requires hundreds of animals and continual efforts to minimize inbreeding.

4. The number of animals of known lineage and free of disease (e. g. tuberculosis) is far less than the total. "Founder animals were brought into captive herds but reproductive records were lost or not kept at all" (Scimitar-horned oryx masterplan). Until and unless the genotypes of the others can be ascertained (by genetic "fingerprinting"), only those registered in the studbooks will be used in the Species Survival Program. The rest are considered "surplus."

5. Captive-breeding on ranches offers important advantages over zoos in terms of space and the possibility of keeping antelopes in natural or semi-natural social groups. Unfortunately, the majority of ranch-bred herds are made up of "surplus" stock and breeding has rarely been carefully controlled. Full advantage can accordingly not be taken of ranch animals.

"Maximizing preservation of genetic diversity is best achieved by management of bloodlines or founder lineages. Such management requires that pedigree information be available for the population so that founders can be identified and their bloodlines tracked through the history of the population" (op. cit.).

6. Most of these antelopes propagate readily in captivity. To avoid overcrowding the available space, it is necessary to limit the number of offspring while maintaining maximum genetic diversity in age- and sex-balanced populations. Two figures are given for population size: the effective breeding population and actual carrying capacity required. The former is the number of animals needed if all individuals reproduced; because some do not and because of disparities in the sex ratios, etc., a carrying capacity of twice to even four times as many animals may be necessary to maintain the desired number of breeding individuals.

Arabian Oryx

Estimated numbers in the wild: extinct since the early 1960s, when the last few were captured to establish a captive-breeding population in the USA (see

Dixon, A. & D. Jones [eds] 1988. *Conservation and Biology of Desert Antelopes.* London, Christopher Helm).

Reintroductions. Herds have now been reintroduced in Jordan (95 head) and Saudi Arabia (16 head), in addition to Oman (74 head), where the first reintroduction of this species took place a decade ago. Oryxes from Jordan that were accustomed to foraging in a large enclosure, and fully acclimated, adjusted to ranging the desert far more readily than did zoo-reared animals, which took considerably longer to become self-sufficient.

Captive populations: world total, 905+, of which 463 are of known provenance (in studbook or registry). North America, 211 + 92 surplus; U. K., 9; Europe, 51; Middle East, 170 pedigreed, 350 non-pedigreed; other countries: Africa, 15, Asia, 7.

Effective founders (founder genome equivalents): 8..2+ existing founders of the world population, 17.2+ potential founders.

Effective number required (to maintain 90% of the original founders' genetic diversity for 200 years): 468.

Actual carrying capacity required: 936 (assuming a 50% reproduction rate).

Scimitar-horned oryx

Estimated numbers in the wild. Possibly as many as 200 could have survived the wars in Chad, the former distribution center of the species (Newby, J. E. 1988. Aridland wildlife in decline: the case of the scimitar-horned oryx. In: Dixon and Jones, op. cit., pp 146-66). A very few may survive in northern Sudan near the Chad border, and in Mauritania; probably extinct in Mali and Niger, following years of prolonged drought earlier in the decade.

Numbers in captivity: at least 1546 in the world population. North America, 297 in Species Survival Program, 700+ surplus; U. K., 64; Europe, ca. 150; Middle East,150 (Israel, 50); Australia, 60; other countries, 125? (inc. > 80 in Pretoria).

Effective founders: 21.7 with a potential of 27+ founders.

Effective number required (to maintain 90% of the original founders' genetic diversity for 200 years): 147.

Actual carrying capacity required: 294 (assuming a 50% reproduction rate).

Reintroductions:

•Bou-Hedma National Park, Tunisia. Ten scimitar-horns were brought here from the U. S. in 1985, and released into a 1500 ha Total Protection Zone in 1987 (see May ' 88 *Gnusletter).* There are currently 14, including 4 calves. The enclosure could support an estimated 70 oryxes.

•Gadabeji Reserve, Niger. This 760 km² reserve was selected during the study undertaken by the Zoological Society of London to determine the feasibility of breeding and reintroducing *O. dammah,* addax, and dama gazelle in Niger (see Sept. 88 *Gnusletter).* Typical central-Sahel habitat, with parallel fields of fixed dunes interspersed with plains of more clay-rich soils where there are pans, depressions, and fossil watercourses, Gadabeji was gazetted in 1955 as a reserve for *O. dammah; it* also harbored most other Sahel antelopes as well as giraffe and ostrich, and various smaller mammals and birds. However, at 15°00'–15°10'N, Gadabeji is south of the addax's range. The reserve was never protected and all the game has been shot out, except for a few dorcas and red-fronted gazelles. Nevertheless, because it was known to be gazetted, the area has suffered less than its surroundings from the activities of the Taureg and Peul pastoralists.

A "Feasibility study for the establishment of a West African regional captive breeding centre," co-authored by Alexandra Dixon and John Newby, goes beyond captive breeding and reintroduction and proposes establishing a regional Institute for Aridland Research at Gadabeji, the goals of which would be the conservation, research and development of Sahelian wildlife resources. "The site offers a unique opportunity for innovative work in wildlife rehabilitation and subsequently in wildlife management for sustainable development. "

"The results of the feasibility study," Dixon and Newby conclude, "have indicated that the establishment of a captive breeding centre for the reintroduction of aridland species is technically and logistically feasible. A suitable site has been identified, the animals and expertise are available and there is the necessary national and local support. It is appreciated that the project under consideration will require a long-term commitment if it is to accomplish its aims. But it is also felt that given the cultural and ecological value of these aims, this commitment would be extremely worthwhile."

The first animals to be reintroduced in Gadabeji would be the scimitar-horned oryx and the ostrich, with enough of the latter to begin a commercial ostrich farm. More sensitive species such as the dama gazelle would be brought in after establishing the necessary level of animal-keeping expertise.

Addax

Estimated numbers in the wild: Chad 200, Niger, 50-200; Mali, < 50; possibly a few left in remote corners of Algeria, Sudan, and Egypt.

Number in captivity: world total, 853. North America, 191 in Species Survival Program, 400+ surplus; U. K., 14; Europe, 40 pedigreed, 64 non-pedigreed; Middle East, 125+ (Israel, Qatar, Saudi Arabia, Bahrain); Australia, 3; other countries, 16.

Effective founders: 6.7, potential founders 12.2+.

Effective number required (to maintain 90% of the original founders' genetic diversity for 200 years}: 468 (assuming input of more potential founders to make at least 10 effective founders).

Actual carrying capacity required: 936 (assuming a 50% reproduction rate).

Reintroductions

Bou-Hedma N. P., Tunisia. Eight addax from the San Diego Zoo were released in 1987 in a 1500 ha Total Protection Zone (see May, 1988 *Gnusletter).* They have increased to 12, despite the loss of three males killed by scimitar-horned oryx bulls.

Air-Tenere National Nature Reserve, Niger. Alexandra Dixon and John Newby also co-authored a proposal for the reintroduction of addax into the 12,805 km² strict nature reserve, created especially as an Addax Sanctuary, within the 77,360 km² Air and Tenere National Reserve, largest protected area in Africa (see Jan. '89 *Gnusletter).* Quoting from the proposal, "As a result of the official gazetting of the Reserve and the allocation of substantial resources by WWF and IUCN to protect the area, the prospects for wildlife and habitat conservation are now greatly improved. Furthermore, rainfall in the region over the past two years has generated good quality addax pasture which will probably

persist for two to three years even if next year's rains are poor. It is therefore proposed that a project be established immediately to reintroduce addax into the Sanctuary using captive-bred animals. The objective is to repopulate areas suitable for addax and in the process, provide a genetic and social boost to any existing groups."

The simple facilities proposed include a 1 km^2 enclosure to serve as a pre-release pen where recently arrived addax can adapt to their new environment, a smaller holding pen and a shelter. Precautions for the welfare of the animals will include veterinary supervision and radio-tracking after release. "Presuming the method is successful," write Dixon and Newby, "it will be possible to channel a steady stream of animals quickly back into the wild so that between 50 and 75 addax could be released during the three-year period of this project."

The probability that some addax still survive in the Air-Tenere region caused a number of people to object to this release program both when it was presented in Rome and at the Aridland Antelope Workshop. The possibility of introducing disease or bad genes to the wild survivors is worrisome. For example, Bob Lacy, geneticist from the Chicago Zoological Park, voiced this concern and questioned the advantage of bringing in the effective genetic value of only four animals when the existing population may include 20 different genoms.

But the key question is whether the scattered remnants of the addax population would be able to repopulate the region without any intervention. John Newby, the foremost authority on Nigerien and Sahelian antelopes, thinks not. In an *in absentia* report to the Workshop, "Addax in Niger: distribution, status and conservation options," Newby recommends proceeding with the proposed short-term release program for 1991 reintroduction and "simultaneously [to] establish a capture programme to reinforce captive genetic stock."

My own recommendation, for what it is worth, would be to proceed with the reintroduction, but to refrain from capturing wild addax pending a thorough aerial survey of the region. The opportunity to reintroduce captive-bred addax to good habitat within their natural range is the outcome of years of effort, may not arise again, and should not be wasted. Establishing an acclimation/breeding station within the species' natural range is a necessary step in realizing the purpose of captive breeding. When and if other parts of the addax's range can be made safe, animals acclimated and/or bred in the Addax Sanctuary would be the best candidates for restocking.

Dama Gazelle

The dama gazelle was not included in the tables of data from which the above information on the addax and oryxes was taken. The information given below was gleaned from other sources.

Estimated numbers in the wild. According to Rod East's "List of threatened antelopes in sub-Saharan Africa," numbers in the wild are "unknown, but are unlikely to be less than a few hundred or more than a few thousand. .Eliminated from much of its range on the southern fringe of the Sahara by uncontrolled hunting, competition with domestic livestock for forage, and the effects of persistent drought. Small numbers survive in most of the eight countries of sub-Saharan African within its historical range." It occurs in no more than six protected areas, notably Niger's Air – Tenere National Nature Reserve and Chad's Oudi Rime-Oudi Achim Reserve, which formerly supported 6-8000 dama gazelles.

De Smet (in lit. 19 Jun 89) reports finding a small number in southern Algeria last March, ca. 150 km north of the Niger border. "No sign, however, any more of oryx or addax (last seen 9 years ago)."

Reintroductions. In 1984 two male and five female dama gazelles bred at the Estación Experimental de Zonas Aridas at Almeria, Spain (from founders captured in the Western Sahara in the mid-1970s), were reintroduced to Senegal, where this species had been exterminated, in the 720 ha.Gueumbeul Faunal Reserve, an island near St. Louis at the mouth of the Senegal River. Since then there have been 11 births and 9 deaths. The fact that the gazelles have been kept all this time in a small enclosure instead of being released on the island may have much to do with their failure to increase. According to Dr. Vericad, senior scientist of Almeria, the reason for not releasing them is the risk of poaching, although a 250 ha fenced area adjoins the pens and Senegalese National Parks personnel look after the gazelles. More animals are to be imported from Almeria.

Number in captivity: world total, 351 (according to International Zoo Yearbook, 1986). ISIS records: North America, 244; Europe, 38—but according to Vericad, there are currently ca. 80 dama gazelles at Almeria.

DIBITAG

The collection of aridland antelopes maintained at Al Wabra by the ruling family has been much admired by visitors to Qatar. As noted in the May, 1987 *Gnusletter*, some antelopes not found in any other zoo are successfully kept and bred there, notably wild-caught beira, Soemmerring's and Pelzeln's gazelles from Somalia, addax, dama and Mongalla gazelles from Sudan, and red-fronted gazelles from Chad and Sudan. Jim Dolan sent me copies of color slides he took on a visit to Qatar, and a video casette showing how some of these animals were captured.

Unfortunately not all the capture operations end successfully. During the Rome meetings I learned that 50 dibatags were imported to Qatar from Somalia, all of which died within a month. Almost certainly others were injured or killed during the capture operation. A more convincing proof of the urgent need to establish an effective conservation program in Somalia to protect such rare, indigenous antelopes could hardly be imagined.

GAZELLE BIBLIOGRAPHY

Chris Thouless, Ecology Officer at the King Khalid Wildlife Research Centre, has compiled a bibliography of publications about gazelles which currently contains some 300 titles. It is fairly complete for the Middle East, but gaps exist elsewhere. Printouts of the bibliography are available upon request, in return for which Chris hopes to receive additional references.

Copies of a paper on "Gazelle distribution in Saudi Arabia," by Thouless, J. G. Grainger, M. Shobraq, and K. Habibi can also be obtained by writing Chris, National Commission for Wildlife Conservation and Development, P. O. Box 61681, Riyadh 11575, Saudi Arabia.

JENTINK'S DUIKER

Mark Taylor (pers. comm., Aug. 1989) saw a Jentink's duiker *(Cephalophus jenkinki)* in Liberia's Gbi National Forest in January, 1989, while searching for the Liberian mongoose *(Liberiictis kuhni*—a single live specimen was procured). The duiker was in a mosaic of partially logged and primary forest.

The only captive population of this endangered duiker is possessed by the Gladys Porter Zoo, Brownsville, Texas. According to an article by T. Alvarado in the *Gladys Porter Zoo News* (Issue 3, 1988), a study is underway to determine the feasibility of using superovulation and embryo transfer to increase the captive population. In cooperation with Texas A&M university, "the initial goals of this project are to determine the normal estrous or breeding cycle of Jentink's duiker and the yellow-backed duiker," a closely related species of similar size and weight that is commoner in captivity. "At this point in time, our plan is to develop modified embryo transfer techniques allowing us to use yellow-backed duikers as recipients for Jentink's duiker embryos. Using a regime of hormones, we would induce a Jentink's duiker female, which normally ovulates a single egg, to produce multiple eggs. After fertilization, the resulting embryos would be transferred to yellow-backed duiker females, who would then give birth to Jentink's duiker calves."

THE PAN-AFRICAN DUIKER PROJECT

Speaking of the yellow-backed duiker (previos paragraph), Vivian Wilson is now in a position to breed this species in his Chipangali Zoo. He writes (in lit. to R. East, 18 Aug 89), "The wonderful news is that we now have a pair of yellow-backed duiker. They are from the Cincinnati Zoo in the U. S. A. and Karl Kranz actually brought them out to Zimbabwe for us. They are really wonderful animals and I now believe, at long last, that we are going to get the duiker breeding centre off the ground."

In the same letter, Wilson speaks of some of the difficulties and frustrations of carrying out his decade-long duiker project. "The entire duiker project has been very difficult—with lots of interest from the people in the field—but no encouragement or financial support from the top wildlife people in the world. Anyway, no matter, I will continue with the job which I am personally enjoying so much."

"One day I can assure you,. . .the international wildlife authorities will realize just how important the duiker is to the people of Africa. To fill the bellies of the hungry people in Africa can only be done with duiker meat—not rhino or elephant or leopard or bongo. Tens of millions of dollars are still being spent on the glamorous mega-vertebrates but nothing on duikers."

FOUR-HORNED ANTELOPE

ASG member K. Ullas Karanth returned to India last November, after completing an M. Sc. at the University of Florida. He has taken up the position of Wildlife Biologist at the Centre for Wildlife Studies, 499, Chitrabhandu Road, Mysore-570 023.

Ullas (in lit. 9 July 89) has expressed reservations about Cliff Rice's correspondence survey of the four-horned antelope *(Tetraceros quadricornis)* reported in the May 1989 Gnusletter.

"1. Most park managers, forestry officials and even some native tribals in India (particularly in the South) do not clearly distinguish FHA [four-horned antelope] as distinct from the muntjac. I would be hesitant to accept the information from such sources based merely on letters from them.

"2. The population figures of FHA reported are without any basis, since, as of now, density/population size estimation using modern, rigorous, quantitative methods are not carried out in any nature reserve in India. The so-called 'census' figures reported for most areas are based on totally irrational methods or worse, ill-informed guesses. I am sending separately a recent reprint of mine dealing with this problem ["Analysis of predator-prey balance in Bandipur Tiger Reserve with reference to census reports." *J. Bombay Nat. Hist. Soc.* 85(1):1-8]. It would not be correct in my opinion to treat these as scientific data and compute density estimates from them as Cliff appears to have done.

"I have been conducting line transect sampling of large herbivore densities in my study area of Nagarahole National Park. FHA occurs in a part of the area, but density estimates obtained in 1986-87 was 0.91±0.61 (S. E.) animals/km^2 in dry deciduous forest. This estimate is based on small sample size and is therefore not reliable. The encounter rates were very low, and I saw only six animals while randomly sampling [a] 110 km transect length. However, during drives in specifically selected localities/routes, I used to see several animals on a single drive. I have done some more sampling recently and am working on the data."

REGIONAL RUNDOWN

CENTRAL AFRICAN REPUBLIC

Vivian Wilson has written another report of his Pan-African Decade of Duiker Research, this one about a one-month visit to the CAR, during which he and son Barry spent 19 days on a preliminary survey of the duikers inhabiting lowland rain forest in the southwest corner of the country, bordering the Congo and Cameroon. [Mike Fay's account of the duikers in this area was published in the May, 1988 *Gnusletter.]* The Wilsons were invited by Arthur Green, Director of the WWF-US Dzanga-Sangha Project and an ASG member, to sort out the distribution and status of the six different duikers and to provide baseline data needed to establish a program of duiker husbandry which could lead to a sustainable supply of bushmeat for the local market. The six species include the blue *(Cephalophus monticola),* Peter's *(C. callipygus),* bay*(C. dorsalis),* black-fronted *(C. nigrifrons),* white-bellied *(C. leucogaster),* and yellow-backed duiker *(C. silvicultor).*

Part of the time the Wilsons accompanied the BaBinga pygmies, who catch duikers by driving them into nets and shoot individuals attracted by imitating their calls. As a result of very severe hunting pressure exerted by the pygmies and other tribes (who set thousands of wire snares to trap red duikers), only blue and Peter's duikers are still common in the area.

KENYA

When Karen Ross finished her dissertation research on the sable *(Hippotragus niger roosevelti)* of the Shimba Hills

National Reserve in 1982, there were known to be 11 roan *(H. equinus)* in the Reserve, including two new calves and three two-year-old females. Although she has returned six times since then, most recently in late 1988, "that was the last time I saw any roan in the Shimbas", Karen wrote last March (May '89 *Gnusletter)*.. "The Game Warden agrees with me that they are now extinct in the area."

But wait a minute. Merav Ben-David, who knows African wildlife very well, told me during the ITC meetings in Rome that he personally saw three roan when he visited the Shimba Hills a year ago. Although it is surprising that these animals could remain unseen (or anyway unreported) for such a long time, I remember that the roan were rarely seen except when they emerged on open grassland within sight of the roads. They spent a lot of time in roadless areas where there was enough cover to make them hard to find.

So a few roan still survive in the Shimba Hills. Nevertheless, translocating 35 roan here from central Kenya in the late 1960s has certainly turned out to be a costly failure (see *Antelopes: Global Survey and Regional Action Plans*, Part 1, Kenya chapter).

UGANDA

Dr. Eric Edroma, Director of the Uganda Institute of Ecology and an ASG member, has been appointed Director of Uganda Parks. This welcome news is the best indication to date that the Government of Uganda is committed to the restoration of its once outstanding parks system. Eric (pers. comm., Aug. '89) says that he intends to bring in the best-qualified people as wardens, administrators, and researchers, whether they be Ugandans or expatriates.

Dr. Edroma is organizing an International Symposium on Human Influences on Endangered Wildlife, to be held in Uganda from 3–6 December, 1990.

BOTSWANA

According to a letter addressed to the President by the Acting Director of Survival International (30 Mar 89), the wildlife and people of the Central Kalahari Game Reserve are again threatened by economic exploitation. Allegedly, the Government has granted prospecting licences to three mining companies, permitting them to search for diamonds and oil without being required to make environmental and social impact statements. Already, some 2500 km of cut lines have been established, which along with survey tracks are damaging the vegetation and opening up remoter parts of the Reserve to cattle brought in from outside. An estimated 200-500 mining company employees are living in the Reserve. Tourists, too, are entering in increasing numbers; they drive vehicles across pans and fossil river valleys, damaging these fragile habitats and accelerating erosion. Most disturbing of all, the Government is bent on moving the 1000 Basarwa Bushmen and 300 Bakgalagadi out of the Reserve, even though the CKGR was specifically established in 1961 to safeguard the Basarwa. (Because no legislative mechanisms existed to guarantee their land rights, the designation of the area as a Game Reserve was the only legal option available to secure their future on the land they have occupied for untold centuries.) Yet suitable alternative lands have not been identified and the residents are said to be almost unanimously opposed to leaving.

The CKGR is the heart of the region that supported one of Africa's greatest populations of plains wildlife, before game-proof fences were put up in the 1960s as part of a European Economic Community project to develop Botswana's cattle industry. Fenced off from access to water vital to survival in time of drought, untold thousands of wildebeest, zebra and other Kalahari wildlife subsequently died along the fences.

Thanks in large part to the studies of Mark and Delia Owens and of Douglas and Jane Williamson who succeeded them, and to the controversy stirred up by the Owenses' bestseller, *Cry of the Kalahari*, the Government made decisions that acknowledged the right to exist of the Kalahari wildlife in the 1986 Report of the Central Kgalagadi Game Reserve Fact Finding Mission (see Jan '87 *Gnusletter* and Part 2 of the Antelope Survey, pp 42-43). But in looking over the decisions and recommendations, I see that what is now happening actually represents an effort to implement some of the proposals:

•That the residents of the Reserve be encouraged—but not forced—to relocate to viable sites for economic and social development outside the Reserve.

•That the Department of Wildife take immediate steps to tap the tourism potential of the Reserve.

•That wildlife policies be speedily implemented to facilitate faster realization of the benefits from Wildlife.

On the other hand, mining of the Reserve seems to be something new. It is also noteworthy that the game fences are still in place. However, attitudes about them have changed: now conservationists want the fences to protect the CKGR from cattle, which have devastated their own range, whereas the Reserve's grazing is in much better shape. To solve the water problem, the EEC has hired an international consulting firm to establish boreholes inside the Reserve. This latest information was imparted in Rome by Keith Lindsey, a colleague and friend from East African days, who is in charge of the water exploration.

ALGERIA

In Rome, Koenraad De Smet gave me a copy of his doctoral dissertation, written in Flemish, on the distribution and habitat choice of the larger mammals in Algeria. His work was discussed most recently in the Sept. '88 *Gnusletter*. De Smet, who heads up the Department of Forestry and Nature Protection in the Algerian National Institute of Agronomy, has now completed his Ph.D. at the University of Ghent. Although my Flemish is a bit rusty, the thesis is certainly of impressive size, weighing over one kilogram.

ASIA

ISRAEL

Giora I. Ilani, Senior Zoologist, Nature Reserves Authority of Israel, gave a report on the two gazelles at the ASG Workshop. The mountain gazelle *(G. g. gazella)*, which occupies northern Israel, increased under Israeli protection in the Golan Heights to some 3000 on the west and 6000 on the east, becoming in the process a serious agricultural pest. Since an outbreak of foot and mouth disease reduced the population by some 2000 animals (see Jan. '87 *Gnusletter)*, the Golan population has remained stable.

In the south, the dorcas gazelle *(G. dorcas)* now numbers ca. 1000 head. A

distinct form of the mountain gazelle.lives in the Negev Desert 30 km north of the Gulf of Aquaba. There are about 20 members of what Ilany calls *G. g. acacie*, because 70% of their diet is obtained from two species of acacias. They frequently stand bipedally to browse the foliage, whereas the associated dorcas gazelle feeds mainly on lower shrubs.

USSR

At the ASG Workshop, Prof. Dr. Vladimir Sokolov, Director of the Institute of Evolutionary Animal Morphology and Ecology, USSR Academy of Sciences gave a brief report on Soviet antelopes. A saiga *(Saiga tatarica)* population in two areas northwest and northeast of the Caspian Sea in Kazakh numbers more than 100,000 animals. But a proposed irrigation canal across the northwestern range threatened to bisect and degrade much of the habitat by bringing salt to the surface. Soviet zoologists have successfully lobbied against construction of the canal.

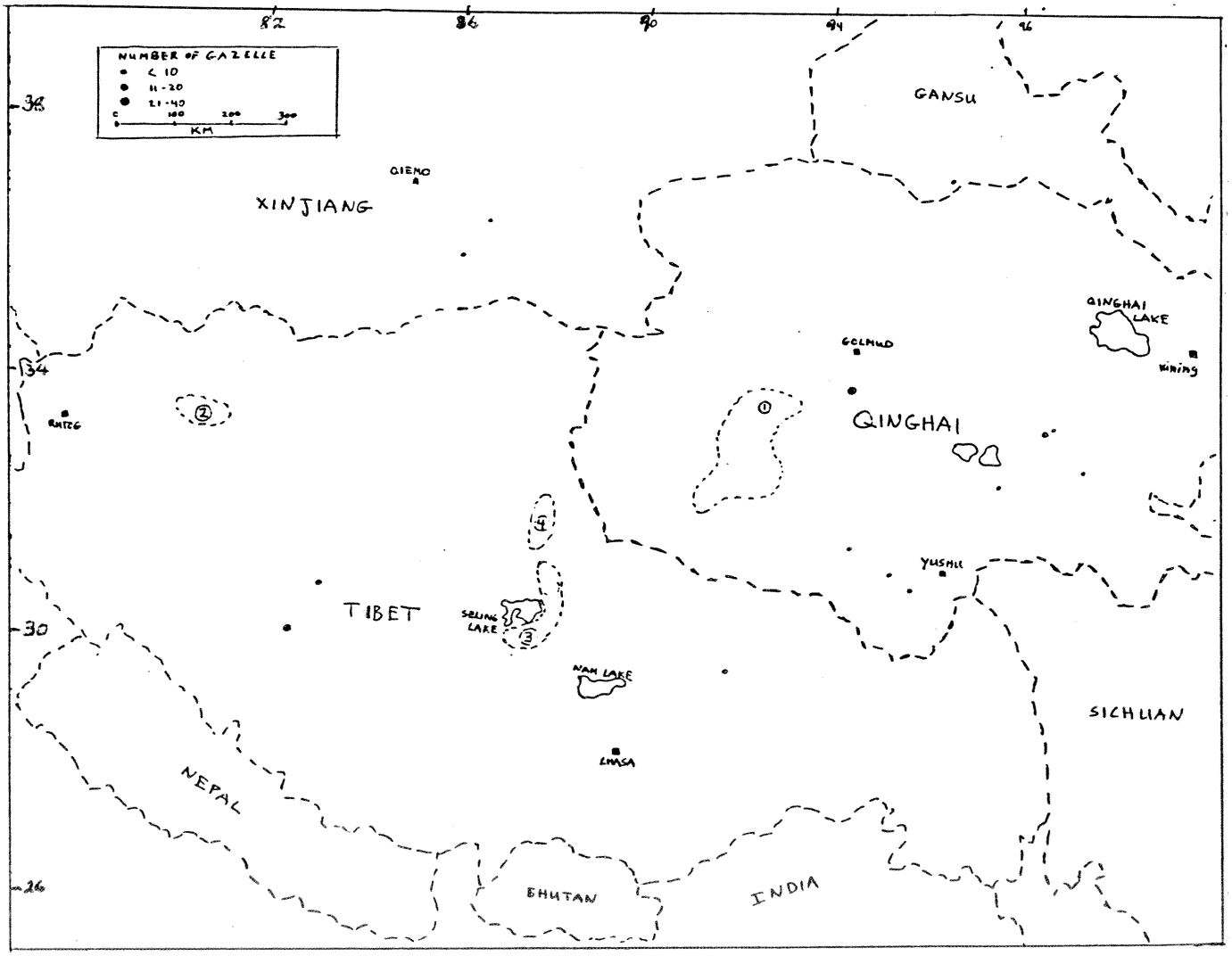
A subspecies of the saiga, a smaller animal with small horns, lives in the Mongolian Republic in a valley on the south side of the Altai Mountains. There are only a few dozen animals and Sokolov considers the need to study and protect this subspecies as urgent.

In Turkmania there is a considerable number of goitered gazelles *(G. subgutturosa). Procapra* from Mongolia also cross the border into Russia. In southern Mongolia and neighboring Inner Mongolia, Sokolov said the Chinese and Mongolians kill 100,000 *Procapra gutturosa* a year in the steppe zone.

TIBET

George Schaller sent in some notes on the Tibetan gazelle before returning to the field in August to resume his survey of Tibetan Plateau wildlife.

"In recent years," he writes (18 July 89), "whenever I traveled on China's Tibetan Plateau, I recorded any sighting of gazelles *(Procapra picticaudata)*. These gazelles were once probably the most abundant wild ungulate on the plateau, occurring on the plains and even in mountain valleys wherever grazing is good. Although still widespread, especially in Qinghai Province and the Tibet Autonomous Region, the species has been decimated and locally eradicated by hunters in most parts of its range. The decline has not surprisingly been most drastic where the human and livestock population is greatest, as in eastern Qinghai and southwestern Tibet. In these regions one only on occasion encounters a few gazelles after many miles of travel. In remote parts where herdsmen are scarce or absent, and where



pasturage may be sparse and sporadic, as in southwest Qinhai and northwest Tibet, gazelles persist in low but viable numbers; however unlike Tibetan antelope and Tibetan wild ass, they seem unable to survive in the most desolate parts, as in Tibet north of 34°N.

"On the enclosed map, I have indicated where I saw gazelles, and still found populations of reasonable size, though, when calculated as number of animals per km², densities are low indeed, probably on the order of one gazelle per 10 to 20 km². I tried to classify single animals and all herd members along my route of travel. Many adult males are alone or in small herds with up to 7 members. The largest gazelle herd comprised 11 females and 5 young. There were about 35 to 43 young to 100 females. Males tended to outnumber females, though this may reflect a sampling bias rather than the true population composition because males tend to aggregate in certain areas.

"These data are fragmentary and not particularly illuminating, but I thought that you might like to have them on file."

Composition of Tibetan gazelle population

Locality	Date	Adult Male	Yearling Male	Female	Young	Total
1. Wudaoliang	Nov. '85, 86	86	9	68	28	191
2. Aru Lake	Aug. '88	25	7	21	9	62
3. Seling Lake	Sept. '88	46	3	48	17	124
4. Shuanghu	Sept. '88	34	12	42	15	103

ANTELOPE SPECIALIST GROUP T-SHIRTS

For over a year I have been planning to produce Antelope Specialist Group T-shirts, as one way of raising funds for ASG projects. The opportunity to go to Rome spurred me to have100 T-shirts printed, using the original drawing (by Lisa Gemmill) of the giant sable logo that appears on the ASG letterhead. The design I came up with, largely by a process of trial and error, is shown nearly full size on the last page, as it appears on the shirt front.

The T-shirts, of pure cotton, pre-shrunk and sturdy, have proven as popular as I hoped: about 120 have been sold up to now (mostly at the SSC meeting, the ITC, and the Aridland Antelope Workshop). They come in four colors, green, light blue, yellow, and white, in all sizes, and sell for $15.00. To order, cut out and send in the form below, accompanied by a check or money order in dollars. Orders received by mid-November should be delivered before Christmas, if sent by airmail.

ASG T-SHIRT ORDER FORM

Quantity	Color	Size	Amount (@ $15.00 apiece)
Postage: $1.20 (3rd class) in USA			
Europe: $4.22 by air; 1.84 by sea			
Asia and Africa: $5.55 by air; 1.84 by sea			
Total			

NAME ADDRESS COUNTRY

Overseas orders must be paid by international money order or check drawn on a U. S. bank.

SEPTEMBER 1989 GNUSLETTER 16