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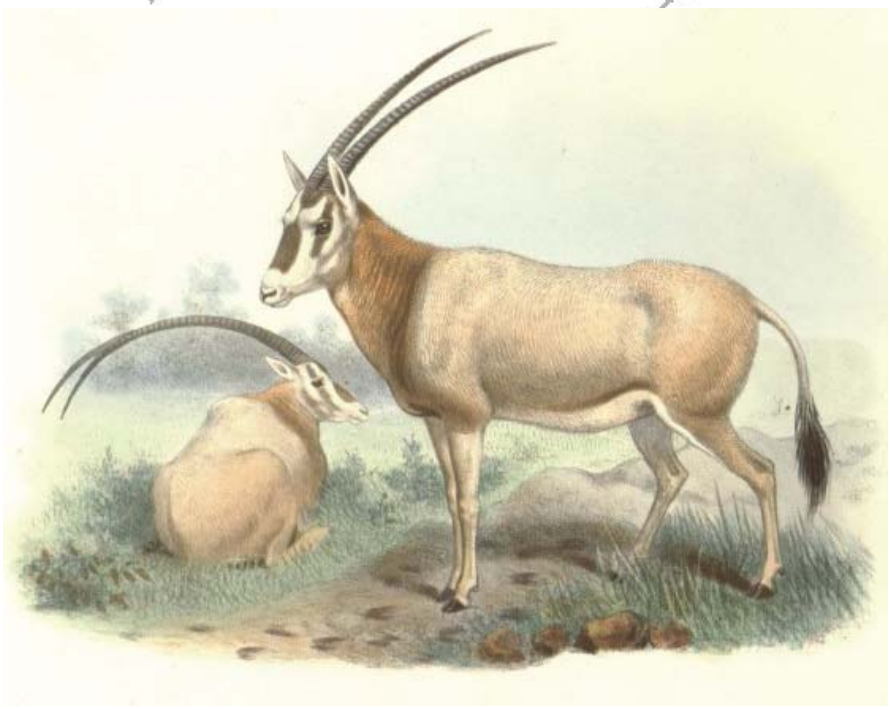

Convention on Migratory Species

CMS

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Action Plan for the conservation and restoration of Sahelo-Saharan antelopes 1998

Prepared by: R.C. Beudels-Jamar, P. Devillers and R.M. Lafontaine
Institut Royal des Sciences Naturelles de Belgique

Revised and adopted at the workshop on the conservation and restoration of Sahelo-Saharan antelopes, 19-23 February 1998, Djerba, Tunisia

Convention on the Conservation of Migratory Species of Wild

UNEP/CMS Secretariat
United Nation Premises in Bonn
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Germany

The Action Plan expands on the plan adopted by the 4th Conference of the Parties of the Convention on Migratory Species (Nairobi,1994), to which had contributed, besides the authors, Martine Bigan and Pierre Pfeffer.
It follows the model proposed by CMS and ICF for the Siberian Crane (1997).

Marie-Odile Beudels, Jean Terschuren-Devillers, Chris Kerwyn, Isabelle Bachy, Yves Laurent, Maurice Leponce, Olivier Noiret, Tommy Smith and Pierre Stassin have contributed to its finalization.

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- **Vlaams Ministerie van Leefmilieu**
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ACRONYMS LIST

CMS:	The Convention on Migratory Species
CMS Secretariat:	The CMS Convention Secretariat
CMS-SC:	The CMS Convention Scientific Council
IUCN:	The World Conservation Union International Union for Nature Conservation and Natural Resources
IUCN ASG:	IUCN Antelope Specialist Group of the IUCN Species Survival Commission
IUCN CBSG:	IUCN Captive Breeding Specialist Group
IUCN RSG:	IUCN Reintroduction Specialist Group
EAZA:	European Zoological Association
AZA:	American Zoological Association
SSP/EEP:	Species Survival Plans of the EAZA and AZA

CMS/CEM	La Convention sur les Espèces Migratrices
CMS Secrétariat:	Le Secrétariat des la Convention sur les Espèces Migratrices
CMS-SC:	Le Conseil Scientifique de la Convention sur les Espèces Migratrices
UICN:	L'Union Mondiale pour la Conservation de la Nature L'Union Internationale pour la Conservation de la Nature et des ressources naturelles
UICN ASG:	Le groupe des spécialistes des Antilopes de la Commission pour la Survie des Espèces de l'UICN
UICN CBSG:	Le groupe des spécialistes de la reproduction en captivité de l'UICN
UICN RSG:	Le groupe des spécialistes de la réintroduction de l'UICN
EAZA:	L'Association des jardins zoologiques européens
AZA:	American Zoological Association
SSP/EEP:	Species Survival Plans of the EAZA and AZA

PREFACE

The Sahelo-Saharan desert and savannah area of northern Africa is larger than the surface of all of Australia (7.7 million km²). The expansion of the desert in this region is a problem of global concern. The reasons are, inter alia, overgrazing, agricultural activities, and overexploitation of vegetation for domestic use, including overuse of trees and bushes as fuelwood (UNEP, Atlas of Desertification, 1992). As a consequence, soil degradation by wind and water are affecting the land's fertility.

Going hand in hand with this development, the region has almost entirely been cleared from many of the indigenous Antelopes. Five of them, *Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros* and *Gazella cuvieri* are in immediate danger of extinction, and a sixth one, *Gazella dorcas*, is in serious decline. These species are excellent indicators for the overuse of natural resources by their direct overexploitation and, indirectly, land degradation. Additionally, they could be an important component of an environmentally sound re-establishment of large areas. Their reintroduction into the wild would have ancillary benefits for the re-establishment of vegetation because, unlike livestock, they do not destroy the grass, but are important distributors of seeds of grass and other plants. They are well adapted to their surroundings, can stand long periods of drought, and are less sensitive than livestock against shortage of food and water. In addition, as examples from southern African regions prove, they could eventually be used economically: their meat is delicate and their skin can be processed into fine leather. The species are very attractive. They could become an important factor for the development of tourism, both for hunters and photographers. Not the least, once fully recovered, the populations could, and should, become again an important source for the food supply of the local people.

Antelopes are migratory, travelling large distances and disregarding political boundaries. Hence, they are a shared natural resource of the respective Range States. This implies common rights to the animals' sustainable use and a common obligation for their conservation. Antelopes are an important component of the regions biological diversity. The species' reintroduction in the wild would support the survival or reestablishment of many plant and animal species. Also, as indicated above, they could be useful indicators for the combat against desertification.

The organs of the ***Convention on the Conservation of Migratory Species of Wild Animals*** (Bonn Convention / CMS) have made a first approach to gather the Antelope experts of the Sahelo-Saharan Range States as well as internationally reputed experts from around the world in order to discuss possible action for the recovery of the endangered Antelope species of the region (Seminar in Djerba, Tunisia, 19-23 February 1998). The draft of this Action Plan was intensively discussed and, with useful amendments, adopted by consensus.

In addition in its ***"Djerba Declaration"***, the Seminar appealed strongly to the authorities of the Range States of the species concerned as well as non-Range States, to international governmental organisations and competent non-governmental organisations to assume commitments to assist in the transfer into action of the Action Plan. It reads:

"6. Invites

- all national and international governmental institutions inside as well as outside the range of the species concerned, to implement the Action Plan and to integrate it into their activities,
- international as well as supra-national governmental organisations, in particular the organs of the Convention on Biological Diversity (CBD), of the Convention on Desertification, of the Global Environmental Facility (GEF), of the World Bank, of the United Nations Development Programme (UNDP), of the United Nations Environment Programme (UNEP), the European Union, to support the implementation of the Action Plan by including recommended actions in the priorities of their work programmes and by providing technical and financial assistance to the development of transboundary co-operation and the implementation of concerted actions,
- all international and national non-governmental organisations involved in the conservation and sustainable use of African fauna and flora, to collaborate in the development and translation into action of projects put forward in the Action Plan;"

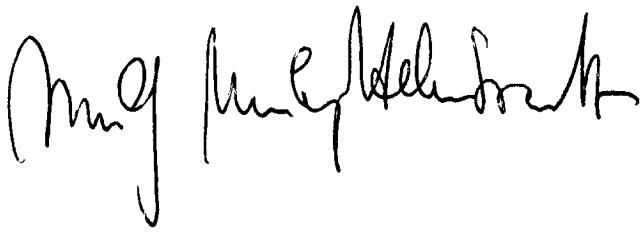
The joint implementation of this Action Plan could become an excellent example of, and even a model for, an integrated approach to implement more than one global convention at a time. The world community is called upon to implement the Action Plan as a joint venture under

- the Convention on the Conservation of Migratory Species of Wild Animals (CMS),
- the Convention on Biological Diversity (CBD)
- the Convention to Combat Desertification (CCD)and, maybe,
- the Framework Convention on Climate Change (FCCC).

The Executive Director of the United Nations Environment Programme (UNEP), Dr. Klaus Töpfer, recently deplored the fragmentation of competences and responsibilities by separate multilateral treaties in the environmental sector. It is, indeed, a challenge to see whether those governmental and non-governmental bodies working for the implementation of various conventions for the benefit of the environment as the living basis of mankind, are able and willing to cooperate for the recovery of the six Sahelo-Saharan Antelope species and their habitat.

An even greater challenge it will be for the world community to prove that it can be as effective in re-establishing wild animals and their ecosystems as men have been in their destruction.

Bonn, Germany, 30 May 1998



Arnulf Müller-Helmbrecht
Executive Secretary, CMS

INTRODUCTION

Circum-Sahara Africa has lost, over the historical period, more higher vertebrate species, birds and mammals, than any other region of the Palearctic. Such recent diversity loss of larger species exemplifies the severly threatened ecological status of Northern Africa, and is particularly worrying in the current context of general decline of local relictual populations of species still present in the desertic and sub-desertic habitats of the region. Among these, several species of Sahelo-Saharan ungulates are seriously threatened on a global level. Five of them, *Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros* and *Gazella cuvieri* are in immediate danger of extinction, and a sixth one, *Gazella dorcas*, is in serious decline.

Those six antelopes are among the most striking elements of the natural heritage common to fifteen Saharan and circum-Saharan countries. They have developed unique adaptations to the most arid environment, some of them adapted even to the most remote dunes of the Sahara.

The state of conservation of the first five species is very alarming. One of them, *Oryx dammah*, has not been observed since 1988, and is probably extinct in the wild. The other four have practically disappeared in several range states. A number of large protected areas, some of them established a long time ago, could potentially be home to important populations of Sahelo-Saharan antelopes. Several of those areas are now totally defunct, due to local or transborder conflicts; they would need to be rehabilitated and protection should be restored. The different types of habitats necessary to maintain these antelopes will restore themselves in most cases, providing proper conservation measures are applied.

Most of these species are preserved and reproduce in captivity in several zoos and private ranches throughout the world; the genetic material is at least partly maintained ex situ and captive nuclei will be used where reintroduction and reinforcement of populations are necessary.

The Sahelo-Saharan ungulates are among a group of threatened species listed in the Appendix I of the Convention for the conservation of migratory species (Bonn Convention or CMS), and identified as candidates for concerted actions by Parties to the Convention, under Resolution 3.2, 4.2 and 5.2 (Geneva 1991; Nairobi, 1994 ; Geneva 1997). In 1994, the Conference of the Parties of CMS adopted a resolution that recommended the development and the implementation of a plan of action for the conservation of the six ungulates. The text of this resolution was proposed by the following parties to the Convention: Morocco, Tunisia, Niger, Egypt, Mali, Burkina Faso, France and Belgium, and was based on documents prepared by France, the European Union, and Belgium.

A first project, representing the initial step toward the development and the implementation of the first plan of action, was initiated in mid-1996, financed by CMS, and co-ordinated by the Institut Royal des Sciences Naturelles de Belgique (IRSNB). The main objectives of the project included the compilation of comprehensive status reports of the respective species throughout the migration range based on the most recent surveys and reports, the up-dating and development of the 1994 draft Action Plan, and the organisation of a workshop of experts from the Range States, with specialised NGOs and co-operating IGOs. The workshop participant's main tasks was to examine the status reports and the proposed Action Plan, and to decide whether or not a Range State agreement should be developed under CMS.

During the course of the project, an Action Plan was developed, based on the findings on the conservation status of the different species and their habitats. The structure adopted was inspired directly by the Siberian Crane Action Plan developed also under CMS. This structure allows cross-consultation by species or by country.

A workshop on the conservation and the restoration of the six Sahelo-Saharan ungulates, organised by the CMS Secretariat and IRSNB, was held in Djerba, Tunisia, in February 1998, at the invitation of the Government of Tunisia. The different Range States were all represented, most of them by two representatives of the services in charge of nature conservation of each country. A number of aridland experts and representatives of International Organisations took an active part in the workshop. An important part of the work was spent revising the Action Plan: the current version includes the amendments proposed during the meeting.

The Seminar also debated on the opportunity to develop an agreement under the terms of CMS. Participants approved the idea, on the basis that such an agreement would serve the conservation interest of the species ; they asked CMS secretariat to initialise the process.

A Working Group was set up, constituted of members of the Scientific Council do CMS who initiated the preliminary work for the concerted action, the councillors of the Range States, as well as a number of experts in the field.

The Action Plan, approved by the Djerba workshop, will be distributed to funding agencies prior to the development of projects for the conservation and the restoration of Sahelo-Saharan ungulates, essential elements for the sustainable development of the arid and semi-arid regions of Sahelo-Saharan Africa.

DJERBA DECLARATION

Seminar on the Conservation and Restoration of Sahelo-Saharan Antelopes
(Djerba, Tunisia, 19-23 February 1998)

Representatives of the Governments of the Range States of six endangered Sahelo-Saharan antelope species, *Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros, Gazella cuvieri, Gazella dorcas*, together with representatives of neighbouring countries of scientific institutions, of non-governmental organisations and a panel of experts met at Djerba, Tunisia, from 19-23 February 1998, for the purpose of:

- reporting on the conservation status of the species in each Range State,
- amending and adopting an Action Plan for the conservation and restoration of the species and their habitats,
- discussing the medium and long-term concerted actions and international co-operation, including the possibility of developing an Agreement under the auspices of the Convention on the Conservation of Migratory Species (CMS/Bonn Convention).

The Seminar was convened by the Secretariat of the Convention on the Conservation of Migratory species (UNEP/CMS) on behalf of the Conference of the Parties, at the initiative of the Scientific Council of the Convention. Preliminary status reports on the conservation of each of the six species and a preliminary Action Plan had been prepared in advance by the Institut Royal des Sciences Naturelles de Belgique (IRSNB).

The Range States represented were: Algeria, BURKINA FASO[1], CHAD, EGYPT, Ethiopia, Libyan Arab Jamahiriya, MALI, Mauritania, MOROCCO, NIGER, NIGERIA, SENEGAL, Sudan, TUNISIA.

BELGIUM, FRANCE, GERMANY and the KINGDOM OF SAUDI ARABIA, the latter representing, *inter alia*, the Chair of the CMS Standing Committee, were also represented each by one or more governmental representatives and/or by one or more experts.

The Seminar was chaired by Dr. Ahmed Ridha Fekih Salem, Director General, Department of Forests, Ministry of Agriculture of the Republic of Tunisia. The UNEP/CMS Secretariat, represented by its Executive Secretary, Mr. Arnulf Müller-Helmbrecht, and the Institut Royal des Sciences Naturelles de Belgique (IRSNB), represented by Dr. Roseline Beudels-Jamar de Bolsée, representing also the Chair of the CMS Scientific Council, acted as the secretariat for the Seminar.

The representatives of the Range States as well as a number of invited experts presented reports on the distribution, the conservation status, habitats, trends, population dynamics, causes of decline and measures undertaken for the conservation and recovery of the six species. These reports confirmed the extreme precariousness of the conservation status of the Sahelo-Saharan ungulates in the wild, and the urgency of implementing an Action Plan.

Six Working Groups, meeting in two parallel sessions, reviewed and amended the draft Action Plan prepared by the IRSNB.

The Seminar, meeting in Plenary, also debated the opportunity of developing, under CMS, an Agreement between the Range States, as well as the means necessary to develop international co-operation to restore, conserve and manage the species.

The Seminar:

1.

[1] States in capital letters are Parties to CMS

- thanks the Government of Tunisia, represented by the Minister of Agriculture, for its generous hospitality,
- thanks the various agencies and institutions that contributed to the holding of the meeting, in particular:
  - the Conference of the Parties of CMS;
  - the Department of Forests, Ministry of Agriculture of Tunisia;
  - the Environment Ministry of the Flemish Region of Belgium;
  - the Services of the Prime Minister for Scientific, Technical and Cultural affairs of Belgium;
  - the Ministry of the Environment of France;
  - the Federal Ministry for Economic Co-operation and Development of Germany (Bundesministerium für Wirtschaftliche Zusammenarbeit und Entwicklung);
  - the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety of Germany (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit);
  - the United Nations Environment Programme;
- forwards its thanks to the COP of CMS, represented by the UNEP/CMS Secretariat, and to the IRSNB, for the organisation of the meeting and for the co-ordination of the scientific inputs aimed at the restoration and conservation of Sahelo-Saharan antelopes;
- thanks its Chairman, Dr. Ahmed Ridha Fekih Salem, Director General of the Department of Forests of Tunisia, for his excellent guidance of the meeting;

2. better informed of the critical conservation status of the six species concerned thanks to the reports compiled by IRSNB and those submitted by the experts of Sahelo-Saharan countries, calls upon governments of the Range States to increase their efforts towards conservation and restoration of these species and their habitats;

3. congratulates the Range States and contributing governmental and non-governmental organisations which have undertaken projects with commendable results, and encourages them to continue their efforts and to assist other Range States including financial assistance in benefiting from their experience;

4.
- informed that serious damage is being inflicted to the wildlife of several Sahelo-Saharan countries, particularly to highly endangered species, among which are the antelopes, by foreign hunters and falconers,
- considering the commitment of the countries concerned, confirmed by their ratification of a number of international conventions, to restore and/or maintain sustainable populations of these species,
- considering also the negative impact that such activities have on:
  - the conservation status of the highly endangered species concerned, some of which are on the brink of extinction;
  - the conservation efforts undertaken by all the local actors for the enforcement of their respective countries' laws and regulations;
  - the continued assistance of the international community to the conservation efforts undertaken;
- deeply concerned by the disastrous consequences that such practices, often illegally and excessively carried out, will have, if they continue, on the wild resources and their future,
- appeals to all countries concerned to comply fully with the relevant provisions of the appropriate international conventions;

5. adopts the Action Plan, and requests the Secretariat of the Seminar to finalise it according to its recommendations and to distribute it to all the participants to the Seminar as well as to all organisations competent at national and international level;

6. invites
- all national and international governmental institutions inside as well as outside the range of the species concerned, to implement the Action Plan and to integrate it into their activities,
- international as well as supra-national governmental organisations, in particular the organs of the Convention on Biological Diversity (CBD), of the Convention on
- Desertification, of the Global Environmental Facility (GEF), of the World Bank, of the United Nations Development Programme (UNDP), of the United Nations Environment Programme (UNEP), the European Union, to support the implementation of the Action Plan by including recommended actions in the priorities of their work programmes and by providing technical and financial assistance to the development of transboundary co-operation and the implementation of concerted actions,

- all international and national institutions involved in the conservation and sustainable use of African fauna and flora, to collaborate in the development and translation into action of projects identified in the Action Plan;

7. urges the Range States of Sahelo-Saharan ungulates to develop and conclude an Agreement under the auspices of CMS in order to provide a framework for the species' long-term conservation and management;

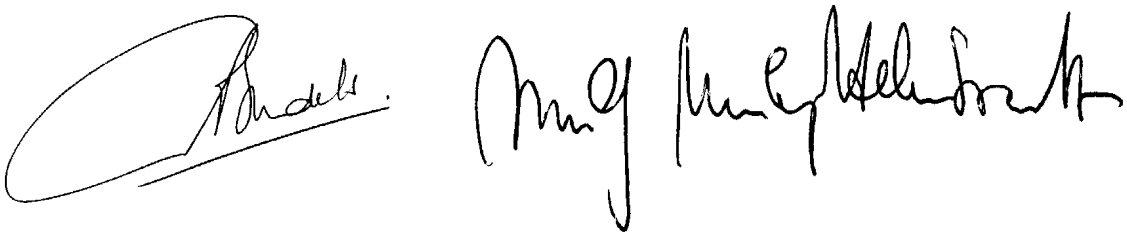
8.
- decides to set up a Working Group of experts who will collect and circulate the necessary information:
  - to enable experts from national and non-governmental organisations to develop appropriate projects;
  - to provide Range States with a catalogue of appropriate measures for the development of site-management plans, for capacity building, training, research and public awareness;
  - to facilitate the integration of conservation needs into other policy-sectors such as agriculture, forestry or wise use of fauna;
  - to prepare, for Range States, proposals that allow for the integration of local community development with ecosystems, habitats and species conservation;
- the Working Group will report, through the Convention Secretariat, to the Scientific Council and to the Standing Committee of CMS;

9.
- decides to meet again in two years to:
  - review the work performed,
  - update the Action Plan,
  - discuss possibilities of improving its implementation on the basis of the experience gained,
- and requests CMS to organise such a meeting and to seek the necessary funds;

10. calls upon those Sahelo-Saharan countries who have not done so to accede to CMS as soon as possible and to implement it.

Done at Djerba, Republic of Tunisia, on the 23 day of February, 1998

Confirming the correct wording of the Seminar's declaration:



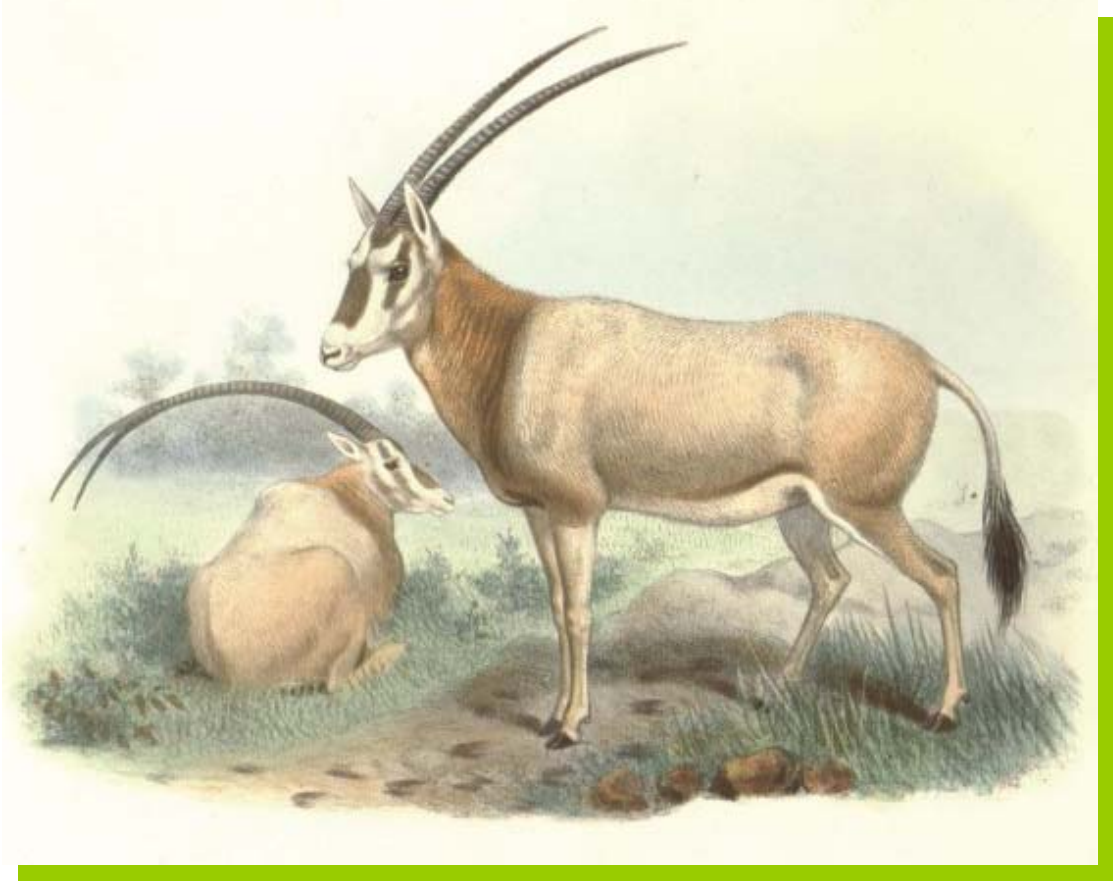
Dr. Roseline C. Beudels-Jamar de Bolsée
Institut Royal des Sciences Naturelles de Belgique
(IRSNB), Brussels, Belgium

Arnulf Müller-Helmbrecht
UNEP/CMS Secretariat,
Bonn, Germany

Date: 25 March 1998

Report on the status and perspectives of a species

Oryx dammah



Report prepared by Pierre Devillers and Jean Devillers-Terschuren
Institut royal des Sciences naturelles de Belgique

This report is based on documents prepared for the Convention on Migratory Species by Pierre Pfeffer (1993b, 1995) and on supporting documents for the action plan on Sahelo-Saharan antelopes adopted by the 4th Conference of the Parties of the Convention, documents that were prepared by Roseline C. Beudels, Martine Bigan, Pierre Devillers and Pierre Pfeffer (1994). The information it contains originates mainly from the general accounts and regional action plans edited by Rod East (1988, 1990), and the fundamental work of Hubert Gillet (1965, 1969) and John E. Newby (1974, 1988, in particular). It is completed by a new review of the literature and a survey of actors in the field conducted in 1996 and 1997 by Tommy Smith (1998) with the support of Koen De Smet. Roseline C. Beudels, René-Marie Lafontaine, Marie-Odile Beudels, Tommy Smith, Yves Laurent and Chris Kerwyn have contributed to the preparation and finalising of this report.
Original in french; translation by Roseline C. Beudels and Jean Devillers-Terschuren

Cover drawing: J. Smit, in Sclater and Thomas, 1899.
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1. Taxonomy and nomenclature

1.1. Taxonomy.

Oryx dammah belongs to the tribe Hippotragini, subfamily Hippotraginae, family Bovidae, which comprises one extinct species and seven surviving species together with two evolutionarily distinct subspecies in genera *Oryx, Addax* and *Hippotragus* (Simpson, 1945; Corbet, 1978; Murray, 1984; Corbet and Hill, 1986; Wacher, 1988). All hippotraginids are adapted to the exploitation, at low density, of difficult, low-productivity habitats (Kingdon, 1982; Murray, 1984; Wacher, 1988; Beudels, 1993). Genus *Oryx* comprises five evolutionary isolates, of which one, *Oryx leucoryx*, is adapted to deserts, three, *Oryx dammah*, *Oryx gazella beisa*, *Oryx gazella gazella*, to subdesert or semidesert habitats, the last, *Oryx gazella callotis*, to somewhat more productive savannas (Wacher, 1988).

1.2. Nomenclature.

1.2.1. Scientific name.

Oryx dammah (Cretzschmar, 1826)

1.2.2. Synonyms.

Antilope gazella, Cerophorus gazella, Oryx gazella, Cemas algazel, Aegoryx algazel, Antilope algazella, Oryx algazella, Antilope tao, Oryx tao, Antilope leucoryx, Oryx leucoryx, Antilope ensicornis, Oryx ensicornis, Antilope bezoartica, Oryx bezoarticus, Antilope dammah.

1.2.3. Common names.

English: Scimitar-horned Oryx, Scimitar Oryx.
Arabic: Wach, Begar al Ouach.
French: Oryx algazelle, Algazel (Buffon, 1764), Algazelle (Cuvier, 1819), Antilope oryx, Oryx blanc.

2. Biological data

2.1. Distribution.

2.1.1. Historical distribution.

The historical distribution of permanent or temporary presence and of movements of the Scimitar-horned Oryx includes all of Saharan and sub-Saharan North Africa between the Atlantic and the Nile. However, this range was never uniformly occupied, the distribution and extent of effective presence of individuals having always been conditioned by the location of sub-desert zones to which the Oryx is adapted. the Scimitar-horned Oryx seems to need, within an area compatible with its capability of seasonal migrations, an adequate time sequence of therophyte pastures, perennial graminid formations and dry woodland, notably of acacias (Brouin, 1950; Malbrant, 1952; Gillet, 1965, 1969, 1970; Newby, 1974, 1988; Dragesco-Joffé, 1993). This combination of habitats is especially characteristic of regions where annual precipitation is between 75 and 400 mm (Newby, 1988; Thomas and Newby, 1990). In the arid conditions that have prevailed in the Sahara over the last three millennia (Le Houérou, 1986; Newby, 1988), these requirements essentially limit the potential distribution of the species to the northern and southern subdesert fringes, that is, to the Sahel and the Mediterraneo-Saharan transition zone (Rattray, 1960; White, 1983; Le Houérou, 1986; Ayyad and Ghabbour, 1986; Monod, 1986; Newby, 1988; Ozenda, 1991). The ecological conditions favourable to the species can also develop, although on more restricted surfaces or in an unstable manner, in the Atlantic Sahara and surrounding areas (Rattray, 1960; White, 1983; Ozenda, 1991), on the periphery of entral Saharan mountains (Rattray, 1960; White, 1983; Le Houérou, 1986; Ozenda, 1991), and in locations with particular access to the water table (Le Houérou, 1986), notably around large aeolian depressions of the Libyan Desert (Osborn and Helmy, 1980; Ayyad and Ghabbour, 1986; Zahran and Willis, 1992).

The main, Sahelian, range of *Oryx dammah* coincides with the Sahel semi-desert grassland of White (1983), forming his unit 54a in region XVI. This well-characterised band is also the sub-Saharan *Aristida* steppe zone of

Rattray (1960), comprising his units A11, A13, A15, the sub-desert steppes of Newby (1974), the Saharan savannas of Schulz (1988) and of Ozenda (1991). They extend across southern central Mauritania between 18° N (locally 20°) and 16° N, central Mali between 18° and 15°, Niger between 17° and 15°, Chad between 17° and 14°, and Sudan between 17° and 12° 30' (Malbrant and Maclatchy, 1949; Brouin, 1950; Audas, 1951; Dekeyser, 1955; Gillet, 1965, 1969, 1970; Kock, 1970; Newby, 1974, 1975, 1988; Lamprey, 1975; Schnell, 1976; Wilson, 1978, 1980; Monod, 1986; Ayyad and Ghabbour, 1986; Hillman and Fryxell, 1988; Sournia and Verschuren, 1990; Heringa, 1990; Grettenberger and Newby, 1990; Thomassey and Newby, 1990; Millington *et al.,* 1991; Dragesco-Joffé, 1993; Hashim, 1996). The range of the Oryx also included more southern latitudes, advancing into the band of Sahelian deciduous bushland (White, 1983, region XVI, unit 43), in particular, in Senegal (Sournia and Dupuy, 1990), in Burkina Faso (Heringa *et al*., 1990), in Mauritania (Trotignon, 1975), in Chad (Gillet, 1965; Newby, 1974), in the Sudan (Audas, 1951; Kock, 1970; Wilson, 1980), and even into the Sudanian dry woodlands (White, 1983, region III, unit 29a), notably in Chad, where the 11th parallel was reached during exceptionally dry years (Gillet, 1965) and probably in the Sudan (Audas, 1951). The range of the species also extended northwards to 20° N, in the favourable conditions of the Nile Valley of Sudan (Kock, 1970).

A subdesert fringe somewhat equivalent to the Sahel occurs north of the Sahara in the transition zone between the Mediterranean region and the desert. It is formed of the submediterranean steppe band with *Stipa tenasissima* and *Lygeum spartum* (Rattray, 1960, units ST1, ST2, ST3; White,1983, region XVIII, unit 55), including *Argania spinosa* woodland (unit 49) or *Acacia gummifera* woodland (unit 79), completed by a part of Rattray's (1960) northern *Aristida* pre-steppe band, forming his unit A16. This Mediterraneo-Saharan fringe is developed over some width and with some continuity only between the Atlantic, where it descends to 27° N, and Tunisia (Rattray, 1960; White, 1983). It exists in a fragmentary way in extreme northwestern and extreme northeastern Libya. The presence of the Oryx in this Mediterraneo-Saharan zone was documented during Roman times, at least in Algeria (Heim de Balsac, 1931; Kowalski and Rzebik-Kowalska, 1991) and Tunisia (Sclater and Thomas, 1899). Climatic conditions then were similar to those that prevail today, but the habitats were very different, with an important representation of thermomediterranean and sub-Saharan dry forests, often dominated by Aleppo Pines (*Pinus halepensis*) or Arbor-vitae (*Tetraclinis articulata*), and of Mediterraneo-Saharan steppes and wooded steppes (Le Houérou, 1986; Damblon and Vanden Bergen, 1993). The Oryx was then associated with several species that are now distinctly Sahelo-Sudanian, in particular, the Bubal, *Alcelaphus buselaphus* and the African Elephant, *Loxodonta africana*. There is no documentation of the presence of stable populations of the species in the Mediterraneo-Saharan zone posterior to Antiquity nor any indication as to choice of habitat in this zone. The last record for Tunisia is from the 20th century (Lavauden, 1920), but its location is imprecise and it could pertain to erratic animals wandering from southern regions, which could also be the case of two Libyo-Egyptian records, one hypothetical (Hufnagl, 1972), the other confirmed (Osborn and Helmy, 1980). In Algeria the only post-Antiquity records date from the 16th century and are hypothetical (Kowalski and Rzebik-Kowalska, 1991). In Morocco, no historical records exist except in the Atlantic region, from the Oued Noun southwards (Joleaud, 1918), including the Drâa basin (Loggers *et al*., 1992). This region was, however, probably part of the range of Sahelian populations, reaching it across the Atlantic Sahara.

Several central Saharan or south Saharan massifs (Heim de Balsac and Mayaud, 1962; Simon, 1965; Ozenda, 1991) offer steep gradients of humidity and vegetation with precipitation attaining 1100 mm in the higher altitudes (Rattray, 1960). They include notably sub-desert steppes with *Aristida*, *sensu* Rattray (1960), corresponding to his unit A14, and various ligneous formations (Schnell, 1977; Ozenda, 1991), in particular, in the valleys. Thus, locally, they reproduce conditions somewhat similar to those of the Mediterranean and Sahelian sub-desert fringes. The southernmost constitute protruding peninsulas of the Sahel (Monod, 1986), rather than islands, or are enclaved in the Sahel. They are the Adrar des Iforas in Mali, the Aïr in Niger, the Ennedi in Chad, the Darfur in the Sudan. All have been part of the Sahelian range of the Scimitar-horned Oryx. The other massifs are insular (Heim de Balsac and Mayaud, 1962; Ozenda, 1991). They include the vast complex formed by the Hoggar and the Tassili des Ajjers in Algeria, the Tibesti in Chad and Libya, the Djebel Uweinat within the confines of Libya, Sudan and Egypt. In these regions there is no indication of a stable presence of the Oryx in historical times (Regnier, 1960; Gillet, 1969; Osborn and Krombein, 1969; Hufnagl, 1972; Misonne, 1977; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991). Dalloni's (1936) mention for the Tibesti is apparently not based on any record except rock carvings, and Wilson's (1980) record is erroneous since he cites Blancou (1958) who reported on Chad and never on the Tibesti.

The Atlantic Sahara is a cold-current coastal desert. It is an attenuated desert (Monod, 1958; Ozenda, 1991) in which atmospheric humidity and low evaporation compensate the reduced precipitation (Valverde, 1957). These conditions allow the Sahelian flora and fauna to penetrate far north (Valverde, 1957). This coastal desert comprises a narrow coastal band, from 30 to 60 km wide, forming the oceanic Sahara or Atlantic coastal desert (Valverde, 1957; Quézel, 1965; Schnell, 1977; White, 1983, unit 68a; Ozenda, 1991), and a sublittoral zone, extending to 200 or 300 km from the coast, with an abundance of steppes and acacia stands (Valverde, 1957; Rattray, 1960; Quézel, 1965; Schnell, 1977; Ozenda, 1991). This zone is located almost entirely within the former Spanish Sahara and northwestern Mauritania. It is in contact with the Mediterraneo-Saharan zone in the north, the transition being at

about 27° N according to White (1983), farther north according to Edmondson *et al.* (1988). In the south, it is in contact with the Sahel, losing its oceanic character around 18° N (White, 1983). The acacia woods and associated steppes of the oceanic subzone, limited in northern areas to favourable sites, notably at the foot of escarpements (Valverde, 1957; Lafontaine, 1995), become more and more numerous and extended, while taking on a more and more Sahelian character, in the south (Valverde, 1957; Schnell, 1977; Ozenda, 1991). Numerous observations of the Scimitar-horned Oryx have been made in the Atlantic Sahara, particularly in the southern part, until the middle of this century (Morales Agacino, 1950; Valverde, 1957; Loggers *et al*., 1992). This range was in continuity with the Sahelian range and Müller (1996) suggests that it is during periods of drought in the Sahel that the species occupied the Atlantic Sahara as well as the southern Atlantic part of the Mediterraneo-Saharan zone. This hypothesis of irregular presence is coherent with the records given by Morales Agacino (1950). Valverde (1957) suggests, however, a permanent presence in the pre-Sahelian Atlantic Sahara.

A disjunct range of the Scimitar-horned Oryx persisted until the middle of the 19th century in the Libyan Desert of Middle Egypt, in regions of extremely low precipitation, less than 50, or even 25, mm (Kock, 1970; Osborn and Helmy, 1980). The range was evidently linked to the great oases formed in the vast aeolian depressions reaching to the water table, characteristic of this desert (Osborn and Helmy, 1980; Ayyud and Ghabbour, 1986; Le Houérou, 1986; Goodman *et al*., 1986; Zahran and Willis, 1992). These depressions and the adjacent areas supported woods of acacias (*Acacia raddiana, A. ehrenbergiana*) and palms (*Hypophaene thebaica*) and dense grassy steppes, in a combination of habitats with a Sahelian physiognomy (Osborn and Helmy, 1980). Moreover, the distribution of the Scimitar-horned Oryx coincided with that of *Alcelaphus buselaphus*, a distinctly more mesophile species. Essentially limited to Egypt, these oases extend just over the Libyan border at Jaghbub (Bundy, 1976; Goodman *et al.*, 1986). The oases where a historical presence of the Oryx is documented (Kock, 1970; Osborn and Helmy, 1980) include Siwa in the northwest, Wadi Natroun, Faiyum and Wadi el Ruwayan near the lower Nile, Dakhla and the Kharga complex between 24° and 26° N.

It is possible that other areas of presence have existed within historical times, and perhaps as late as the 19th century or the beginning of the 20th century, in Saharan regions where suitable, though probably fragile and unstable, vegetation complexes would have occurred in conjunction with wadi systems or the piedmont of hill ranges. The occupation of such areas by stable populations could explain frequent occurrences in regions far removed from presently known centres of distribution, such as the recurrent captures in southern Tunisia at the end of the 19th century and at the beginning of the 20th century (Lavauden, 1920; Kacem *et al*., 1994). Precise data do not, however, seem to be available to document such a possibility.

2.1.2. Decline of the range.

The range of the Scimitar-horned Oryx has regressed continuously since Antiquity. The northern sub-Saharan range ceased supporting permanent populations at an unknown date, but almost certainly before the 19th century and in any case by the second decade of the 20th century. (Lavauden, 1920; Kowalski and Rzebik-Kowalska, 1991; Loggers *et al*., 1992). The generalised destruction of the habitat goes back to Roman times (Le Houérou, 1986) and follows a regressive sequence, irreversible by spontaneous processes, that leads to the disappearance of the Mediterranean dry forests, then of their substitution steppes (Le Houérou, 1986). During the same periods, large-scale taking of all large North African animals was taking place (Newby, 1988). The oases of the Libyan Desert were abandoned by the Oryx at the beginning of the second half of the 19th century (Osborn and Helmy, 1980), the Atlantic region in the middle of the 20th century (Newby, 1988). The Sahelian range was still almost continuous in the 1960's (Gillet, 1969), fragmented into several major nuclei in the 1970's (Newby, 1988), apparently reduced to two fragments, in Niger and in Chad, at the beginning of the 1980's, and, finally, to one in Chad (Newby, 1988). Table 1, taken from Newby (1988), summarises the probable dates of disappearance of the species in each country within the historic range. Figure 1 summarises schematically the evolution of its range.

Table 1. Dates of probable extinction of the Scimitar-horned Oryx in the countries within its range, after Newby (1988).

Country	Probable date of extinction compiled by Newby (1988)	Possible late observations, probably of vagrants
Morocco	1930's	
Ex-Spanish Sahara	1963	1973 (a)
Algeria	1960's	1987 (b)
Tunisia	1906 (vagrants?)	
Libya	1940's (vagrants?)	
Egypt	1860's (c)	1975 (c)
Mauritania	1960's	

Mali	1981	
Niger	1983?	1986 (d)
Chad	surviving	
Sudan	1978	
Senegal	1850's	
Burkina Faso	1950's	1986 (e)

(a) Le Houérou, 1992; (b) De Smet and Mallon, 1997; (c) Osborn and Helmy 1980; (d) Millington *et al*., 1991; (e) Heringa *et al*., 1988.

Figure 1. Historical distribution of the Scimitar-horned Oryx *Oryx dammah.*

1. Sahelian nuclei surviving at the beginning of the 1980's (Newby, 1988).
2. Sahelian distribution in the 1960's (Gillet, 1969).
3. Main Sahelian range (Sahelian vegetation 54a of White, 1983)
4. Atlantic range occupied until the 20th c. (Trotignon, 1975; Loggers *et al*., 1992)
5. Libyan Desert range in Egypt occupied until the 19th c. (Osborn and Helmy, 1980)
6. Probable southern Mediterraneo-Saharan range, Antiquity (zones 55, 49, 79 of White, 1983)
7. Central Saharan massifs, no historical data.

2.1.3. Residual distribution.

The only population of Scimitar-horned Oryx for which survival is probable is that of the Sahelian regions of Chad south of the Ennedi, in the Ouadi Rimé-Ouadi Achim region (Newby, 1988; Thomassey and Newby, 1990; Moksia and Reouyo, 1996), where the species has not, however, been seen since the 1980's, in spite of searches carried out since 1991 (Pfeffer, 1993a, 1993b, 1995; Beudels *et al*., 1994; Tubiana, 1996a, 1996b). Other regions where a possible survival could be confirmed include the border region between Mali and Burkina Faso (Duvall *et al*., 1997), the Adrar des Iforas in Mali (Kowalski and Rzebik-Kowalska, 1991), the Aïr-Ténéré-Termit in Niger (Grettenberger and Newby, 1990), the Wadi Howar region in the northern Darfur in Sudan (Hashim, 1996).

2.1.4. Recolonisation prospects.

The zone of potential distribution of the Scimitar-horned Oryx is the subdesert. It lies between two boundaries, of which one is the limit of the more desert-like regions of the Sahara, the other the more mesic regions of the Sahelo-Sudanian or Mediterranean zones. Towards the desert, the limit is clearly climatic, corresponding to the degree of

aridity beyond which adequate grazing land is unable to develop or to maintain itself. Towards the Sudanian and Mediterranean regions, on the contrary, the limit is probably a matter of interaction with other species. Competition with more mesophilous wild ungulates and predation probably play a role, and Brouin (1950) evokes the abundance of parasites as a limiting factor in the south during the rainy season. It is certain, however, that nowadays it is competition with domestic herds and human predation that are the determining factors. The pockets of survival of the species are located in zones of compromise between a too extreme aridity and a too strong human pressure. It is the least unfavourable combination of these two factors that must be sought for the reintroduction or recolonisation zones. Moreover, the more these are located in climatically marginal zones the more they require seasonal displacements and thus vital space (Newby and Sayer, 1976).

Human occupation in the Sahel increased considerably in the middle of the 20th century under the combined effects of a relative peace, above average precipitation, and the boring of deep wells (Newby, 1988). Overgrazing has become generalised, agriculture has progressed and hunting has become motorised and has become universal (Gillet, 1969, 1970; Newby, 1974, 1988; Wilson, 1978; Ayyad and Ghabbour, 1986). Recent Sahelian zones of presence of *Oryx dammah* correspond generally to the proximity of mountain or hill ranges that widen the zone of favourable habitats, augment their diversity and circumscribe regions of reduced accessibility. They obviously constitute the first possibilities to consider for habitat protection or reintroduction efforts. They are, by order of importance, the Ouadi Rimé-Ouadi Achim zone south of the Ennedi in Chad (Gillet, 1965, 1969; Newby, 1974, 1988; Thomassey and Newby, 1990; Dragesco-Joffé, 1993; Pfeffer, 1993a, 1995), the Termit in Niger (Lhote, 1946; Jones, 1973; Newby and Jones, 1979; Newby and Grettenberger, 1986; Newby, 1988; Grettenberger and Newby, 1990; Millington *et al.*, 1991; Bousquet, 1992; Dragesco-Joffé, 1993; Poilcot, 1996a, 1996b), the Wadi Howar zone and the north of the Darfur in Sudan (Lamprey, 1975; Wilson, 1978, 1980; Hashim, 1996), with the neighbouring Chadian massifs, the Adrar des Iforas in Mali (Lhote, 1946; Sayer, 1977; Sidiyène and Tranier, 1990) and its periphery, in southern Algeria (De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991), the southeast of Mauritania (Trotignon, 1979; Vincke *et al*., 1987).

A second approach could rely on the more southerly zones of the range, probably the most favourable to restoration on a small surface, as long as human pressures can be controlled in regions of high human occupation. Several relatively detailed analyses of the ecology of *Oryx dammah*, carried out during periods when it was still well represented (Lhote, 1946; Brouin, 1950; Audas, 1951), insist on the favourable character of the southern part of its Sahelian range and suggest that the restriction of the Scimitar-horned Oryx to the northern fringes is a result of human pressure and was not ecologically happy. The Ferlo in Senegal (Bille *et al*., 1972; Bille and Poupon, 1972; Sournia and Dupuy, 1990; Diop *et al*., 1996; Clark, 1996), the Gourma region (Réserve des Eléphants) in Mali (Pavy, 1996), the Ansongo-Menaka reserve at the Mali-Niger border (Heringa, 1990), Sahelian Burkina Faso (Heringa *et al*., 1990) and the Gadabedji reserve in Niger (Dixon and Newby, 1989; Grettenberger and Newby, 1990) appear, in this optic, as interesting deployment possibilities. Protection of the Oryx was, originally, the principle objective the Gadabedji reserve (Newby, 1988).

In the Mediterraneo-Saharan transition region, habitat degradation dates back to Antiquity and was already advanced in the first centuries of our time. Le Houérou (1986) indicates that dry forests, most often dominated by *Pinus halepensis* or *Tetraclinis articulata* occupied most of the arid zone. He shows that *Stipa tenacissima* steppes succeeded them but that they cannot regenerate in the absence of the protective shade of the trees. Over-exploitation transforms them into shrub formations poorly suited for pasturage. Nearer the desert, these habitats are supplemented by formations of *Acacia raddiana* and relatively fragile subdesert steppes (Le Houérou, 1986). By extrapolation from what is known of the ecology of the Scimitar-horned Oryx in the Sahel, it can be hypothesised that the woods of *Acacia raddiana,* with their accompanying cortège, and the sub-Mediterranean steppes of *Stipa tenacissima* or sub-desert steppes of *Aristida* that flank them constitute the optimal reimplantation zone for the Oryx in the southern Mediterraneo-Saharan fringe (Kacem *et al*., 1994). Adequate woodland, in juxtaposition with steppes, do not seem to subsist except in a very few places. In Tunisia, Kacem *et al*. (1994) indicate that the conditions favourable to the reintroduction of the Oryx exist only in the region of Bou Hedma. Müller (1996) identifies a region with similar characteristics in the lower Drâa valley in Morocco. These two sectors appear thus to be by far the most important for the redeployment of the species in the Mediterraneo-Saharan zone. Other localities can be considered, for example, in Tunisia, the region of the Sidi Toui National Park and the edge of the Great Eastern Erg (Kacem *et al*., 1994), but they would probably need considerable manipulations of the habitat, in particular, the reimplantation of *Acacia raddiana* and its cortège (Kacem *et al*., 1994). More Mediterranean sites, in which open dry forests of *Pinus halepensis* or *Tetraclinis articulata* and *Stipa tenacissima* wooded steppes persist or could be rehabilitated, might also be considered.

It is not entirely clear that the Atlantic Sahara constituted, in the recent past, a zone capable of permanently harbouring autonomous populations of the Scimitar-horned Oryx, without exchange with the Sahel. Nevertheless, an attempt at establishment should be made, by means of protection and, if the case arises, restoration of the habitat. The projected national park in the Dakhla region, in the zone of the highest density of historical observations of

Oryx dammah (Loggers *et al*., 1992), offers the most favourable site, on the condition that sub-oceanic ensembles of grassy steppes and acacia woodland (Valverde, 1957) can be included or re-established in sufficient quantity.

On the opposite side of the range of the species, the feasibility of restoring sedentary populations around one, or several, of the oases of the Western Desert of Middle Egypt should be studied. Such a project would depend on the possibilities of controlling human pressures in sites that are necessarily of multiple use, and of which the habitats have been profoundly modified since the period of presence of the Scimitar-horned Oryx (Goodman *et al.*, 1984). The Siwa oasis, relatively remote, and not too distant from an additional complex of oases across the border in Libya, may be the best suited (Meininger, 1998).

Given the absence of historical observations, the Centro-Saharan massifs do not appear to be very favourable to the implantation of the Scimitar-horned Oryx. Still, the existence in Algeria of national parks, constituted or projected, of exceptional dimensions on a continental scale (Bousquet, 1992), the Hoggar and the Tassili des Ajjers, could be favourable for an experiment. Rehabilitation of some habitats would very likely be necessary. Such habitats could be selected around the wadis of the piedmont and their gallery woods (Schnell, 1977).

These considerations permit the identification of 15 zones that appear particularly favourable to reimplantation of the Oryx. They are summarised in Table 2.

Table 2. Zones of potential reimplantation for *Oryx dammah*.

Segment of the potential range	Country	Site
Main Sahelian range	Chad	Ouadi Rimé-Ouadi Achim
	Niger	Termit
	Mali	Adrar des Iforas
	Sudan	Wadi Howar-Darfur
	Mauritania	Southeast
Southern Sahelian range	Senegal	Ferlo
	Mali	Gourma, Ansongo-Menaka
	Niger	Gadabedji
	Burkina Faso	Sahel
Southern Mediterraneo-Saharan range	Tunisia	Bou Hedma
	Morocco	Drâa
Saharo-Atlantic range	Morocco (ex-Spanish Sahara)	Dakhla
Libyan Desert range	Egypt	Oases, in particular Siwa
Centro-Saharan massifs	Algeria	Hoggar, Tassili des Ajjers

2.2. Habitat.

Precise data on the habitat of *Oryx dammah* are based mainly on the Sahelian populations and have been collected in Chad (Malbrant, 1952; Gillet, 1965, 1969; Newby, 1974, 1988; Dragesco-Joffé, 1993), in Niger and in Mali (Lhote, 1946; Brouin, 1950; Malbrant, 1952; Grettenberger and Newby, 1990) and, to a lesser extent, in Sudan (Sclater and Thomas, 1899; Wilson, 1978, 1980). There is also precise information for the Atlantic Sahara (Valverde, 1957). There does not seem to be any first-hand information on the ecology of the species in the Libyan Desert of Middle Egypt (Kock, 1970; Osborn and Helmy, 1980), or, *a fortiori*, in the Mediterraneo-Saharan zone. The habitat of the species in these regions can only be understood by extrapolation of the Sahelian information, combined with examination of the sparse data on stable presence and the historically likely distribution of habitats. All the sources converge to establish a typically Sahelian, in particular, north Sahelian, subdesert character of the habitat of the Scimitar-horned Oryx.

The Sahelian populations of the Scimitar-horned Oryx seem to have fed, during the hot, dry season, from March to June, on perennial grasses of the Sahelian steppes, notably *Panicum turgidum*, *Aristida mutabilis* and other species of *Aristida* (Gillet, 1965; Newby, 1974, 1988; Dragesco-Joffé, 1993), the fallen pods of *Acacia tortilis* (Malbrant, 1952; Gillet, 1965; Newby, 1974, 1988; Dragesco-Joffé, 1993), foliage from persistent shrubs, including had, *Cornulaca monacantha*, *Chrozophora senegalensis*, *Cassia italica* (*C. obovata*) and a few herbs, including *Heliotropium strigosum* (Newby, 1974; Dragesco-Joffé, 1993). *Panicum turgidum* seems to also offer cover for newborn calves (Newby, 1974). During the rainy season, from July to September, and during the cold months, from November to February, the Oryx use mainly temporary pastures formed by the emergence of annuals, including the grasses *Cenchrus biflorus* (cram-cram), *Dactyloctenium aegyptiacum*, *Echinochloa colona*, the Aizoaceae *Limeum*

viscosum, as well as young green shoots of shrubs belonging to the Fabaceae (*Indigofera*), Nyctaginaceae (*Boerhavia*), Amarantaceae (*Aerva*) (Gillet, 1965; Newby, 1974, 1988; Dragesco-Joffé, 1993); they went north at this time, following the formation of temporary pastures (acheb, gizu) to the edge of the desert (Gillet, 1965; Wilson, 1978; Newby, 1988). Water was provided by the formations of annuals or by other newly green plants, or, in their absence, by succulents growing along wadis and in depressions of the Sahel (Newby, 1988) that remain green until far into the dry season (Newby, 1974). The wild melon, *Colocynthis vulgaris* (*Citrullus colocynthis*), particularly characteristic of the Sahelian subdesert steppes, plays, from this point of view, a particularly important role (Brouin, 1950; Malbrant, 1952; Gillet, 1965; Newby, 1974, 1988; Dragesco-Joffé, 1993). Shade, an essential element of the habitat during the hot months, was assured, like the humidity, by the accessibility, in the Sahelian steppe, of thickly wooded wadis and interdunal depressions (Brouin; 1950; Gillet, 1965; Newby, 1974, 1988; Dragesco-Joffé, 1993). Dense shade trees such as *Maerua crassifolia* were particularly sought-after (Gillet, 1965). *Commiphora africana*, various acacias (*Acacia senegal, A. seyal, A. arabica, A. nilotica, A. sieberiana, A. raddiana*) and several other Sahelian trees formed fairly dense woods in the preferred zones of occupation in Niger (Brouin, 1950). In sparsely wooded regions shade can be provided by a clump of *Panicum turgidum* (Gillet, 1965). Access to salt deposits was likely indispensable during certain periods (Gillet, 1965).

For the Atlantic Sahara, information is more fragmentary. Morales Agacino (1950) observed the importance of *Aristida plumosa*. Valverde (1957) mentions *Andropogon laniger*. The distribution of the species noted by Morales Agacino (1950) corresponds to the Sahelo-Saharan zone of diffuse acacia woodland and *Aristida* steppes defined by Valverde (1957) and in which he notes the abundance of *Colocynthis vulgaris* and of the shrubby leguminous shrub *Crotalaria*, accompanied by a largely Sahelian cortège.

2.3. Evaluation and evolution of populations

No estimate of the size of populations of the Scimitar-horned Oryx in the 19th century were attempted. In the 20th century, the species was almost entirely limited to the Sahel. Until the middle of the century, it seems to have been common there, herds of several hundred head and sometimes several thousand were recorded several times, notably in Chad and Niger (Lhote, 1945; Brouin, 1950; Malbrant, 1952). In the 1950's and the early 1960's, the Sahelian populations were still substantial (Newby, 1988). Herds of about 100 or more were still regularly reported in Chad in the beginning of the 1960's (Gillet, 1969). In the late 1960's, Gillet (1969) estimated that there were only small populations left in Niger and farther west, and a very few, probably errant, animals in eastern Chad and eastwards. Groups of more than 100 animals were still recorded in Niger during this period (Dragesco-Joffé, 1993).

By the end of the 1970's the world population was evaluated at 6000 individuals (Newby, 1988), located almost entirely in the Wadi Rimé-Wadi Achim region, where Oryx were estimated to number 4000-6000 head in 1975-1978, following an energetic antipoaching policy campaign which allowed a strong increase (Newby, 1988; Thomassey and Newby, 1990). The rest were located in Niger (Grettenberger and Newby, 1990), with perhaps a few small surviving groups elsewhere, in particular, in Mali (Heringa, 1990). At the beginning of the 1980's, the Nigerian population numbered less than 200 head (Grettenberger and Newby, 1990). The Chadian one was unknown, but probably reduced to the same order of magnitude, following the interruption of protection in 1978 (Thomassey and Newby, 1990). No observation has been made in Niger since 1986 (Grettenberger and Newby, 1990; Millington *et al*., 1991). If the species survives in Chad, it is certainly in small numbers (Pfeffer, 1993a, 1993b, 1995; Beudels *et al*., 1994; Tubiana, 1996a, 1996b).

2.4.Migration.

In the Sahelian range of the Scimitar-horned Oryx, seasonal migrations of a substantial amplitude, up to several hundred kilometres, have been recorded (Brouin, 1950; Malbrant, 1952; Gillet, 1965, 1969; Dupuy, 1967; Newby, 1974, 1988; Dragesco-Joffé, 1993). The migration cycle, particularly well-observed in Chad, is summarised as follows (Gillet, 1965, 1969; Newby, 1974, 1988). During the hot season, from March to May, the Oryx are found in the southern part of their range; at the beginning of the rains, that appear in the south of the Sahel at the end of May or the beginning of June, they move further south, to the sub-Sahelian wooded steppes. At the end of June or in July, they perform rapid, massive migrations towards the north of their range, where the rains have started, taking advantage of the therophytic pastures to the extent that competition with domestic herds permits. In August they reach the northernmost latitudes, between the 16th and 17th parallels. In October and November, the large herds disperse for the cold season. They return in March towards the summer quarters. This cycle varies in function of the irregularities of the annual rainfall. During low-rainfall years they can be forced to spend most of the year near the summer quarters; inversely, during years with abundant rainfall, they can prolong their stay in the north. Similar migrations have been observed in Niger (Lhote, 1946; Brouin, 1950; Malbrant, 1952), and in Sudan (Audas, 1951;

Schomber, 1963). Errant individuals or small groups in search of pastures probably often go beyond the limits of regular migrations (Wacher, 1988; Dragesco-Joffé, 1993). It is possible that this nomadism has increased recently under the effects of persecution and habitat degradation (Dragesco-Joffé, 1993). This erratic behaviour, notably of isolated males (Wacher, 1988), explains, in any case, the isolated observations made relatively often far from the permanent ranges.

Cyclic migrations, seasonal or interannual, of the Scimitar-horned Oryx have a cross-border nature, at least between Mauritania, ex-Spanish Morocco and perhaps Algeria (Valverde, 1957; Trotignon, 1975), between Mali and Niger (Lhote, 1946), between one or another of these countries and Algeria (Lhote, 1946; Dupuy, 1967; Kowalski and Rzebik-Kowalska, 1991), between Mali and Burkina Faso (Heringa, 1990; Heringa *et al*., 1990), between Niger and Chad (Dragesco-Joffé, 1993), and between Chad and Sudan (Lambert, 1975; Wilson, 1980; Hillman and Fryxell, 1988).

3. CONSERVATION STATUS, BY PARTY

Morocco (including ex-Spanish Sahara): Extinct.

The presence of the Oryx during historic times is not documented except for the regions south of the Oued Drâa (Morales Agacino, 1950; Valverde, 1957; Loggers *et al*., 1992) or perhaps of the Oued Noun (Joleaud, 1918). In the southeastern part of the Spanish Sahara, in the region of Sahelian affinity, groups numbering up to 25 or 30 individuals could still be seen during the first half of this century, when pastures, particularly of *Aristida plumosa,* were abundant (Morales Agacino, 1950). In 1957, Valverde estimated that there remained no more than one or perhaps two groups. The last observations were in 1963 (Newby, 1988) and 1973 (Le Houérou, 1992), the latter record referring to a single, isolated individual.

Algeria: Extinct.

The presence of the Oryx in the Mediterraneo-Saharan zone of Algeria is not documented beyond the Roman era, or perhaps the 16th century (Heim de Balsac, 1931; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991). In extreme southern Algeria, the southeastern Tanezrouft was probably, until the 1960's, part of the range of Malian populations from the Adrar des Iforas, and the southwestern Tassili Oua-n-Ahaggar part of the range of the Nigerian populations from the Aïr, as Dupuy (1967) supposed. However, few observations support this hypothesis (De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991). Two individuals killed in the region of the Tassili des Ajjers in 1987 (De Smet and Mallon, 1997) could have been wanderers coming from the Sahel.

Tunisia: Reintroduced

The Scimitar-horned Oryx was present at least until Roman times in the Mediterraneo-Saharan zone of Tunisia (Sclater and Thomas, 1899). There are no later data, except for a few captures at the beginning of the 20th century (Lavauden, 1920) that could pertain to wandering animals coming from southern regions. The species has been reintroduced in the Bou Hedma National Park (Bertram, 1988; Bousquet, 1992; Kacem *et al*., 1994), in an adequate environment, and in a habitat of steppes and *Acacia raddiana* woodland, the restoration of which (Karem *et al.*, 1993; Kacem *et al.*, 1994) is a remarkable success, and makes it the best example of this type of habitat in the northern fringe of the Sahara (Bousquet, 1992). The population of Bou Hedma currently (1999) numbers about 106 animals. Additional individuals, of the order of 15, originating from various European zoos, were imported into Tunisia in 1999 and released in Sidi Toui National Park and the Aïn Dekouk Reserve.

Libya: Extinct.

Rock paintings, notably in the Tibesti and the Djbel Uweinat, attest to the existence of prehistoric populations of the Scimitar-horned Oryx. There are no sure records of its presence in Libya during historical times (Hufnagl, 1982). However, in the 19th century, animals occupied the oases of the Libyan Desert of middle Egypt very near the Libyan border and *Alcephalus busephalus,* which was associated with the Oryx in most of the oases, was known from at least one depression within Libyan territory. Thus, it is possible that Libya was within the range of these populations. Dragesco-Joffé (1993) suggests that wandering animals belonging to the Chadian population might have entered southern Libya. A plausible, but uncertain, observation of an individual was made in the Mediterranean northeast in 1942 (Hufnagl, 1972). It recalls a record considered to be certain in northwestern Egypt in 1975 (Osborne and Helmy, 1980).

Egypt: Extinct.

Until the middle of the 19th century, numerous observations of the Oryx were reported, in the oases of the Western Desert, in particular in the Siwa oasis in the northwest, the Wadi Natroun, the Faiyum and the Wadi el Ruwayan near the lower Nile, the enormous oases of Dakhla and the Kharga complex between 24° and 26° N (Kock, 1970; Osborn and Helmy, 1980). There are no records for this period outside these oases and their vegetation systems. This concentrated distribution is characteristic of most of the mammals of the Western Desert (Osborn and Helmy, 1980) and probably reflects the reality of distribution in this nearly unvegetated desert (Osborn and Helmy, 1980; Monod and Sers, 1994) rather than the distribution of observers. The latest records date from the 1850's and 1860's (Flower, 1932; Kock, 1970; Osborn and Helmy, 1980). A single more recent observation exists, that of an animal seen in the Mediterranean coastal desert in extreme northern Egypt in 1975 (Osbon and Helmy, 1980). This record probably pertains to a far-wandering animal coming from southern populations.

Mauritania: Extinct.

Southern and western Mauritania make up part of the Sahelian and Atlantic Saharan ranges of the Scimitar-horned Oryx; these ranges were probably continuous, but the existing records do not document this. The first relatively precise information on the distribution of the species in the country seems to date from the 1930's (Trotignon, 1975). During this period, the Oryx was recorded in the west, the centre and the east of the Sahelian steppe zone, as well as along the northern border of this zone in the regions of Dhar Tichit, Dhar Oualata, 'Adafer and Aklé Aouana. A second zone of presence was located in the Spanish Sahara. There are records, during the 1940's, for the east of the Sahelian zone and its northern limit (Trotignon, 1975). In the 1950's, the observations cited by Trotignon (1975) are confined, on the one hand, to the east of the Sahelian region, between Oualata, Nema and the Malian border, on the other hand, to the immediate vicinity of the south-eastern border of the Spanish Sahara, in continuity with the records given by Morales Agacino (1950). The last observation apparently dates back to 1959 and pertains to the Atlantic population (Trotignon, 1975; Newby, 1988; Sournia and Verschuren, 1990).

Mali: Probably extinct.

The Sahelian range of the Scimitar-horned Oryx extends across Mali from Irrigi in the west to Azouak in the east, between 18° and 15° N, with an extension to 20° N and to the Algerian border at the periphery of the pene-Sahelian massif of the Adrar des Iforas (Lhote, 1946; Gillet, 1969; Dupuy, 1967; Trotignon, 1975; Sayer, 1977; Newby, 1988; Heringa, 1990; Sidiyene and Trainer, 1990). Lhote (1946) indicates its presence in the entire Sahelian steppe zone, including in the Niger river bend, in particular, in the Hombori region, in the immediate vicinity of what is now the Elephant Faunal Reserve and at the latitude of the Ansongo-Menaka reserve. The last data from Mali appear to be from the end of the 70's and the beginning of the 80's and come from the extreme eastern part of the country (Sayer, 1977; Newby, 1988; Heringa, 1990). An isolated observation was made of two individuals in the Laga Koundiri region on the border with Burkina Faso during the 1986 rainy season (Heringa, 1990; Sidiyene and Trainer, 1990). It is situated within the normal range of the species.

Niger: Probably extinct.

The Sahelian range of the Scimitar-horned Oryx crosses Niger from the Azaouak to the southern Ténéré, between the 15th and 17th parallels (Lhote, 1946; Brouin, 1950; Gillet, 1969; Jones, 1973; Newby, 1988; Grettenberger and Newby, 1990; Dragesco-Joffé, 1993; Poilecot, 1996a, 1996b). In the 1940's, the main concentrations were observed south of the Aïr, moving between the Tadéras region and the southeastern edges of the massif, in the vicinity of the Ténéré (Lhote, 1946; Brouin, 1950). Brouin (1950) qualified the "very wooded" Tadéras region, between 15° 30' and 16° 30' latitude, and between 6° 30' and 9° longitude, as preferred Oryx habitat, as well as preferred *Gazella dama* habitat. At the end of the 1960's, large groups of Oryx still occupied their traditional range (Dragesco-Joffé, 1993). During the 1970's, the species seems to have been reduced to small groups (Dragesco-Joffé, 1993) living on the desert edges between Agadez and the Termit (Grettenberger and Newby, 1990). At the beginning of the 1980's, drought probably forced the survivors to the southern part of their normal range, in an area where they were exposed to increased anthropic pressure; at that time, the population was estimated at less than 200 individuals (Grettenberger and Newby , 1990). The last observations in Niger are from 1983 (Newby, 1988; Grettenberger and Newby, 1990) and 1986 (Millington and *al.*, 1991).

Chad: Endangered, possibly extinct.

Chad has been, for a long time, the home of the largest populations of Scimitar-horned Oryx. Already in the 1930's, the Oryx seemed much more abundant in Chad than in more western or eastern regions (Malbrant, 1952). They

were distributed over the entire Sahelian belt, mostly between the14th and 17th parallels, from the Niger border in the west to the Ouaddaï, Kapka, and Ennedi massifs and the Mourdi depression in the east (Newby, 1974). Large herds of several hundred, even several thousand, animals were regularly observed (Malbrant, 1952; Thomassey and Newby, 1990). In the 1950's and 1960's, the species seems to have maintained itself throughout its range (Newby, 1974). In 1962-1963, herds of around a hundred individuals were still frequently observed, one herd of several hundred animals (at 14° 23' N) and another of 600 head signalled (Gillet, 1965, 1969). Gillet (1969) believed that the number of animals had not been reduced, at least in the Oued Rimé-Oued Achim region, during the 1960's. In the 1970's, the Oryx practically disappeared from the region between the 20th meridian and the eastern border mountains (Newby, 1974). By then, it had become rare also in the western part of the country. In the mid-1970's, more than 95% of the remaining world population was concentrated in the Oued Rimé-Oued Achim region, between 18° E and 20° E and between 15° N and the southern part of the Djourab (Newby, 1974; Thomassey and Newby, 1990). In 1975-1978, the population in that region was estimated at 4000-6000 individuals, after a period of substantial increase due to a very efficient anti-poaching prevention policy (Thomassey and Newby, 1990). From 1978 on, a rapid decline took place as a direct consequence of military activities in the country. At the beginning of the 1980's, the Chadian population was reduced to "the lower hundreds or less", following the cessation of the conservation policy (Newby, 1988; Thomassey and Newby, 1990). Recent surveys (Pfeffer, 1993a, 1993b, 1995; Beudels et *al*., 1994; Tubiana, 1996a, 1996b) could not confirm the survival of the species.

Sudan: Extinct.

At the beginning of the century, the Scimitar-horned Oryx was distributed throughout the entire Sahelian zone of the Darfur and the Kordofan (Audas, 1951; Kock, 1970; Wilson, 1980; Hillman and Fryxell, 1988). Along the Nile valley, it was found as far as 20° N (Kock, 1970). In Kordofan, it was apparently common in the southern part of the northern Sahelian steppe zone (White, 1983, unit 54a) and in the entire southern Sahelian zone of deciduous shrubs (White, 1983, unit 43), between 12° 30' N and 16° N, to the south as far as the southernmost limit of the Sudaniens woodlands (White, 1983, unit 29a), migrating seasonally like in the other part of the Sahel (Audas, 1951; Kock, 1970). The last observations are from the end of the 1920's (Audas, 1951). In the 1930's, numbers were already dangerously low throughout the country (Audas, 1951). The Scimitar-horned Oryx remained however apparently well represented until the 1940's in the Sahelian steppes of northern Darfur, adventuring north to the desert's fringe to make use of temporary pastures or *gizu* (Lamprey, 1975; Wilson, 1978, 1980). From the 1950's on, data become rare (Wilson; 1980). The last precise data are of groups of up to 50 individuals in the Wadi Howar region and on the temporary *gizu* pastures north of the Wadi Howar in 1964, observed by Hussain Dosa and reported by Lamprey (1975), and the capture of an individual at the westernmost part of the Sudanian Wadi Howar in 1973 (Lamprey, 1975). Newby (1982, 1988) estimates that extinction took place in the 1970's.

Senegal: Extinct.

The southern part of the Scimitar-horned Oryx potential Sahelian range, the sub-Sahelian deciduous shrub zone, includes northern Senegal, from the Louga region in the west to the Bakel region in the east (White, 1983). The species was present in the area (Sournia and Dupuy, 1990). The extinction date is not clearly known. It is situated in the 1850's by Newby (1988, on the basis of informations given by Dupuy), before 1914 by Sournia and Dupuy (1990).

Burkina Faso: Extinct.

Northern Burkina Faso, north of 14° N, is situated in the south-Sahelian deciduous shrub zone (White, 1983). The Scimitar-horned Oryx used to occur there, and probably went extinct in the 1950's (Heringa and *al*., 1990). Two individuals were observed, however, in the region of Laga Koundiri, a waterhole situated on the border between Mali and Burkina Faso, during the rainy season of 1986 (Heringa and *al*., 1990; Heringa, 1990).

Nigeria: Past presence uncertain.

The northeasternmost part of Nigeria, in the Lake Chad and Jawa region, is situated in the south-Sahelian deciduous shrub belt (White, 1983; Anadu and Green, 1990). A much larger area, north of the 12th parallel in the west and the 8th parallel in the east, is part of the Sudanian savannahs and woodlands (White, 1983; Anadu and Green, 1990). The presence of the Scimitar-horned Oryx in either of these zones in the past (Sclater and Thomas, 1899) is possible but not clearly established (Anadu and Green, 1990).

4. ACTUAL AND POTENTIAL THREATS

The decline of the Scimitar-horned Oryx took place under the combined effect of several factors acting simultaneously, anthropogenic degradation of habitats, arid land environmental stochasticity, taking, loss of habitat caused by human pressure. These factors remain active today.

4.1. Degradation and decline of habitats.

Catastrophic droughts. Within the context of aridity that has prevailed in the Sahara for the last 3000 to 4000 years (Le Houérou, 1986; Newby, 1988), years of increased drought, affecting in particular the Sahel, appear at irregular intervals (Monod, 1986). During the 20th century, severe Sahelian droughts took place in 1913- 1914 (Monod, 1986), in 1940-1945 (Monod, 1986; Newby, 1988), then, with a particularly high frequency, in 1968-1973, 1976-1980 and 1983-1984 (Monod, 1986; Newby, 1988; Hassaballa and Nimir, 1991). Drought periods always have a catastrophic effect on arid land fauna. The impact of recent episodes on migratory palaearctic birds wintering in the Sahel has been amply documented and commented. The effects of such natural catastrophes have been seriously aggravated by their combination with anthropogenic factors. They hit Sahelian antelope populations which had already been pushed by anthropic pressure towards sub-desert zones at the limit of their aridity tolerance. They forced these populations to re-shift southwards, to areas where the pressure of pastoralists and farmers is much higher (Newby, 1988) and the risk of taking is greater (Newby, 1982). Moreover, the level of human occupation of the land hampers vegetation regrowth after the droughts (Millington and *al.*, 1991).

Degradation of pastures through overgrazing. The capacity of the excellent grazing areas of the sub-desert steppe to support an enormous primary production of graminids and other perennial plants, combined with relatively low levels of competition and predation, explain the past abundance of the Oryx (Newby, 1974). Major increases of domestic stock and the possibility created for this stock, thanks to the drilling of deep wells, to permanently use grazing land situated in waterless areas, have lead to generalised intensive overgrazing (Newby and Sayer, 1976; Newby, 1978a; Newby, 1988). For the entire northwestern Saharan and sub-Saharan regions, Le Houérou (1986) evaluates grazing pressure to be twice the carrying capacity, and notes, and notes among its effects the elimination of perennial grasses and browsable shrubs, trampling and compaction of soils, their denudation and consequent eolian erosion. For the Sahel, Monod (1986) indicates grazing pressures of 0.8 to 1 sheep-equivalent per hectare, for a carrying capacity of 0.25 sheep-equivalent per hectare, a load four times too high, leading to severe and generalised overgrazing. The effects of such overexploitation are well described for the Sudan by Bari (1991) who documents the transformation of rich pastures of short grasses and perennials into absolute desert, and by Hassaballa and Nimir (1991) who note a 5 to 6 kilometres progression of the desert per annum. The destruction of feeding grounds, notably the *Cornulaca* formations, by overgrazing, has also been observed in Chad, in the areas of late persistence of the species (Newby, 1974).

Cutting of woody plants. Woody plants seem to be essential to the Oryx, for shade and for food. Their systematic destruction in the Sahelo-Saharan region is an historical constant (Le Houérou, 1986). It increased sharply in recent times in the southern fringe of the Sahara, under the combined effects of drought and need for charcoal (Newby, 1988; Bari, 1991; Hassaballa and Nimir, 1991). In Sudan, for example, Bari (1991) documents the total disappearance of *Acacia tortilis*, *Acacia raddiana*, *Acacia senegal*, and *Merua crassifolia* woodlands, and their replacement by absolute desert.

Loss of optimal habitats. It is likely that as early as the 1950's, the Oryx was forced out of the most ecologically favourable areas by development pressures. Drought-induced reduction of available range, and increased accessibility for the domestic stock to marginal lands, have progressively removed any buffer zone, and finally any separation, between wild fauna and domestic animals (Newby and Sayer, 1976). The wild fauna is quickly excluded from common use areas. During the last years of survival of Oryx in the Sudan, Wilson (1978) noted that *gizu*, therophytic pasture, while still appearing in abundance, had become inaccessible to the antelopes because of excessive loads of domestic stock.

4.2. Direct exploitation.

Traditional hunting. Traditional hunting (Brouin, 1950; Gillet, 1965, 1969; Newby, 1978a, 1978b, 1988; Dragesco-Joffé, 1993), exercised mostly by nomads, with horses and spears, with horses and nets, or, from the Neolithic

period on, with bow and arrows, certainly played a role in the disappearance of the species, but probably only from the time when it began to act in conjunction with other factors, and affected already decimated populations.

Taking by sedentary hunters. Brouin (1950) notes the considerable impact of capture done by traps by non-nomads in the southern part of the range. It is only one aspect of the pressure caused by increased contact with dense human populations progressing northwards.

Hunting with vehicles. Of far more significance than traditional hunting, the generalised use of modern firearms and vehicles has been the essential proximal factor of the species extinction. It was mostly carried out by mining, oil extraction, military or administration personnel, African or expatriate (Gillet, 1965, 1969; Newby, 1978a, 1978b, 1988; Hassaballa and Nimir, 1991; Dragesco-Joffé, 1993).

Hunting tourism. Like for all Sahelo-Saharan antelopes, the slaughter perpetrated by hunting tourism, in particular from the Middle-East, well documented for Sudan (Cloudsley-Thompson, 1992), Niger and Mali (Newby, 1990; Bousquet, 1992), is a potentially major threat.

4.3. Other threats.

All indirect forms of anthropic pressure likely to affect the species, such as the extension of domestic herds, the multiplication of deep wells, and the invasion of available habitats exert pressure through degradation or regression of habitats and increased susceptibility to direct taking. They are treated under the respective paragraphs.

5. Regulatory provisions

5.1. International:

Bonn Convention : Appendix I, Resolution 3. 2, paragraph 4.
Washington Convention (CITES): Appendix I

5.2. National:

The Scimitar horned Oryx is totally protected in Algeria, Tunisia, Mauritania, Mali, Niger, and partially in Sudan.

6. CONSERVATION MEASURES, BY PARTY

6.1. Ban on taking.

Tunisia (reintroduced): protected
Niger (probably extinct): protected

6.2. Habitat conservation

Morocco (including ex-Spanish Sahara)

The proposed national parks in the lower Drâa basin and the Dakhla region (Müller, 1996) appear to be well suited for the reintroduction of the species, insofar as the Dakhla proposed park extends sufficiently inland to include a substantial representation of steppes and Sahelian woodland which characterised the local range of the species (Valverde, 1957). In both cases, past utilisation of those areas by the Oryx may have been seasonal or non-annual, and the current impracticability to insure secure movements towards other regions may impose a very active management of the habitat, temporary or permanent.

Algeria

The Tassili des Ajjers National Park and the Hoggar National Parks offer, by their exceptional dimensions and environmental diversity (Bousquet, 1992), obvious reintroduction potential. However, the absence of post-Neolithic observations in these central Saharan massifs, which have been, for thousands of years, mostly at or beyond the limit of aridity tolerable for stable populations of the species, indicates that a reintroduction experiment will almost certainly require habitat rehabilitation and possibly permanent management.

Tunisia

A habitat rehabilitation programme, accompanied by a reintroduction programme, has been conducted in Bou Hedma National Park (Bertram, 1988; Bousquet, 1992; Kacem and *al*., 1994). Results obtained so far are remarkable, with a present, well-inserted population of 106 animals and a satisfactory reproductive rate (Bertram, 1988; Bousquet, 1992; Kacem and *al*., 1994; pers.obs). The efforts of the Tunisian authorities to expand the limits of the fenced area on the basis of general consensus must be supported by all means. Although Bou Hedma NP appears today as the optimal reintroduction site for the species in Tunisia (Bertram, 1988; Kacem *et al*., 1994), supplementary sites could be looked for in order to maximise the benefits accruing from the good conservation climate that prevails in Tunisia. Such sites could be found, under the condition of habitat restoration along the lines of the Bou Hedma experiment, in the reserves situated south of Bou Hedma, but also, and possibly mostly, in regions to the north of Bou Hedma, since it is unlikely for the centre of gravity of the antique range of the species in Tunisia to have been situated in the far south, and since the aridity of the habitat, if not that of the climate, has since progressed northwards. It is in partial application of that programme of extension of the number of sites that, in early 1999, about 15 individuals, originating from various European zoos, were imported into Tunisia and released successfully in Sidi Toui National Park, and, in very small number, in the Aïn Dekouk Reserve.

Mali

The Elephant Faunal Reserve and the Ansongo-Menaka Reserve are located within the recent range of the Scimitar-horned Oryx (Lhote, 1946) and within the part of the range that seems to be particularly favourable for permanent residence. Ansongo-Menaka had a substantial population of Oryx at the time of its creation (Newby, 1982). The two reserves offer good reintroduction potential, but pressures of all types, agricultural, pastoral, residential and cynegetic, to which they seem to be exposed must first be fully controlled (Heringa, 1990). The Elephant Faunal Reserve potential is of particular interest, with the excellent tourism perspectives represented by the combination of one of the last Sahelian populations of African Elephant (*Loxodonta africana*) and of a spectacular antelope (Pavy, 1996).

Niger

The Gadabedji Reserve was created for the Scimitar-horned Oryx. Like the two Malian reserves, it is situated in the optimal climatic zone for the species (Newby, 1982; 1988; Dixon and Newby, 1989; Grettenberger and Newby, 1990). Unfortunately, anthropic pressures have never been sufficiently controlled, and the Oryx became extinct (Newby, 1988; Millington and *al.*, 1991). It remains nevertheless an excellent potential reintroduction site, if those pressures can be alleviated. A habitat rehabilitation programme was undertaken in 1989 (Millington *et al.*, 1991). Another reserve proposed in the Termit region would offer a second possibility. The Termit massif seems to be one of the most intact regions of the Nigerian Sahel, with remaining populations of several ungulates as well as relatively well conserved habitats (Newby, 1982, 1988; Newby and Jones, 1986; Grettenberger and Newby, 1990; Millington *et al.*, 1991). The Aïr-Ténéré National Park, situated mostly in the Ténéré massif, and which only includes a small part of the eastern slope and piedmont of the Aïr, appears too arid for the Scimitar-horned Oryx (Newby and Jones, 1986; Newby, 1988).

Chad

The Ouadi Rimé-Ouadi Achim reserve is by far the most important site for the conservation of the Scimitar-horned Oryx (Gillet, 1965, 1969; Newby, 1974, 1988; Thomassey and Newby, 1990; Dragesco-Joffé, 1993; Pfeffer, 1993a, 1995). The fact that a few individuals may still be living there, making it the very last rampart against extinction in the wild, obviously identifies it as the first conservation priority at global level. The implementation of strict habitat

and fauna conservation measures is indispensable. Any other action must be delayed, until proper evaluation of the species chances of survival in the wild, and therefore of the preservation of its original behaviour, has been conducted. In the longer term, when populations have built up, the richness of the area allows perspectives of sustainable development by wise use of the large fauna (Grettenberger and Newby, 1990).

Sudan

The proposed Wadi Howar National Park in Darfur offers possibilities of reintroduction for the Oryx (Hashim, 1996). The conservation status of the steppes and associated woodlands in Sudan (Bari, 1985; Hashim, 1996) suggests that important habitat restoration programmes would be necessary. Efficient control of poaching pressure in large protected areas might be very difficult to implement (Cloudsley-Thompson, 1992).

Senegal

The two faunal reserves of the Ferlo (Bille *et al*., 1972; Bille and Poupon, 1972; Sournia and Dupuy, 1990) offer excellent reintroduction possibilities. The total area is a proposed National Park (Diop *et al*., 1996). A reintroduction programme has been planned (Diop *et al*., 1996; Clark, 1996). Its success will rely , mostly, like for every southern Sahelian site, on the feasibility of limiting human pressures, in order to protect the fauna and allow the vegetation to regrow (Diop and *al*., 1996).

Burkina Faso

The Sahel partial faunal reserve could become the nucleus of a reintroduction zone in the Sahelian Burkina Faso. The reserve has been seriously affected by overgrazing, woodcutting and droughts (Heringa *et al*., 1990).

6.3. Attenuation of obstacles for migratory animals

Given the present state of the populations, the question has no object. In the case of a recuperation of numbers, or progressively as reintroduction projects succeed, it gradually could arise more and more. In the short and medium term, only the creation of protected areas which are sufficiently vast to include the entire necessary range, and in particular, cross-border reserves, seems to be an adequate answer. It appears indeed improbable that the security of movement between protected areas can be assured in a realistic manner in the foreseeable future.

6.4. Regulations concerning other detrimental factors.

For reasons exposed under 6.3, such rules have meaning only in the framework of protected areas management plans. This paragraph therefore merges with paragraph 6.2.

6.5. Other measures

Tunisia

The Oryx reintroduction programme is highly successful so far in Bou Hedma National Park, which is situated within the historic range (Bertram, 1988; Bousquet, 1992; Gordon and Gill, 1993; Kacem *et al*., 1994). A project initiated in Sidi Toui National Park in early 1999, shows encouraging beginnings.

Niger

A semi-captive raising programme is being envisaged at the Ekafrane ranch, with an objective of possible reintroduction in appropriate areas (Millington *et al.*, 1991).

Senegal

A reintroduction programme in the Ferlo reserves, with preliminary acclimatisation in the Gueumbeul Sahelian wildlife reserve is being developed (Diop *et al*., 1996; Clark, 1996).

Outside range

There are captive or semi-captive herds or individuals in over 40 institutions (Newby, 1979), situated in several countries, in North Africa, the Middle East, Europe and North America.

7. Research activities

7.1. Public authorities.

Tunisia: monitoring of reintroduction activities in Bou Hedma and elsewhere.

7.2. N.G.O

8. Needs and recommended measures

Recommended measures are part of an Action Plan developed in parallel with this status report (Beudels *et al.*, 1998). The principal needs that they meet are listed below.

8.1. Total protection of the species

Necessary in all the countries of the historical range to prepare for a possible reoccupation of the species.

8.2. Conservation measures.

Establishment of a network of protected zones in all parts of the historical range, based on the guidelines of paragraph 2.1.4., with absolute priority given to zones where the species could still be surviving in the wild, specifically, firstly, the Ouadi Rimé-Ouadi Achim Reserve in Chad, secondly, Niger.

8.3. Location and monitoring of residual populations, and definition of their ecological requirements.

Determined search for residual populations, firstly in Chad, secondly in Niger.

8.4. Reinforcement and/or reintroduction of populations in the potential range.

Support to the Tunisian reintroduction programme. Preparation of programmes in other parts of the range, following the guidelines of paragraph 2.1.4.

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Report on the status and perspectives of a species

Addax nasomaculatus

Report prepared by Roseline C. Beudels-Jamar, Pierre Devillers and René-Marie Lafontaine

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This report is based on documents prepared for the Convention on Migratory Species by Pierre Pfeffer (1993b, 1995) and on supporting documents for the action plan on Sahelo-Saharan antelopes adopted by the 4th Conference of the Parties of the Convention, documents that were prepared by Roseline C. Beudels, Martine Bigan, Pierre Devillers and Pierre Pfeffer (1994). The information it contains originates mainly from the general accounts and regional action plans edited by Rod East (1988, 1990), and the fundamental work of Hubert Gillet (1965, 1969) and John E. Newby (1974, 1988, in particular). It is completed by a new review of the literature and a survey of actors in the field conducted in 1996 and 1997 by Tommy Smith (1998) with the support of Koen De Smet. Roseline C. Beudels, René-Marie Lafontaine, Marie-Odile Beudels, Tommy Smith, Yves Laurent and Chris Kerwyn have contributed to the preparation and finalising of this report.
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1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomy.

Addax nasomaculatus belongs to the tribe Hippotragini, sub-family Hippotraginae, family Bovidae, which comprises one extinct species, seven surviving species, and two evolutionary distinct subspecies in genera *Oryx, Addax* and *Hippotragus* (Simpson, 1945; Murray, 1984; Corbet et Hill, 1986; Wacher, 1988). All hippotraginids are adapted to the exploitation, generally at low density, of difficult, low-productivity habitats (Kingdon, 1982; Murray, 1984; Wacher, 1988; Beudels, 1993). The genus *Addax* is comprised of a single species, adapted to the desert.

1.2. Nomenclature.

1.2.1. Scientific name.

Addax nasomaculatus (De Blainville, 1816)

1.2.2. Synonyms.

Antilope nasomaculatus, Antilope addax, Addax nasomaculatus addax, Antilope naso-maculata, Cerophorus nasomaculata, Antilope suturosa, Antilope mytilopes, Antilope gibbosa, Oryx addax, Oryx naso-maculatus, Addax suturosus, Addax addax

1.2.3. Common names.

English :Addax
Arabic : Begaar el Ouach, Akash, Abu-Akach, Anjidohl, Auel, Bakra el onash, Tamita
French : Addax, Antilope addax, Antilope de Mendès

2. BIOLOGICAL DATA

2.1. Distribution.

2.1.1. Historical distribution.

The historical range of permanent or periodical presence and movements of the Addax encompasses all of desert and sub-desert North Africa between the Atlantic and the Nile. Within this range, the distribution of the species is conditioned by that of large zones of ergs and sandy regs (Lhote, 1946; Schnell, 1977; Quézel, 1965; White, 1983; Walter and Breckle, 1986; Le Houérou, 1986; Grettenberger and Newby, 1990; Ozenda, 1991; Kacem *et al.*, 1994), of temporary pastures (Grettenberger and Newby, 1990; Dragesco Joffé, 1993), and of ecotones between the sub-desert steppes and the desert (Gillet, 1969; Newby, 1974).

The Addax is a species of the true desert, adapted to very dispersed pastures (Heim de Balsac, 1936; Gillet, 1969; Newby, 1984; Grettenberger and Newby, 1990; Dragesco Joffé, 1993). The distribution seems to have been organized in a number of large ensembles between which exchanges were probably possible.

In the west, a large body of data identifies populations linked to the great Mauritanio-Malian ergs of the Majabat al Koubra and to the Iguidi and Chech ergs (Monod, 1958; Gillet, 1969; Trotignon, 1975; Walter and Breckle, 1986; Lamarche, 1987). It is probably these populations which occupied, with an unknown regularity, the Atlantic Sahara in the region of Dakhla (Morales Agacino, 1950; Valverde, 1957; Loggers *et al.*, 1992) and gave way to observations east of Zagora in the region of the upper Drâa in Morroco (Marçais, 1937; Loggers *et al.*, 1992).

More to the east, substantial zones of presence are centred on the Grand Erg Occidental (Gillet, 1969; Kowalski and Rzebik-Kowalska, 1991), the Grand Erg Oriental (Lhote, 1946; Gillet, 1969; Kowalski and Rzebik-Kowalska, 1991; Kacem *et al.*, 1994), the large sandy zones (Walter and Breckle, 1986) of the Hamada de

Tinrhert and the southern part of the Hamada el Hamra (Lhote, 1946; Gillet, 1969; Hufnagl, 1972; Kowalski and Rzebik-Kowalska, 1991), and the entire piedmont of the Hoggar and the Tassili des Ajjers, in particular in the Erg Admer (Lhote, 1946; Gillet, 1969; Kowalski and Rzebik-Kowalska, 1991). Beyond, in Libya, the data, relatively few and dispersed, suggest a possible presence in the piedmont slopes of the Haruj al Aswald, in the region of Koufra, and in the vicinity of the Calanshio Sand Sea (Hufnagl, 1972).

In the Western Desert of Middle Egypt, the Addax was known from large oases and depressions or their periphery, in particular from Siwa in the northwest and from the Libyan oasis adjacent to Jaghbub, from the depression of Qattara, from Faiyum, from Bahariya, from Farafara, from Dakhla, and from the Kharga complex (Osborne and Helmi, 1980). It was noted also in the extreme northeast of the Mediterranean coastal desert, in the Nubian Desert southwest of Bir Kiseiba, and in the region of the Jebel Uweinat.

In the transition zone between the desert and the Sahelian steppes, regions of significant presence of the Addax existed at least in the periphery of the Adrar des Iforas (Lhote, 1946), in the Ténéré, in the foothills of the Aïr, and in the Termit massif (Lhote, 1946; Brouin, 1950; Grettenberger and Newby, 1990; Millington *et al.*, 1991), in northern Chad south of the Tibesti (Gillet, 1969; Newby, 1974), in the Sudano-Chadian regions of the Mourdi depression and Wadi Howar (Gillet, 1969; Kock, 1970; Wilson, 1980), in the Nubian Desert of the Northern region and of northern Kordofan in Sudan (Kock, 1970).

The southern limit of the main range of the Addax is located between 17° and 19° N in central northern Mauritania, between 17° and 19° N in central Mali, at 16° N in Niger, at 15° N in Chad, and at 14° N in Sudan. It is situated in the semi-desert Sahelian steppe belt of White (1983). During the hot season, the Addax may migrate south into the Sahelian zone in order to meet the first showers and rain-generated pastures. Available data indicate that the historical distribution of the Addax was relatively continuous over the entire Sahelo-Saharan region.

2.1.2. Decline of the range.

Like that of the Oryx, the range of the Addax has regressed continuously since the drying up of the Sahara (Gillet, 1969). During the entire Neolithic Age, it was at least as abundant as the Oryx in all of North Africa (Gillet, 1969). Like the rest of the Saharan fauna, the Addax suffered from the effects of increased aridity, but it found refuge on the periphery of the desert (Gillet, 1969). This was a very temporary refuge, as the Addax, like the rest of the large North African fauna, underwent massive taking during the Roman era (Le Houérou, 1986; Newby, 1988).

The Addax was still widespread throughout the Sahara around 1840 (Dragesco-Joffé, 1993). It had completely disappeared from the northern Sahara and its fringes by the end of the 19th century (Newby, 1986; Kowalski and Rzebik-Kowalska, 1991; Loggers *et al.*, 1992). The decline accelerated as of the beginning of the 20th century, and even more during the period between the two world wars (Gillet, 1969). The rapid decline of the Addax coincided with colonisation, oil prospection, and the militarisation of the desert (Gillet, 1969; Dragesco Joffé, 1993). The increase in off-road vehicles allowed a much more efficient penetration into the remotest regions. The Addax is particularly sensitive to disturbance; it gallops until exhaustion if chased (Dragesco Joffé, 1993). Narratives recount how entire herds were destroyed in a single hunt (Lhote, 1946; Gillet, 1969). The intense periods of drought and the desertification that they have generated these last decades (end of the 1970's and early 1980's) have clearly contributed to the general decline of the species (Newby, 1989).

Until recently, the Addax was still widespread and locally abundant in the centre and the south of its range (Newby, 1986). Like that of the Oryx, the decline of the Addax was spectacularly rapid everywhere. In one generation, the Addax lost 90% of its range (Newby, 1986).

Table 1. Current status and dates of probable extinction of the Addax in range states, according to Newby (1984) or other authors as indicated.

Country	Current status of the Addax (probable date of extinction)	Late observations (possibly of vagrant individuals)
Morocco	extinct	
Ex-Spanish Sahara	extinct (1942)	1963 (1 individual)
Algeria	extinct?	vagrants?
Tunisia	extinct (1932) (Kacem, 1994)	
Libya	extinct (end of the 1960's)	

Egypt	extinct (around 1900)	
Sudan	very rare, extinct?	
Chad	endangered	
Niger	endangered	
Mali	endangered	
Mauritania	endangered	

2.1.3. Residual distribution.

The current range of the Addax is highly fragmented, consisting of three areas strewn across the southern Sahara and sometimes extending into the central Sahara (Gillet, 1969):

- The eastern part of the Majabat al Koubra, between Mauritania and central western Mali (the Djouf) (Lamarche, 1987; Dragesco Joffé, 1993), with key zones constituted by the Aklé Awana, the western Erigat and the eastern part of the Mreyyé, may still harbour populations that could number several hundred animals (B. Lamarche, April 1997).

- The Aïr-Ténéré National Nature Reserve and the area to the northeast of it (Newby, 1989), the region between the Aïr-Ténéré and the Termit massif, the region between the Termit and the Fachi oasis, and, further east, the ergs of the Ténéré and of Bilma towards the border between Niger and Chad, constitute a Nigerian ensemble which seems to harbour small groups (Newby, 1989). The Termit massif, smaller in area than the Aïr reserve, may support a higher density of Addax (Newby, 1989; Dragesco Joffé, 1993). A few individuals originating from the north of the Aïr or from the Djado may occasionally reach Algeria and perhaps even Libya.

- A mainly Chadian area extending from the Niger-Chad border to the Djourab, the Mourdi depression, the Erdi and the Sudanese border, between the 16th and 19th parallels (Newby, 1974; P. Pfeffer, 1993), appears to be occupied by a few groups in what was until recently one of the most important zones for the species (Newby, 1981, 1989); this area extends to the northern and western part of the Ouadi Rimé-Ouadi Achim Faunal Reserve, and perhaps also to the Wadi Howar and Wadi Naoué in the northern Darfur of Sudan (East, 1990; East, 1996).

2.1.4. Recolonisation prospects.

Any prospect of recolonisation of the Addax must necessarily integrate, on the one hand, new attempts at in situ conservation of the Addax and its habitat, and, on the other hand, attempts at reintroduction or reinforcement of populations from individuals born in captivity, in parallel with measures of habitat management. The techniques of reinsertion in the wild of captive-born animals are relatively well mastered today for antelopes, and more than 800 Addax are currently held in captivity.

The chances of recolonisation are perhaps better for the Addax than for the Oryx. The species is capable of living in extreme habitats which man and his livestock cannot use, and it has a reproductive strategy that allows it to rapidly exploit favorable climatic conditions. The potential range of the Addax is the desert and the sub-desert. Its distribution within desert regions does not seem to have limits other than the periodic carrying capacity of temporary pastures dependant on a pattern of sporadic precipitation. The Addax roams in a region reached, although in attenuated form, by tropical summer rains at their extreme extension, and also, sporadically, by winter storms of Mediterranean origin that cross the Sahara in its southern part (Gillet, 1965). Towards the desert, the limit of its range corresponds to that of availability of feeding grounds. Towards the Sudanese regions, the limit of the range, reached by the Addax during dry periods, situated near the 15th parallel in the driest years (Gillet, 1965), is probably set by competition with other species, domestic livestock in particular.

Newby (1989) believes that the decline of the Addax in Niger over the last 50 years can be attributed essentially to three determinant factors: direct taking (hunting and poaching), drought and disturbance by tourism. According to his 1989 analysis, the influence of hunting and disturbance caused by tourism should be decreasing in Niger. Consequently, even taking into account the fact that in certain areas and for certain types of habitat the recent periods of drought most certainly caused irreversible damage, Newby considered that, in 1989, prospects for conservation and reintroduction projects were probably better than they had been in the preceding decade.

In situ conservation measures need to be sustained or initiated to improve the perspectives of recolonisation in a number of range state, as follows:

Mauritania. The possibility of implementing the proposal of a Tilemci reserve (Hamerlynck, in litt.) near Oualata and Tichitt, or another zone of protection in the Mreyyé needs to be studied. The control of hunting is otherwise crucial to any conservation efforts in Mauritania.

Mali. The establishment of a zone of protection specifically for the Addax in the Majabat al Koubra must be considered as rapidly as possible. The Adrar des Iforas is also a potentially important region. Field prospection must be conducted in the area, with a view to concrete proposals.

Chad. The rehabilitation of the Ouadi Rimé-Ouadi Achim Reserve is a national and international priority for the survival of the Addax. New evaluations of the state of conservation of Addax populations in the reserve are needed. Additional prospection is also urgent in northeastern Chad, in the depression of the Mourdi and the Erdi, and in the Djourab to the border with Niger.

Niger. The Aïr-Ténéré National Nature Reserve, created in 1988 for the conservation of Sahelo-Saharan antelopes, has suffered these last years and human presence has never been sufficiently controlled (Newby, 1988), but the size of the reserve (77,360 km²) and the Addax sanctuary that it encloses constitute an important advantage. A planned reserve in the Termit region offers an extraordinary possibility of conservation of the Addax (Grettenberger and Newby, 1990), and it should be supported and implemented.

Sudan. Systematic prospection is desirable in the northern Darfur, toevaluate the possibility of establishing a reserve. A proposal for creating a reserve exists in the Wadi Howar.

Population reinforcement or reintroduction measures, some based on existing programmes or proposals, must accompany these measures in the same or additional range state, as follows:

Tunisia. The essential Tunisian Addax reintroduction programme, so far very successful in its establishment of a viable and successfully-reproducing herd of about 45 animals at Bou Hedma National Park, must be assisted in its progress and supported internationally. In particular it must be helped to proceed to the crucial stage of reimplantation of the species in more typical, Saharan, habitats. This has long been foreseen by Tunisian authorities, but requires complex preparatory management measures in southern Tunisian protected areas, in particularl Djebil National Park.

Morocco. An Addax restoration programme is underway, which must be supported. The prospects of reimplantation of the Addax the proposed National Park of Dakhla-Adrar Souttouf are good.

Niger. A programme to reinforce the Addax population in Aïr-Ténéré was studied in detail at the end of the 1980's (Dixon, Knowles and Newby, 1989) and should be pursued and updated in the current environmental and socio-economic context.

Chad. An evaluation of the necessity and feasibility of a population reinforcement programme is needed.

Algeria. The existence of national parks of exceptional dimensions, the Tassili des Ajjers National Park and the proposed Hoggar National Park, could be an important favourable element for the reimplantation of the Addax in Algeria.

Libya. The Zellaf Reserve, in the southern part of the Hamada el Homra, could be considered for a future reimplantation of the Addax.

2.2. Habitat.

The main, Saharan, range of the Addax, corresponds to the desert formations of White (1983), including the desert dunes with perennial vegetation of his unit 70 together with the regs, hamadas and wadis of his unit 71. It also extends to White's unit 54, which contains the grassy and shrubby formations of the northern Sahel, entered by Addax in search of pastures during periods of drought.

The Addax is well known for its utilisation of extremely desolate, inhospitable, and arid habitats (Dragesco-Joffé, 1993). It has anatomical, physiological, and behavioural characteristics which allow it to exploit habitats

where life seems impossible (Lavauden, 1934; Bourgoin, 1955; Gillet, 1965; Newby, 1974). A specialist of sandy desert regions, the Addax is the characteristic occupant of Saharan dunes, adapted to very dispersed pastures (Heim de Balsac, 1936; Malbrant, 1952; Gillet, 1969; Newby, 1984; Grettenberger and Newby, 1990; Dragesco Joffé, 1993).

The precise data available on the habitat of *Addax nasomaculatus* have been gathered in Chad (Malbrant, 1952; Gillet, 1965, 1969; Newby, 1974; Dragesco Joffé, 1993), in Niger (Lhote, 1946; Grettenberger and Newby, 1989) and in Mauritania and Mali (Lamarche, 1980, 1987). The conjunction in the southern Sahara of the extreme extension of tropical summer rains and of sporadic winter depressions of Mediterranean origin allows, in favourable years, a year-round production of green pastures by plants that react to both phenomena (Gillet, 1969). The plants capable of greening with the passage of humid air linked to the northward shift of the tropical front, are precisely those which provide the basic food of the Addax, in particular the drinn (*Aristida pungens*), *Aristida plumosa*, the had (*Cornulaca monacantha*), plants of broad distribution reaching far north into the desert (Gillet, 1965).

In the southern part of its range at least, during the dry season, Addax approach areas of human occupation in the south, their distribution then being determined by the presence of wild melons, *Colocynthis vulgaris (Citrullus colocynthis)*, particularly characteristic of sub-desert Sahelian steppes and representing for the species the principal source of water at this time of year (Newby, 1974; Dragesco Joffé, 1993). As soon as the first rains renew their Saharan pastures, Addax return rapidly to the security of their remote grazing grounds. Newby (1974) shows that, in Chad, the southern limit of Addax during the rainy season corresponds approximately to the southern limit of had (*Cornulaca monacantha)*, a chenopodid shrub that is a good source of water.

In the ephemeral pastures of the rainy season, the Addax feeds on graminids such as *Aristida pungens, Stipagrostis plumosa, Tribulus sp, Cyperus conglomeratus,* young green leaves of *Panicum turgidum*, and a variety of leguminous plants such as species of *Tephrosia* and *Indigofera*. During recent periods of drought, Addax have survived by grazing mainly on the perennial grass *Stipagrostis vulnerans,* which is usually only consumed in the dry season (Newby, 1974). Other plants utilised by the Addax in the dry season are the Apiaceae *Schouwia thebaica,* the Amaranthaceae *Aerva javanica* and the Euphorbiaceae *Chrozophora brocchiana* (Newby, 1974), or grasses like *Aristida acutiflora* (Dragesco Joffé, 1993).

The Addax can go without water for very long periods (Malbrant, 1952; Gillet, 1965, 1969; Newby, 1974; Dragesco Joffé, 1993), as noted, in particular, in Niger (Lhote, 1946; Grettenberger and Newby, 1989). Some plants having surface hair or glands capable of trapping night-forming dew, such as *Tephrosia vicioides*, are very sought after by the Addax (Gillet, 1965). It seems that the Addax can make use of viscous liquids at high osmotic pressure secreted by several plant species that it consumes (Gillet, 1969).

One of the main types of Saharan pastures is the "gizu" or "jizzu", ephemeral pastures that form after occasional rains, without which the Addax could probably not survive (Wilson, 1978; Newby, 1984). The combination of cool winter nights and good water retention of the soil allows the pastures to remain green until summer. The animals that graze on the gizu can stay almost indefinitely independent from waterholes (Newby, 1984). The main elements of gizun are *Indigofera berhautina, I.hochstetteri, Neurada procumbens, Tribulus longipetallus, Fagonia bruguieri, Cyperus conglomeratus* and *Stipagrostis acutiflora* (Newby, 1974, 1984; Wilson, 1978).

2.3. Evaluation and evolution of populations.

Although there is no estimate of the size of Addax populations in the 19th century or before, it appears that the species was widespread in Antiquity (Lavauden, 1926). Most authors agree that the species was formerly common and locally abundant in its entire range (Sclater Thomas, 1899-1900; Chudeau, 1920; Heim de Balsac, 1931; Harper, 1945; Lhote, 1946; Monod, 1958; Le Houérou and Gillet, 1986; Lamarche, 1987; Newby and Magin, 1989).

In 1966, estimates of total numbers of Addax surviving in the wild were of the order of 5000 individuals (Dolan, 1966). Around 1980-1981, Newby (1981) estimated that the total number for the species had decreased to fewer than 4000 individuals, and to fewer than 2000 individuals in 1986 (Newby, 1986). More recent estimates suggest that the total population is fewer than 600 individuals, most living in Chad (around 200), in Niger (50 to 200), and in the Majabat al Koubra, on the northeastern border of Mali and the eastern border of Mauritania (Dixon *et al.*, 1991; East, 1990).

2.4. Migration.

The Addax is described by several authors as being in perpetual movement, like a tireless nomad who roams large areas in search of pastures and which exploits environments where all life seems impossible, such as the ergs and the regs (Gillet, 1965, 1969; Lamarche, 1987; Dragesco Joffé, 1993). Because of the erratic character of Saharan rains, the Addax lives in regions where grassy clumps are extremely dispersed, making it necessary to perform large daily movements (Gillet, 1967; Newby, 1984). In addition to local movements made throughout the year, numerous authors have described annual migratory movements, with a penetration in the desert at the time of rains and during the cool season, and a reverse movement, towards the periphery of the desert, in summer (Newby, 1984). These movements are closely linked to the search for shade and, above all, to the absolute need to consume plants capable of satisfying both the nutritional and water needs of the species (Newby, 1984); they thus vary considerably from year to year, although they are not unpredictable (Newby, 1974).

Annual movements were described for Chad and Niger by Gillet (1965, 1969) and Newby (1974), for Mali and Mauritania by Monod (1952) and Lamarche (1980, 1987), and for Sudan by Wilson (1980). Gillet (1969) and Newby (1974) compare, in Chad, the seasonal migrations of the Oryx and of the Addax and note that these seasonal movements are of a lesser amplitude for the Addax than the Oryx (Newby, 1974) and stay almost always in a more northerly position (Gillet, 1969). At the end of the dry season, the Addax moves well into the sub-desert Sahelian steppes, between the 15th and 17th parallels, and in very dry years descends as far as the 14th parallel (Newby, 1974). In Chad, Gillet (1965) distinguishes between populations which make regular movements, populations which are relatively sedentary, and individuals or small groups that perform large amplitude but erratic movements.

Cyclic migrations, , seasonal or interannual, of Addax have, or had, a cross-border character, at least between Mali and Mauritania, between Mauritania and the former Spanish Sahara, between Mali and Algeria, Niger and Algeria, Chad and Algeria, Niger and Chad, Chad and Sudan, between Sudan, Egypt, and Libya, between Algeria and Tunisia, and between Algeria and Libya (Lhote, 1946; Dupuy, 1967; Kowalski and Rzebik-Kowalska, 1991; Dragesco Joffé, 1993).

3. CONSERVATION STATUS, BY PARTY

Morocco (including ex-Spanish Sahara)**: E**xtinct

It is probably the populations linked to the large Mauritanio-Malian ergs of the Majabat al Koubra and to the Iguidi and Chech ergs which occupied, with an unknown regularity, the Atlantic Sahara in the Dakhla region (Morales Agacino, 1950; Valverde, 1957; Loggers *et al.*, 1992) and gave rise to observations east of Zagora in the upper Drâa region of Morocco (Marçais, 1937; Loggers *et al.*, 1992). The few data from around Saquiat el Hamra suggest that they do not refer to permanent populations (Morales Agacino, 1950; Valverde, 1957; Loggers *et al.*, 1992). The last herd was eliminated in 1942, and the last report dates from 1963, relating to an isolated female.

Tunisia: Reintroduced

The Addax was present in the Tunisian part of the Grand Erg Oriental, where the last animals were hunted around 1900, between Bir-Aouïn and the El Jenaîen Erg (Kacem, 1994). Kacem (1994) situates the date of extinction at around 1932. The species was successfully reintroduced in Tunisia in the Bou Hedma National Park in 1985 (Bousquet, 1992; Kacem, 1994). The translocation and reintroduction of the Addax in more Saharan environments, especially those of the Djebil National Park, is planned, and will be carried out once reinforcement of Saharan park protection is assured.

Algeria: Probably extinct, or very occasional visitor

Until the middle of the 19th century, the northern limit of the range of the Addax in Algeria reached the northern part of the Grand Erg Occidental (Colomb, 1856 and Mares, 1857 in Kowalski and Kowalska, 1991), and the southern part of Ouargla and Touggourt (Aucapitaine, 1860 in Kowalski and Kowalska, 1991). In the beginning of the 20th century, the northern limit of the range was much farther south, and at the same time, data appear on presence of the species in southern regions of Algeria which were until then inaccessible to

prospectors. Grenot (1979) dates the extinction of the species in the northwestern Sahara at around 1905 with the disappearance of the last herd in the Er Raoui Erg. The Addax probably disappeared from the Grand Erg Oriental in the beginning of the 20th century (Kowalski and Kowalska, 1991). Lhote (1946) reported presence of the species in 1938-1939 in the Hamada de Tinrhert; he observed the species in the Ténéré Erg at the Niger-Algeria border, and traces of Addax near the Malian border south of the Tanezrouft, to the north of the Adrar des Iforas. The species was still present in the north of the Iguidi Erg until the 1930's, but does not seem to have survived beyond that except on the Mauritanian side (Heim de Balsac, 1948). The presence of the Addax around the Hoggar massif, in the Tassili des Hoggar, in the Tassili des Ajjers, the Ténéré Erg, and the Hamada de Tinrhert was reported by several authors until the 1970's and even the 1980's (Lhote, 1946; Regnier, 1960; Dupuy, 1966, 1967b; De Smet, 1988). The Addax is probably currently still a very occasional visitor, entering Algeria along the southern border with Mauritania, Mali, Niger, and perhaps even Libya.

Libya: Probably extinct

In Libya, the scanty data suggest a former presence of the Addax on the piedmont slopes of the Haruj al Aswald, in the Koufra region and in the vicinity of the Calanshio dunes (Hufnagl, 1972). Hufnagl (1972) thought that it had become very rare, and even extremely rare in the Hamada el Homra, where the Tripoli museum specimens were taken in 1938. In the 1970's, Hufnagl records it again in the northeast and southeast, towards the Egyptian border (Kufra Oasis), as well as in the center of the Haruj el Aswad. Osborn and Krombein (1969) had reported, in the Jebel Uweinat region, the probable periodic presence of migrating Addax coming from the south, while Misonne considered it extinct in the area in 1977. Some individuals were pursued by hunters in 1975 in the Edyin de Murzuk (Gillet, 1971).

Egypt : Extinct

Kock (1970) and Osborn and Helmy (1980) have discussed the observations of the Addax in Egypt. Until the 1870's, they are numerous. They pertain to the Western Desert of Middle Egypt, where the Addax was known from the large oases and depressions or their peripheries, in particular from Siwa in the northwest, as well as from the Libyan oasis adjacent to Jaghbub, from the Qattara Depression, from Faiyum, from Bahariya, from Farafara, from Dakhla, and from the Kharga complex (Osborne and Helmi, 1980). The Addax was also observed in the extreme northeastern part of the Mediterranean coastal desert, in the Nubian Desert southwest of Bir Kiseiba, and in the region of Jebel Uweinat. This concentrated distribution is characteristic of most mammals in the Western Desert (Osborn and Helmi, 1980) and most likely reflects the reality of the distribution in this desert empty of vegetation (Osborn and Helmi, 1980). The last data refer to animals killed in 1900, 65 km west of Alexandria (Flower, 1932), and in 1931, in Scheb (Osborn and Helmi, 1980).

Mauritania: Endangered

Eastern Mauritania is part of the range of Addax populations which were linked to the big Mauritanio-Malian ergs of the Majabat al Koubra and to the Iguidi and Chech ergs (Monod, 1958; Gillet, 1969; Trotignon, 1975; Walter and Breckle, 1986; Lamarche, 1987). The southern limit of this part of the range descends to southeastern Mauritania between the 17th and 19th parallels. The Addax was still largely distributed in Mauritanian desert regions until the 1940's, but the Mauritanian range has greatly shrunk since (Sournia and Verschuren, 1990). The species probably survived until recently in several parts of the eastern deserts, especially the Dahr Tichit (Trotignon, 1975). Since 1980, the Addax has survived only in the Mreyyé area in the eastern part of the Majabat al Koubra (Lamarche, 1987); this range is occupied by the population also found in western Mali, which makes cross-border seasonal movements over distances of several hundred kilometres (Lamarche, 1987). This moving population of many hundreds of individuals is certainly the biggest reservoir of Addax at present (Lamarche, 1987). It is threatened by the practices of uncontrolled motorized hunting (Sournia and Verschuren, 1990).

Mali: Endangered

Western Mali is also part of the range of Addax populations that were linked to the big Mauritania-Mali ergs of the Majabat al Koubra and to the Iguidi and Chech ergs (Monod, 1958; Gillet, 1969; Trotignon, 1975; Sayer, 1977; Walter and Breckle, 1986; Lamarche, 1987). The Addax is still present along the Mauritanio-Malian border (Sayer, 1977; Lamarche, 1987); it is the same population of several hundred individuals that is also found in eastern Mauritania and that makes seasonal movements of many hundreds of kilometres, movements which, in the cold season, bring it to Mauritania in the region of the Mreyyé (Lamarche, 1987). The southern limit of this part of the range descends to the centre of Mali between the 17th and 19th parallels. This moving population of many hundreds of individuals is certainly the largest reservoir of Addax today (Lamarche, 1987).

It is threatened by uncontrolled motorized hunting (Heringa, 1990; Sournia and Verschuren, 1990). The Addax is currently not found in any protected area in Mali (Heringa, 1990). In the transition zone between the desert and the Sahelian steppes, regions of significant presence of the Addax existed at least in the periphery of the Adrar des Iforas (Lhote, 1946). Lhote (1946) observed traces of the Addax near the Algerio-Malian border south of the Tanezrouft and to the north of the Adrar des Iforas. It is possible that the species still survives there in very small numbers (Heringa, 1990).

Niger: Endangered

The Addax was formerly widely distributed in the desert zone of Niger, but it was eliminated from the largest part of its former range (Grettenberger and Newby, 1990). In the transition zone between the desert and the Sahelian steppes, large populations of Addax existed at least in the Ténéré, the piedmont slopes of the Aïr, and the Termit massif (Lhote, 1946; Brouin, 1950; Grettenberger and Newby, 1990; Millington *et al.*, 1991). It is currently still present in dune zones out of reach of motorized hunts, especially in the east and northeast of the region of the Termit, the Ténéré desert, and in the northwest near the Algerian border (Grettenberger and Newby, 1990). The northern limit is situated around the 16th parallel. In 1990, Grettenberger and Newby estimated the population in Niger to be less than 200 individuals, of which about fifty were in the western part of the Ténéré desert inside the Aïr-Ténéré National Nature Reserve. Grettenberger and Newby (1990) also believe that the density of the Addax population around the Termit massif is probably greater than that of the Aïr-Ténéré Reserve.

Chad : Endangered

The Addax was formerly widely distributed in the sandy zones of the desert and semi-desert steppes north of the 15th parallel. It could even be locally abundant north of the Erguei and the Bodélé (Kanem), east of the Mourdi depression and farther east in the Ennedi, south of the Tibesti (Gillet, 1969; Newby, 1974), and in the Sudano-Chadian regions of the Mourdi and Wadi Howar (Sudan) depressions (Malbrant, 1952; Gillet, 1969; Kock, 1970; Wilson, 1980). Chad was, for several decades, the most important stronghold of the Addax, at a time when the species was disappearing under hunting pressure practically everywhere else (Thomassey and Newby, 1990). In the beginning of the 1970's, there were still undoubtedly several thousand Addax in Chad (Thomassey and Newby, 1990), but the situation has strongly degraded since, under the combined effects of hunting, years of drought, competition with domestic livestock, and military activities in the north of the country (Thomassey and Newby, 1990). In the 1970's, there were still a substantial number of Addax (around 800 individuals) in the north of the region of the Oued Achim-Oued Rimé, and these Addax moved northwards in the direction of the Tibesti during the rainy season (Thomassey and Newby, 1990). Military events occurring in 1978 compromised protection efforts achieved, and pushed the Addax farther and farther away towards even more marginal regions as far as the survival capacity for the Addax is concerned, than those areas where the species had been established (Newby, 1974). There are currently probably less than 200 individuals left in the desert zones which are remote and difficult of access between the 15th and 17th parallels (Thomassey and Newby, 1990). Recent prospections, involving aerial censuses and ground observations, carried out by Pfeffer in 1990 and 1991, and renewed ground observations by Tubiana in 1995, indicated the presence of small groups of Addax on the Oued Achim, in the Mourdi depression, especially in its eastern part, on the Oued Chili, between Kalaït and Fada, and in the east of the Ennedi, between Bao Bilia and the Sudanese border (Pfeffer, 1995).

Sudan: Probably extinct, or very occasional visitor

In the past, the Addax was widely distributed in the zones of desert and semi-desert steppes of northern Sudan, in the Nubian Desert of the North province and of northern Kordofan, in northern Darfur (Audas, 1951; Kock, 1970; Wilson, 1980; Hillman and Fryxell, 1988). It was widespread and even locally abundant until the 1930's-1940's (Brockelhurst, 1931; Shaw, 1936). By the end of the 1930's, the numbers had diminished considerably in the Kordofan (Audas, 1951) and elsewhere in the 1940's. From the 1950's onwards, information become rare (Wilson, 1980). No sign of presence of the Addax could be recorded during aerial prospections conducted in the 1970's in northern Sudan (Lamprey, 1975; Wilson, 1980), but the species survived in small numbers in the Darfur until the end of the 1970's (Hashim, *in litt*. Nov. 1996).

4. ACTUAL AND POTENTIAL THREATS

The decline of the species cannot be attributed to a single cause, but rather to an ensemble of factors which acted simultaneously and concurrently and were mutually reinforcing, that is, hunting associated with bad land management, drought and the desertification it entails, disturbance and insufficient protection (Newby, 1988).

4.1. Degradation and regression of habitats.

Recent periods of great drought, in the 1960's-1970's and the 1980's, induced a catastrophic expansion of desertification over the entire desert and sub-desert region of North Africa. Their effects on Addax populations were disastrous: reduction of winter pastures, increased scarcity of pasture lands in the dry season, loss of shade, and general disappearance of vital organic water resources (Newby, 1988). Previously, during comparable periods of drought, the Addax probably occupied more significantly the north-Sahelian zone of steppes (White, 1983, unit 54a). Sahelian steppes are subjected to a growing pressure for pastures by the livestock of nomad populations fleeing the drought. Livestock in the Sahelian zone is now in direct competition with the large natural fauna of the region. The Addax populations, in search for pastures, are forced to approach zones of human occupation, and have thus become more exposed to direct exploitation.

4.2. Direct exploitation.

Traditional methods of hunting, such as those practised until the 1960's (hunting with nets), and still, nowadays, hunting with spears and dogs, horses, and dromedaries, although resulting locally or periodically in large takes, could not have had a significant impact on Addax numbers (Brouin, 1950; Gillet, 1965, 1969; Newby and Grettenberger, 1986; Newby, 1988; Dragesco-Joffé, 1993). For the last 30 or 40 years, excessive hunting with modern arms has reduced the populations to such a degree that traditional hunting can practically no longer be done (Newby and Grettenberger, 1986).

Man is clearly the main instrument of the decline of the species, mainly since the end of the 1940's, with the advent of the deadly combination of firearms and off-road vehicles, as documented by Gillet (1965, 1969), Newby (1986, 1988) and Dragesco-Joffé (1993), who show that hunting, carried out in an irresponsible way by mining, military, and administrative personnel, is the principal cause of the staggering decline of the Addax.

4.3. Other threats.

Tourism is and has been an additional threat to the Addax, particularly in Niger where Newby (1989, 1990) notes tourists chasing Addax with off-road vehicles. Chased and harrassed in this manner, the Addax starts galloping and can die within ten minutes.

All of the indirect human pressures likely to affect the species, such as the increase of wells, the extension of domestic livestock, and the invasion of available habitats, have an effect through the degradation or the regression of habitats and the rise in vulnerability to taking and harassment. These have been treated in the preceding paragraphs.

5. REGULATORY PROVISIONS

5.1. International.

Bonn Convention: Appendix I, Resolution 3. 2, paragraph 4.
Washington Convention (CITES): Appendix I

5.2. National.

6. CONSERVATION MEASURES, PER PARTY

6.1. Ban on taking.

6.2. Habitat conservation.

Morocco (including ex-Spanish Sahara):

The proposed parks of the Drâa basin and of Dakhla-Adrar Souttouf (Müller, 1966) seem suitable for reintroducing the species. The few existing data for these zones suggest that they did not support permanent populations of Addax. The current practical impossibility of ensuring security of movement towards other regions will perhaps necessitate active management of the habitat.

Tunisia:

The Addax has been extinct in Tunisia since the 1930's. In 1980, the Tunisian Government established the Bou Hedma National Park, 16,488 hectares of steppes and *Acacia raddiana* woodlands, of which 4500 hectares are managed under a system of total protection. The Bou Hedma Park, in which a programme of habitat restoration has been successfully conducted (Bertram, 1988; Bousquet, 1992; Kacem, 1994), represents an optimal site for reintroduction of *Oryx dammah*. It represents for the Addax more a centre for reproduction and acclimatisation, allowing its restoration to more suitable areas in Saharan parks such as Djebil National Park, once planned reinforcement of these parks is assured. Management of the habitat at Djebil may have to be considered.

Algeria:

The Tassili des Ajjers National Park and the proposed Hoggar National Park offer, because of their exceptional size and environmental diversity (Bousquet, 1992), possibilities for reintroduction. The rarity of observations in these regions for the last few decades does not allow exclusion of the need for habitat management.

Mali:

The shifting population of several hundred individuals that still survives in western Mali, at the Mauritanio-Malin border, is probably the largest reservoir of Addax today (Lamarche, 1987). It is threatened by uncontrolled motorized hunting (Heringa, 1990; Sournia and Verschuren, 1990). At present the Addax is not found in any protected area in Mali (Heringa, 1990). Local energetic protection efforts for this last large Addax population are essential to the survival of the species.

Mauritania:

Since 1980, the Addax has survived in Mauritania only in the Mreyyé region in the eastern part of the Majabat al Koubra (Lamarche, 1987); this population is the same as the one found in western Mali, and that performs seasonal cross-border migrations of several hundred kilometres between Mali and Mauritania (Lamarche, 1987). This shifting population of many hundred animals is most likely the largest reservoir of Addax today (Lamarche, 1987). Hunting practices in Mauritania expose this population to considerable risks (Lamarche, 1987; Sournia and Verschuren, 1990). Strict protection measures must be taken to prevent irresponsible motorized hunting in the Mreyyé (Lamarche, 1987). The Addax is at present not found in any protected area in Mauritania. Local energetic protection efforts for this last sizeable population of Addax are essential to the survival of the species. Special efforts must imperatively be made to control hunting.

Niger:

Within the perimeter of the Aïr-Ténéré National Reserve, a sanctuary was created specifically for the preservation of the Addax. A residual population of the species still occupies the sanctuary, the Aïr Reserve and its periphery. Projects for population reinforcement have often been proposed since 1989 (Grettenberger and Newby, 1989, 1990). The idea should be reconsidered now in the light of the current environmental and social context, after new evaluations of the chances of survival of the species in the wild and the preservation of its original behaviour. A planned reserve in the Termit region offers a second possibility for local conservation (Grettenberger and Newby, 1990), as well as for reinforcement if necessary.

Chad:

The Ouadi Rimé-Ouadi Achim Reserve is an essential site for the survival of the Addax (Grettenberger and Newby, 1990; Pfeffer, 1993a, 1995). Addax have still been sighted recently in the north of the Reserve. Rehabilitation of the Reserve, badly treated since the military conflicts, is a prerequisite for any action (Grettenberger and Newby, 1990). The implementation of strict protection measures for the habitat and the animals is indispensable.

Sudan:

The proposal to create a Wadi Howar National Park in the northern Darfour would provide an opportunity to restore populations of Addax or to reintroduce them if it became necessary and feasible. Considering the degraded conditions of the steppe areas in Sudan substantial habitat restoration measures may be a necessary prerequisite. Control of taking within large protected areas may be difficult (Cloudsley-Thompson, 1992).

6.3. Attenuation of obstacles for migratory animals.

Given the present state of the populations, the question is without object. In the event of recuperation, or as reintroduction projects progress, it could be gradually reconsidered. In the short and medium term, only the creation of protected areas large enough to include the entire necessary range and, in particular, cross-border reserves, seems to be an adequate answer. It seems indeed unlikely that security of movement between protected areas can be realistically assured in the foreseeable future.

6.4. Regulations concerning other detrimental factors.

6.5. Other measures.

Outside range:

The species is raised in captivity or semi-captivity in various countries in North Africa, the Middle East, Europe, and North America.

7. Research activities

7.1. Public authorities.

New prospection efforts are needed to evaluate the residual populations of Addax, essentially in Chad and Niger (Newby, 1989).

Research and experiments must be conducted in the domain of rational use of the Addax as an exceptional resource capable of utilizing extreme environments.

7.2. N.G.O.s

8. NEEDS AND RECOMMENDED MEASURES

Recommended measures are the object of an Action Plan developed in parallel with the present status report (Beudels *et al.*, 1998). The principal needs that they meet are listed below.

8.1. Total protection of the species.

Required in all the countries of the historical range in order to prepare a possible redeployment of the species.

8.2. Conservation measures.

Establishment of a network of protected areas in all parts of the historical range of the Addax, based on the guidelines stated in point 2.1.4., with absolute priority given to zones where the species could be surviving in the wild, most importantly, to the protection of the Majabat al Koubra in Mauritania and in Mali, to the rehabilitation of the Ouadi Rimé-Ouadi Achim Reserve in Chad, and to the reinforcement of the Aïr-Ténéré Reserve in Niger.

8.3. Location and monitoring of residual populations, and clarification of their ecological requirements:

Niger: Urgent need for new prospections to evaluate residual populations of Addax, especially around the Termit massif.

Chad: Urgent need for new prospections to evaluate residual populations of Addax.

8.4. Reinforcement of populations and reintroduction into the potential range.

Support for the Tunisian reintroduction programme.
Support for the Moroccan reintroduction programme.
Preparation of programmes in other regions of the historical range, according to the guidelines stated in point 2.1.4.
New evaluation of the possibilities of reinforcing the populations in Niger and Chad.
Study the possibilities of reviving the project to establishe a centre of reproduction in captivity at the former ranch of Erkafane, as proposed in 1989-1991.

9. Conservation and rational use

In the recent past, large mammals were important as a source of protein and for their exchange value in all the desert and semi-desert zones of North Africa, and represented an important resource in particular for the peoples of the desert. For about the last sixty years, these large mammals have become more and more rare, but the number of head of livestock, in Niger for example, has increased significantly in certain periods (Newby and Grettenberger, 1986). During periods of drought, this livestock diminished considerably. If the large mammals of the desert could be reintroduced or their numbers increased until they reach sufficient levels, and if they could be managed as a natural resource, these species, adapted to survival in extreme conditions, could become of inestimable value for the sustainable development of these regions. Research and experimentation should be undertaken within this optic.

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Report on the status and perspectives of a species

Gazella dama

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This report is based on documents prepared for the Convention on Migratory Species by Pierre Pfeffer (1993b, 1995) and on supporting documents for the action plan on Sahelo-Saharan antelopes adopted by the 4th Conference of the Parties of the Convention, documents that were prepared by Roseline C. Beudels, Martine Bigan, Pierre Devillers and Pierre Pfeffer (1994). The information it contains originates mainly from the general accounts and regional action plans edited by Rod East (1988, 1990), and the fundamental work of Hubert Gillet (1965, 1969) and John E. Newby (1974, 1988, in particular). It is completed by a new review of the literature and a survey of actors in the field conducted in 1996 and 1997 by Tommy Smith (1998) with the support of Koen De Smet. Roseline C. Beudels, René-Marie Lafontaine, Marie-Odile Beudels, Tommy Smith, Yves Laurent and Chris Kerwyn have contributed to the preparation and finalising of this report.
Original in french; translation by Roseline C. Beudels and Jean Devillers-Terschuren

Cover drawing: J. Smit, in Sclater and Thomas, 1899.
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1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomy.

Gazella dama belongs to the tribe Antilopini, sub-family Antilopinae, family Bovidae, which comprises about twenty species in genera *Gazella, Antilope, Procapra, Antidorcas, Litocranius, Ammodorcas* (O'Regan, 1984; Corbet and Hill, 1986; Groves, 1988). Genus *Gazella* comprises one extinct species and from 10 to 15 surviving species, usually allocated to three sub-genera, *Nanger*, *Gazella* and *Trachelocele* (O'Regan, 1984; Corbet and Hill, 1986; Groves, 1988). *Gazella dama* is one of three species forming the group of giant gazelles (Groves, 1988) of sub-genus *Nanger* (O'Regan, 1984). The other two species, *Gazella soemmerringi* and *Gazella granti*, are linked to the semi-deserts, dry thickets, dry woodlands, steppes, and open savannas of northeastern and eastern Sudanian Africa. *Gazella dama* is polytypic, comprising three to nine recognised sub-species (Cano, 1984; Groves, 1988; Alados *et al*., 1988; Dragesco-Joffé, 1993; Cano *et al*., 1993; Kacem *et al*., 1994; Abaigar *et al*., 1997). The geographical variation appears clinal, with regions of steepening of the gradient (Groves, 1988); geographical variation is somewhat obscured by individual variation (Brouin, 1950; Malbrant, 1952; Dragesco-Joffé, 1993). Usually three sub-species are distinguished: *Gazella dama mohrr* in the Atlantic Sahara, *Gazella dama dama* in the western and central Sahel, and *Gazella dama ruficollis* in the eastern Sahel (Cano, 1984; Cano *et al*., 1993; Kacem *et al*., 1994; Abaigar *et al*., 1997). Uncertainty exists about the identity of the extinct Sahelian populations of Senegal, included in *Gazella dama dama* after the work of Sclater and Thomas (1898), and again recently by Kacem *et al*. (1994), in *Gazella dama mohrr* by Cano (1984), Cano *et al*. (1993), and Abaigar *et al*. (1997). This uncertainty contributes to doubts about possible geographical isolation of the Atlantic form *Gazella dama mohrr*, morphologically the most distinct. Kacem *et al*. (1994) suppose a hiatus in distribution between *Gazella dama mohrr* and *Gazella dama dama* in the south of Mauritania. This is not apparent on the map of distribution drawn by Trotignon (1975), but is confirmed, however, by an examination of the historical data he collected. In any event, possible future efforts to reintroduce, and even more to reinforce, populations must respect the geographical variation of the species as far as possible, even if its clinal character does not require differential treatment of sub-species. The only probable exception is that of *Gazella dama mohrr* whose geographical isolation and coastal desert specialisation are probable.

1.2. Nomenclature.

1.2.1. Scientific name.

Gazella dama (Pallas, 1766).

1.2.2. Synonyms.

Antilope dama, Cerophorus dama, Cemas dama, Antilope nanguer, Gazella nanguer, Antilope mhorr, Nanger mhorr, Gazella mhorr, Gazella mohr, Antilope mhoks, Antilope dama, var. *occidentalis, Antilope ruficollis, Gazella ruficollis, Antilope addra, Antilope dama,* var. *orientalis*

1.2.3. Common names.

English: Dama Gazelle, Addra Gazelle
Arabic: Ariel, Ril
French: Gazelle dama, Biche-Robert, Mohrr, Gazelle mhorr, Mohor, Gazelle mohor, Nanguer (Buffon), Ména, Grande gazelle

2. BIOLOGICAL DATA

2.1. Distribution.

2.1.1. Historical distribution.

The range of the Dama Gazelle resembles that of the Scimitar-horned Oryx (*Oryx dammah*), with which it largely shares ecological requirements, with however a slightly greater tolerance for desert zones (Dupuy, 1967) and rocky

environments. The zone of historical distribution consequently comprises more or less the same Sahelian and Atlantic sections, but extends to the central Saharan massifs. On the other hand, it seems never to have included a Mediterraneo-Saharan sector (Sclater and Thomas, 1898; Lavauden, 1920; Heim de Balsac, 1931; Dupuy, 1967; Kowalski and Rzebik-Kowalska, 1991; Loggers *et al*., 1992), nor any extension into the oases of the Libyan Desert of middle Egypt (Osborn and Helmy, 1980); the observation of *Antilope dama* by Schweinfurth in Dakhla clearly refers to the oryx, not to the gazelle (Osborn and Helmy, 1980).

The main, Sahelian, range of *Gazella dama* coincides, like that of *Oryx dammah*, with the semi-desert Sahelian steppes belt of White (1983), forming his unit 54a in region XVI, largely corresponding to that of the sub-Saharan *Aristida* steppes of Rattray (1960), comprising his units A11, A13, A15, the sub-desert steppes of Newby (1974), and the Saharan savannas of Schulz (1988) and Ozenda (1991). These steppes extend across the centre-south of Mauritania between 18° (locally 20°) and 16° N, the centre of Mali between 18° and 15°N, of Niger between 17° and 15°N, of Chad between 17° and 14°N, and of Sudan between 17° and 12° 30'N (Lhote, 1946; Malbrant and Maclatchy, 1949; Brouin, 1950; Audas, 1951; Malbrant, 1952; Dekeyser, 1955; Cornet d'Elzius and Gillet, 1964; Newby, 1974; Lamprey, 1975; Schnell, 1976; Wilson, 1978, 1980; Monod, 1986; Grettenberger and Newby, 1986, 1990; Hillman and Fryxell, 1988; Sournia and Verschuren, 1990; Heringa, 1990; Thomassey and Newby, 1990; Millington *et al.*, 1991; Dragesco-Joffé, 1993; Kacem *et al.*, 1994; Hashim, 1996). Towards the south, the distribution of the Dama Gazelle advanced widely in the southern Sahelian band of deciduous shrubs or thickets (White, 1983, region XVI, unit 43) in Senegal (Sournia and Dupuy, 1990), in Burkina Faso (Heringa *et al*., 1990), in Mauritania (Trotignon, 1975), in Mali (Lhote, 1946), in Niger (Lhote, 1946), in Chad (Malbrant, 1952; Newby, 1974), in Sudan (Audas, 1951), and in Nigeria (Anadu and Green, 1990). The Sahelian range included the southern Saharan massifs of the Adrar des Iforas in Mali, the Aïr in Niger, the Ennedi in Chad, and the Darfur in Sudan (Lhote, 1946; Brouin, 1950; Chopard and Villiers, 1950; Malbrant, 1952; Newby, 1974; Lamprey, 1975; Wilson, 1980; Monod, 1986; Grettenberger and Newby, 1986; Kacem *et al.*, 1994).

Contrary to the Oryx, the Dama Gazelle was able to survive until the recent past in the insular central Saharan massifs (Heim de Balsac and Mayaud, 1962; Simon, 1965; Ozenda, 1991) which harbour, at the favour of humidity gradients, in particular in the valleys, *Aristida* sub-desert steppes, as defined by Rattray (1960), and multiple ligneous formations (Schnell, 1977; Ozenda, 1991), and locally reproduce conditions somewhat similar to those of the Sahelian sub-desert fringe. Its presence is well documented in the vast mountainous group formed by the Hoggar and the Tassili des Ajjers in Algeria (Regnier, 1960; Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991), mainly in the southern part of the complex (Dupuy, 1967). It was noted several times in the western piedmont of the Tibesti, but was perhaps rarer there than in the Algerian massifs (Dalloni, 1936; Malbrant, 1952).

The range of *Gazella dama mohrr* coincides more or less with the oceanic and sub-oceanic Atlantic Sahara, a cold-current coastal and attenuated desert comprising a sublittoral zone, 200 to 300 kilometres wide, where steppes and acacia woodlands abound, allowing the Sahelian flora and fauna to penetrate far north (Valverde, 1957; Monod, 1958; Rattray, 1960; Quézel, 1965; Schnell, 1977; White, 1983; Edmondson *et al.,* 1988; Dakki and Parker, 1988; Ozenda, 1991). Numerous observations of the Dama Gazelle have been made in this very pecular desert (Sclater and Thomas, 1898; Morales Agacino, 1950; Valverde, 1957; Trotignon, 1975; Loggers *et al*., 1992), in a belt which extends from the Oued Noun, in Morocco, to the north, to the Inchiri, in Mauritania, to the south, and almost never exceeds a width of 200 to 300 kilometres. Even though the map of distribution proposed by Trotignon (1975) for the species in Mauritania indicates a continuity between this Atlantic population and the Sahelian populations of southeastern Mauritania, this is not supported by the historical observations he compiled and a cartographic examination indicates, on the contrary, a large gap between the two ranges.

2.1.2. Decline of the range.

In the 1940's the Dama Gazelle still seemed very common in the Sahelian part of its range, but already very rarefied in the Atlantic Sahara and in the central Saharan massifs (Lhote, 1946; Brouin, 1950; Dupuy, 1967). Yet at the end of the 1950's, Valverde (1957) noted a sharp increase in the Spanish Sahara, after near extinction, because of effective protection against poaching. He observed a density close to 150 animals per 100 kilometres of road. However, shortly afterwards, the species practically disappeared from the region, Loggers *et al*. (1992) only collecting one observation for the period 1960-1970, and one other for the period after 1980. There is therefore a risk that *Gazella dama mohrr* is extinct in the wild. In the complex of the Hoggar and the Tassili des Ajjers, the last data gathered by Kowalski and Rzebik-Kowalska (1991) date from the 1960's and the species is also generally considered extinct (Dragesco-Joffé, 1993).

With regard to the Sahelian populations, a significant regression was observed in the 1960's and 1970's with probable extinction in Mauritania (Trotignon, 1975; Verschuren, 1984) and in Senegal (Sournia and Dupuy, 1990).

In the early 1980's, relatively large populations were surviving in Mali, Niger, and Chad, and perhaps very small numbers in Sudan (Newby, 1982). In the beginning of the 1990's they had been reduced to dispersed, relict and declining populations, in Mali (Heringa, 1990) and in neighboring Burkina Faso (Heringa *et al*., 1990), in Niger (Grettenberger and Newby, 1990; Dragesco-Joffé, 1993), and in Chad (Thomassey and Newby, 1990).

2.1.3. Residual distribution.

Populations of the Dama Gazelle survive in the Sahel, at least in Mali, Niger, and Chad, and perhaps also in Burkina Faso, Sudan, and eastern Mauritania. In Mali they are probably several hundred strong and slightly increasing (Duvall *et al*., 1997). In Niger, where the zone of the Aïr-Ténéré and the Termit constitutes one of the last bastions of the species, Dragesco-Joffé (1993) evaluated the population at 400 animals. In Chad the species is currently very rare in the Ouadi Rimé-Ouadi Achim Reserve (Moksia and Reouyo, 1996).

It is possible that *Gazella dama mohrr* survives in some isolated pockets in its historical area of distribution. Cuzin (1996) notes observations by nomads in the Drâa basin in 1993 and in the Adrar Souttouf, situated between 21° 30' and 23° N at about a hundred kilometres from the coast, until at least 1994.

2.1.4. Recolonisation prospects.

The survival of several Sahelian cores makes recolonisation of the entire Sahelian range possible, insofar as an adequate network of protected areas can be established. To be usable by the species, these areas must benefit from a sufficient degree of protection against taking, but also be the subject of environmental rehabilitation, particularly of the woodlands of acacia and other ligneous species on which the Dama Gazelle seems to depend. The central Saharan massifs could eventually be reoccupied from Sahelian sources if these core populations were able to rebuild and regain sufficient vigour. The Hoggar and the Tassili des Ajjers populations were certainly in communication with those of the Adrar des Iforas and the Aïr (Lhote, 1946; Dupuy, 1957). However, it is probable, given the inevitable ecological insularisation of protected areas, whether they be Sahelian or Saharan, that the zones where favourable conditions are recreated, but where the species is no longer present, will repopulate naturally only with great difficulty.

With regard to *Gazella dama mohrr*, extinct or on the edge of extinction in the wild, the best possibility of redeployment appears, as for the Oryx, to be in the region of Dakhla-Adrar Souttouf. More to the south, the species was still recently observed in the continental part of the Banc d'Arguin National Park or on its confines. The recent presence of the species at the northern limits of its historical range, in the Drâa basin, offers another possibility.

A number of protected areas, existing or potential, in which restoration of the Dama Gazelle populations could be envisaged, by means of protection, management, and, if necessary, restoration of the habitat, or, in case of current absence, reintroduction of the species, are listed in Table 1. Their choice takes into account the possibility of simultaneous use for *Oryx dammah*.

Table 1. Zones of particular interest for the restoration of *Gazella dama* populations.

Segment of the potential range	Country	Site
North of the Sahelian range	Chad	Ouadi Rimé-Ouadi Achim
	Niger	Termit
	Niger	Aïr-Ténéré
	Mali	Adrar des Iforas
	Sudan	Wadi Howar-Darfur
	Mauritania	Southeast
South of the Sahelian range	Senegal	Ferlo
	Mali	Gourma, Ansongo-Menaka
	Niger	Gadabedji
	Burkina Faso	Seno-Mango
Atlantic Saharan range (*Gazella dama mohrr*)	Morocco (ex-Spanish Sahara)	Dakhla
	Morocco	Drâa
	Mauritania	Banc d'Arguin
Central Saharan massifs	Algeria	Hoggar, Tassili des Ajjers

2.2. Habitat.

Characteristically, the Dama Gazelle has a mixed diet of grazing gramineous or non-graminid herbaceous plants, and of browsing the foliage of ligneous species, which play a particularly important role in its ecological requirements (Newby, 1974). In the Sahelian region the trees and shrubs that are preferentially browsed comprise *Acacia senegal, Acacia raddiana, Acacia erhenbergiana*, *Maerua crassifolia, Capparis decidua, Capparis corymbosa, Cadaba farinosa, Boscia senegalensis, Guiera senegalensis, Grewia villosa, Grewia tenax, Balanites aegyptiaca, Chrozophora senegalensis, Leptadenia pyrotechnica,* and *Commiphora quadricenta*. The forbs, frutescents, and grasses grazed include *Limeum viscosum*, *Monsonia senegalensis, Boerhavia repens, Cucumis melo, Tephrosia lupinifolia, Tephrosia obcordata, Indigofera aspera, Tribulus terrester, Tribulus ochroleucus, Borreria radiata, Blepharis linariifolia, Commelina forskalai, Eleusine flagellifera, Cyperus gemenicus, Aristida mutabilis, Aristida pallida, Schmidtia pappophoroides,* and *Panicum turgidum*, (Brouin, 1950; Malbrant, 1952; Newby, 1974; Grettenberger and Newby, 1986; Dragesco-Joffé, 1993). The gazelle also consumes the pods and flowers of *Acacia spp.* (Dragesco-Joffé, 1993). Its water needs are met in part, as for many other Sahelo-Saharan species, by the wild melon, *Colocynthis vulgaris* (*Citrullus colocynthis*) (Newby, 1974; Dragesco-Joffé, 1993).

The presence and density of trees appear to condition the distribution of the Dama Gazelle (Grettenberger and Newby, 1986). Its close connection with acacia woodlands and their accompanying flora has been noted by numerous observers in various parts of the range (Sclater and Thomas, 1898; Lhote, 1946; Brouin, 1950; Morales Agacino, 1950; Malbrant, 1952; Valverde, 1957; Kowalski and Rzebik-Kowalska, 1991; Dragesco-Joffé, 1993; Kacem *et al*., 1994). In Niger, Grettenberger and Newby (1986) documented its strong preference for the major wadis and their flood plain, secondarily for the steppes of zones of water movement and the dunes invading the wadi beds, environments in which trees remain in better condition during the dry season and bring shade and fodder in the hot season. In the same way, in the Atlantic Sahara, *Gazella dama mohrr* mainly occupied wadis dotted with acacia woods of variable density (Morales Agacino, 1950; Valverde, 1957). There they ate the leaves of *Acacia seyal* with a complement of leaves from *Maerua, Calotropis, Balanites, Salvadora, Leptadenia,* and *Ziziphus.*

2.3. Evaluation and evolution of populations.

The populations have experienced a catastrophic decline accompanied by extinction of local populations, perhaps including the extinction of an isolated form, *Gazella dama mohrr* (including *Gazella dama lazanoi*). The most recent population estimates, pertaining to the end of the 1980's and the beginning of the 1990's, is of less than 1500 individuals for the entire range, of which 400 in Niger (Dragesco-Joffé, 1993). The fragmentary indications available for later years suggest even lower figures (Pfeffer, 1993a, 1993b, 1995; Beudels *et al*., 1994; Moksia and Reouyo, 1996).

2.4. Migration.

The Dama Gazelle undertakes movements of medium amplitude according to the availability of pastures. The cycle of these migrations, during which it could form herds of 100 or 200 head, sometimes up to 600 (Brouin, 1950), is, in the Sahel, similar to that of the Scimitar-horned Oryx (Brouin, 1950; Malbrant, 1952; Newby, 1974; Dragesco-Joffé, 1993). Its stay in the south of the range seems, however, longer than that of the latter species (Newby, 1974). In Chad, Newby (1974) observed a retreat towards the south as of January and February, an increasing concentration in the large wadis during the hot season, from March to May, a new progression towards the south, as for the Oryx, at the time of the first rains, at the end of May or the beginning of June, and migration towards the north in June and July.

The cyclic, seasonal, or interannual migrations of the Dama Gazelle have or had a cross-border character between Mauritania, the former Spanish Morocco, and Algeria (Valverde, 1957; Trotignon, 1975; Kowalski and Rzebik-Kowalska, 1991), between Mauritania and Mali (Trotignon, 1975), between Mali and Niger (Lhote, 1946), between Mali and Algeria (Lhote, 1946; Dupuy, 1967; Kowalski and Rzebik-Kowalska, 1991), between Niger and Algeria (Lhote, 1946), between Mali and Burkina Faso (Heringa, 1990; Heringa *et al*., 1990), between Niger and Chad (Dragesco-Joffé, 1993), and between Chad and Sudan (Wilson, 1980).

3. CONSERVATION STATUS, BY PARTY

Morocco (including ex-Spanish Sahara): extinct or on the edge of extinction

The largest part of the historical range of *Gazella dama mohrr* consists of an oceanic and sub-oceanic desert band about 200 kilometres wide, extending from the Oued Noun to the southern border of the former Spanish Sahara (Sclater and Thomas, 1898; Morales Agacino, 1950; Valverde, 1957; Trotignon, 1975; Loggers *et al*., 1992). Observations exist outside of the Atlantic Sahara proper, in the Mediterraneo-Saharan zone immediately to the north of it, and in the adjacent Sahara in the Drâa basin, northwest to the region of Zagora (Loggers *et al.*, 1992). The species was already extremely rare in the 1940's (Valverde, 1957; Dupuy, 1967), then re-established itself locally in the 1950's (Valverde, 1957), before collapsing. Only one observation exists for the period 1960-1970, and one other for the period after 1980, both in the Drâa basin (Loggers *et al.*, 1992), so that the extinction of the Moroccan population and consequently that of *Gazella dama mohrr* are to be feared. It is possible, however, that the Mohr survives in very small numbers in the Drâa basin and in the Adrar Souttouf (Cuzin, 1996).

Algeria: extinct or on the edge of extinction

Gazella dama mohrr frequented, perhaps irregularly, the Tindouf hamada and the Drâa hamada in the extreme west of the country (Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991). The last observations date back to the 1940's and 1950's. In addition, an area of regular presence of *Gazella dama dama* existed in the Hoggar massif and its surroundings (Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991). This population was probably in contact with that of the Adrar des Iforas in Mali and perhaps with that of the Aïr in Niger (Lhote, 1946; Dupuy, 1967). The last data recorded by Kowalski and Rzebik-Kowalska (1991) for the complex of the Hoggar and the Tassili des Ajjers date back to the 1960's and the species has generally been considered extinct there (De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991; Dragesco-Joffé, 1993), but Bousquet (1992) and De Smet and Mallon (1997) suggest possible survival.

Libya: extinct

The Dama Gazelle was present in the first half of the 20th century in the periphery of the Tibesti in Chad (Dalloni, 1936; Malbrant, 1952), and Hufnagl (1972) suggests that it reached the south of Libya. Essghaier (1980) notes that there are no recent data for the country.

Mauritania: probably extinct

Northwestern Mauritania is part of the Atlantic Saharan range of *Gazella dama mohrr*, while the southeast is part of the Sahelian range of *Gazella dama dama*. These ranges were perhaps in contact but the data gathered by Trotignon (1975) indicate a gap. In the Atlantic zone, the data are limited to the immediate surroundings of the eastern border of the former Spanish Sahara, especially in the region of Bir Moghreim (Fort Trinquet) at 25° 30' N, and to a coastal band about 200 kilometres wide extending from the southern border of the former Spanish Sahara to the Inchiri in the south. The gazelle was noted particularly in the Taziezet, the region of Chami, the Tijirit, and the Inchiri. The last observations there date back to 1967-1968 (Trotignon, 1975). In the eastern Sahelian range, the species was distributed in the 1930's to the 1960's as far as the Adafer, the region of Tidjika, the Tagant, the Aoukar, and the region of Kiffa. It was more common in the southeast, in the Semi-Aklé, the region of Oualata, the Achemine, the Irrigi, the region of Néma, and the region of Bassikounou (Trotignon, 1975). The last observations cited by Trotignon (1975) are in the extreme east and date from the middle of the 1960's. The Dama Gazelle could have persisted there somewhat late, until about 1980, particularly in the Akle Aouana, near the Malian border (Sournia and Verschuren, 1990).

Mali: endangered

The Sahelian range of the Dama Gazelle crosses Mali from the Irrigi in the west to Azouak in the east, between 18° and 15° N., with an extension as far as 20°N., and to the Algerian border in the periphery of the sub-Sahelian massif of the Adrar des Iforas (Lhote, 1946; Dupuy, 1967; Trotignon, 1975; Sayer, 1977; Newby, 1988; Heringa, 1990; Sidiyene and Trainer, 1990). Lhote (1946) notes its presence in the entire Sahelian steppe zone, including in the loop of the Niger river, in particular, in the region of Hombori, in the immediate vicinity of the present Elephant Reserve and at the latitude of the Ansongo-Menaka Reserve. The species survived, at the end of the 1970's and in the beginning of the 1980's, in the southern Sahelian regions of Gourma and Ansongo, to the west of the Adrar des

Iforas, in the region of Araouane and near the Mauritanian border (Heringa, 1990), as well as perhaps in the Azaouak at the border with Niger (Grettenberger and Newby, 1990; Millington *et al.*, 1991). The numbers were estimated at more than one thousand in the beginning of the 1980's, at much lower figures, in decline, at the end of the 1980's (Heringa, 1990). Duvall *et al.* (1997), however, estimate the current population to be several hundred strong and suggest a possible recent increase.

Niger: endangered

The Sahelian range of the Dama Gazelle crosses Niger from the Azaouak to the south of the Ténéré, between the 15th and 17th parallels (Lhote, 1946; Br
ouin, 1950; Grettenberger and Newby, 1986, 1990; Millington *et al.*, 1991; Dragesco-Joffé, 1993; Poilecot, 1996a, 1996b). In the 1940's, the principal concentrations were noted south of the Aïr (Lhote, 1946; Brouin, 1950). Brouin (1950) qualified the "very wooded" region of the Tadéras, between 15° 30' and 16° 30' latitude, and between 6° 30' and 9° longitude, as the preferred habitat of *Gazella dama.* The distribution has contracted considerably, and, in the 1980's, residual populations occupied a range, around the Aïr and the Termit on the one hand, around the Azaouak on the other hand (Grettenberger and Newby, 1990; Millington *et al.*, 1991). The population in Niger was estimated at less than 1000 individuals by Grettenberger and Newby (1990) and Millington *et al.* (1991) of which 150-250 were in the Aïr and 200-400 were in the Termit (Grettenberger and Newby, 1986, 1990; Millington *et al.*, 1991). Dragesco-Joffé (1993) evaluates a population of Niger reduced to 400 animals.

Chad: endangered

The Dama Gazelle was distributed in Chad in the whole Sahelian belt, mainly between the 14th and 17th parallels, from the border with Niger in the west to the massifs of the Ouaddaï, the Kapka, the Ennedi, and the depression of the Mourdi along the eastern border (Malbrant, 1952; Newby, 1974; Thomassey and Newby, 1990). In the 1970's and 1980's, the species seems to have survived in its entire range, in reduced numbers however (Thomassey and Newby, 1990). The Ouadi Rimé-Ouadi Achim Reserve was one of the bastions of the species with a population estimated, in the middle of the 1970's, at 10,000 to 12,000 individuals (Newby, 1974). Currently, the species has become very rare in the Ouadi Rimé-Ouadi Achim Reserve (Pfeffer, 1993a, 1993b, 1995; Beudels *et al*., 1994; Tubiana, 1996a, 1996b; Moksia and Reouyo, 1996) and throughout the Chadian Sahel.

Sudan: extinct or on the edge of extinction

The Dama Gazelle was distributed at the beginning of this century in the entire Sahelian zone and the sub-desert valleys of the Darfur, the Kordofan, and the south of the Northern Province, between 13° and 20° N (Sclater and Thomas, 1898; Audas, 1951; Wilson, 1980; Hillman and Fryxell, 1988). In the 1940's, it survived in all the regions where the Oryx did, north of 13° N, especially in the eastern Kordofan (Audas, 1951). In the 1960's and 1970's, small, very mobile groups of Dama Gazelles persisted in a large part of the north of the Darfur, from the Chadian border to the edge of the Kordofan, particularly in the region of the Wadi Howar at 16° 30' N and further south, towards 15° N (Wilson, 1980). The last precise observations date from the years 1975-1977. Two animals killed in January 1989 between Omdurman and the western Darfur by Middle Eastern hunting tourism are noted by Cloudsley-Thompson (1992). Today, the species is considered in danger of extinction if not extinct in the country, but precise information on its possible survival is lacking (Hillman and Fryxell, 1988; Hashim, 1996).

Senegal: extinct

The Dama Gazelle has been known since at least the 18th century in the Sahelian zone of Senegal (Sclater and Thomas, 1898). Sournia and Dupuy (1990) suppose, however, that it was only a dry season visitor. It seems to have been especially frequent in the zone of the Ferlo at the time of the Sahelian droughts of the 1970's (Sournia and Dupuy, 1990). There are no more recent data.

Burkina Faso: extinct or on the edge of extinction

Northern Burkina Faso, north of 14°, is in the southern Sahelian belt of deciduous shrubs or thickets (White, 1983). The Dama Gazelle was still present recently, though in reduced numbers (Heringa *et al*., 1990). It could have survived in particular in the Seno-Mango area which is part in the Sahel Reserve (Heringa *et al*., 1990).

Nigeria: probably extinct

Extreme northeastern Nigeria, in the region of Lake Chad and the Jawa, is situated in the southern Sahelian belt of deciduous shrubs or thickets (White, 1983; Anadu and Green, 1990). The Dama Gazelle was apparently rare there. There are no recent indications of presence (Anadu and Green, 1990).

4. ACTUAL AND POTENTIAL THREATS

Like that of the Scimitar-horned Oryx, the decline of the Dama Gazelle has happened under the combined effect of several factors acting simultaneously: the anthropogenic degradation of habitats, arid-land environmental stochasticity , taking, and loss of habitat as a consequence of human pressure. These factors, which are still active today, do not differ in their overall description for the two species, whose principal ranges coincide.

4.1. Degradation and decline of habitats

Catastrophic droughts. In the context of aridity which has prevailed in the Sahara for 3,000 to 4,000 years (Le Houérou, 1986; Newby, 1988), years of increased drought, especially affecting the Sahel, occur at more or less long intervals (Monod, 1986). During the 20th century, severe Sahelian droughts happened in 1913-1914 (Monod, 1986), in 1940-1945 (Monod, 1986; Newby, 1988), then, with a particularly high frequency, in 1968-1973, 1976-1980, and 1983-1984 (Monod, 1986; Newby, 1988; Hassaballa and Nimir, 1991). These periods of drought necessarily have a catastrophic effect on the fauna of arid regions. The damage caused by recent episodes to palaearctic migratory birds wintering in the Sahel has been abundantly documented and commented upon. The effects of these natural catastrophes were deeply worsened by their occurrence in combination with anthropogenic factors. They indeed hit populations of Sahelian antelopes which had already been pushed by human pressure towards sub-desert zones at the limit of their tolerance for aridity. They forced them to re-shift southwards, to areas where the pressure of pastoralists and farmers is much stronger (Newby, 1988) and the risks of taking much higher (Newby, 1982). Moreover, the level of human occupation of the land compromises the prospects for reconstitution of the vegetation after periods of drought (Millington *et al.*, 1991).

Degradation of pastures by overgrazing. The capacity of the excellent livestock-raising areas in the sub-desert steppe to support an enormous primary production of gramineous and other perennial plants, combined with relatively weak competition and predation, explain the past abundance of ungulates (Newby, 1974). Sharp increases in domestic livestock and the possibility of permanent use of pastureland located in regions without water thanks to deep-well drilling, have led to the generalisation of intense overgrazing (Newby and Sayer, 1976; Newby, 1978a; Newby, 1988). For the entire northwestern Saharan and sub-Saharan regions, Le Houérou (1986) evaluates grazing pressure to be twice the carrying capacity, and notes among its effects the elimination of perennial grasses and browsable shrubs, trampling and compaction of soils, their denudation and consequent eolian erosion. For the Sahel, Monod (1986) indicates grazing pressures of 0.8 to 1 sheep-equivalent per hectare, for a carrying capacity of 0.25 sheep-equivalent per hectare, a load four times too high, leading to severe and generalised overgrazing. The effects of such overexploitation are well described for the Sudan by Bari (1991) who documents the transformation of rich pastures of short grasses and perennials into absolute desert, and by Hassaballa and Nimir (1991) who note a 5 to 6 kilometres progression of the desert per year. The destruction of pastures, especially of formations of *Cornulaca*, by grazing has also been observed in Chad (Newby, 1974).

Felling of ligneous species. Ligneous species are essential for the Dama Gazelle, as much as or more than for the Oryx, both for the shade and the food. The Dama Gazelle is in fact a mixed user, more a foliage browser than a grazer on gramineous plants. The systematic destruction of trees and shrubs in the Sahelo-Saharan zone is a historical constant (Le Houérou, 1986). It has strongly increased recently in the southern fringe regions of the Sahara, under the combined effects of drought and needs for firewood and charcoal (Grettenberger and Newby, 1986; Newby, 1988; Bari, 1991; Hassaballa and Nimir, 1991; Millington *et al.*, 1991). In Sudan, for example, Bari (1991) documents the total disappearance of *Acacia tortilis*, *Acacia raddiana*, *Acacia senegal*, and *Merua crassifolia* woodlands, and their replacement by absolute desert.

4.2. Direct exploitation.

Traditional hunting. Traditional modes of capture, either hunting (Brouin, 1950; Newby, 1974; Grettenberger and Newby, 1986; Dragesco-Joffé, 1993), or trapping, exercised by nomads in particular, certainly played a role in reducing the species, especially when it was done in conjunction with other factors and was practised at the expense of ecologically weakened populations.

Motorized hunting. Much more than forms of traditional capture, it is the development of taking using modern firearms and vehicles which was an essential proximal factor in the reduction or local extinction of the species. It was mainly perpetrated by military, mining, oil, or administrative personnel, expatriate or African (Grettenberger and Newby, 1986; Hassaballa and Nimir, 1991; Dragesco-Joffé, 1993).

Hunting tourism. As for all the Sahelo-Saharan antelopes, the massacres perpetrated by hunting tourism, in particular Middle-Eastern, which is well documented, especially for Sudan (Cloudsley-Thompson, 1992), Niger, and Mali (Newby, 1990; Bousquet, 1992), represent a major potential threat.

4.3. Other threats.

All the indirect human pressures likely to affect the species, such as the increase of ovine and caprine livestock, the increase in the number of wells, and the invasion of available habitats, are exerted through the deterioration or regression of habitats and the increase in susceptibility to taking. They have been treated under these points.

5. REGULATORY PROVISIONS

5.1. International.

Bonn Convention: Appendix I, resolution 3.2, paragraph 4.
Washington Convention (CITES): Appendix I

5.2. National.

The Dama Gazelle is completely protected in Mali, Senegal, Morocco, Algeria, Tunisia, and partially in Sudan; completely protected for a renewable period in Niger.

6. CONSERVATION MEASURES, BY PARTY

6.1. Ban on takings.

Morocco:	protected
Algeria:	protected
Mali:	protected
Niger:	protected for a renewable period
Senegal:	protected

6.2. Habitat conservation.

Morocco (including ex-Spanish Sahara)

The proposed parks in the lower Drâa basin and in the Dakhla region (Müller, 1996) appear to be appropriate for the restoration or reintroduction of the species. However, in the case of Dakhla, it must extend sufficiently far into the interior, and in the region of the Adrar Souttouf, it must include a substantial representation of steppes and

woodlands with a Sahelian physiognomy which characterised the range of *Gazella dama mohrr* (Valverde, 1957). In both situations, the possibility that the species still occurs in the wild has to be evaluated before any reintroduction project is undertaken. If this is the case, efforts to protect the species, accompanied by restoration of its habitat, must of course be favoured.

Algeria

The National Park of the Tassili des Ajjers and the Hoggar National Park offer, by their exceptional dimensions and their environmental diversity (Bousquet, 1992), unquestionable possibilities of redeployment of the Dama Gazelle. Here also, the possibility that the species still occurs in the wild must obviously be evaluated before launching any project of reintroduction.

Mauritania

Gazella dama mhorr was present until the end of the 1960's in the Banc d'Arguin National Park.

Mali

The Elephant Reserve and the Ansongo-Menaka Reserve are situated in the zone of distribution of the Dama Gazelle (Lhote, 1946). In both reserves, populations of the species occurred until recently, and perhaps still do (Heringa, 1990; Pavy, 1996). Unfortunately, they are under considerable agricultural, pastoral, residential, and hunting pressures (Heringa, 1990).

Niger

The Termit massif, which, at least recently, harboured the largest populations of the Dama Gazelle, is one of the best preserved regions of the Sahel in Niger, with the environment in relatively good condition (Newby, 1982, 1988; Grettenberger and Newby, 1986, 1990; Millington *et al.*, 1991). The national park planned there is essential for the species. The Aïr-Ténéré National Park also shelters substantial populations; the implementation of conservation measures runs up against difficult practical problems but its effective protection remains an essential element of a network of protected areas (Newby and Jones, 1986; Grettenberger and Newby, 1986, 1990; Millington *et al.*, 1991). The Gadabedji Reserve, created for the protection of Sahelo-Saharan antelopes, mainly the Scimitar-horned Oryx, had Dama Gazelles at the time of its creation. Unfortunately, human pressures have never been sufficiently controlled there (Newby, 1982; 1988; Dixon and Newby, 1989; Grettenberger and Newby, 1990; Millington *et al.*, 1991). It is a potential site of reintroduction if these pressures can be held in check and if the programme of habitat rehabilitation which was undertaken in 1989 (Millington *et al.*, 1991) is successful.

Chad

The Dama Gazelle survives in the Ouadi-Rimé-Ouadi Achim Reserve where its population in the mid-1970's totalled 10,000-12,000 individuals (Newby, 1974). However, its situation has sharply deteriorated since the end of the 1970's (Thomassey and Newby, 1990; Dragesco-Joffé, 1993; Pfeffer, 1993a, 1995; Moksia and Reouyo, 1996).

Sudan

The proposal to create a national park in the Wadi Howar in the northern Darfur could offer good possibilities of conservation or recolonisation for the Dama Gazelle (Hashim, 1996).

Senegal

The two reserves of the Ferlo (Bille *et al*., 1972; Bille and Poupon, 1972; Sournia and Dupuy, 1990) offer possibilities of recolonisation or reintroduction for Sahelian antelopes. Their designation as national parks is under consideration (Diop *et al*., 1996). A programme to reintroduce the Dama Gazelle is planned (Sournia and Dupuy, 1990; Diop *et al*., 1996). Its success depends mainly, as for all the southern Sahelian localisations, on the chances of

limiting human pressure so as to ensure the protection of the animals and the rehabilitation of the vegetation (Diop *et al*., 1996).

Burkina Faso

Dama Gazelles may survive in the partial fauna reserve of the Sahel, in particular in the Seno-Mango area. The reserve has suffered much from grazing, wood cutting and drought (Heringa *et al*., 1990).

6.3. Attenuation of obstacles for migratory animals.

The creation of a network of sufficiently close protected areas, numerous and large enough, and particularly of crossborder reserves, can, in the medium term, ensure adequate movement security for this relatively small and discreet species. Among the priorities would appear to be a reserve in Mali in the Adrar des Iforas, in relation with the parks in southern Algeria, and the rehabilitation of western Algerian acacia woodlands in the zone of possible population expansion of *Gazella dama mohrr* in the Drâa basin.

6.4. Regulations concerning other detrimental factors.

These possible regulations only have meaning within a framework of management plans for protected areas. This point consequently merges with point 6.2.

6.5. Other measures.

Tunisia

A programme to introduce the species exists (Kacem *et al*., 1994). Success has been achieved at Bou Hedma.

Senegal

A reintroduction programmeme in the reserves of the Ferlo, including preliminary acclimatization in the Sahelian reserve of Gueumbeul, is underway (Sournia and Dupuy, 1990; Diop *et al*., 1996).

Outside range of distribution

The species is raised in captivity or semi-captivity in North Africa, the Middle East, Europe, and North America. Stocks include specimens of *Gazella dama mohrr*, originating from the ex-Spanish Sahara then from the Almeria animal husbandry center.

7. RESEARCH ACTIVITIES

7.1. Public authorities.

7.2. N.G.O.s

8. NEEDS AND RECOMMENDED MEASURES

Recommended measures are the object of a plan of action developed parallel to this status report (Beudels *et al.*, 1998). The principal needs that they meet are listed below.

8.1. Total protection of the species.

Necessary in all the countries of the present and historical range so as to preserve the surviving populations and prepare for a possible redeployment.

8.2. Conservation measures.

Establishment of a network of protected areas in all the parts of the historical range, with absolute priority to the areas where the species survives or may survive in the wild. Adequate management of these areas to re-establish favourable ecological conditions.

8.3. Localization and monitoring of residual populations, and definition of their ecological requirements.

Determined search for possible residual populations of *Gazella dama mohrr.* Study of the principal surviving Sahelian populations, mainly in Niger, Mali, Chad; evaluation of their current status and the ecological conditions they encounter.

8.4. Reinforcement of populations and reintroductino into the potential range.

Assistance to the Senegalese reintroduction programme. Possible preparation of programmes in other regions of the historical range, after evaluation of the chances of natural survival without reinforcement, and the chances of success of reinforcement or reintroduction efforts. It is principally in the Atlantic range of *Gazella dama mohrr* that this type of measure could be applied.

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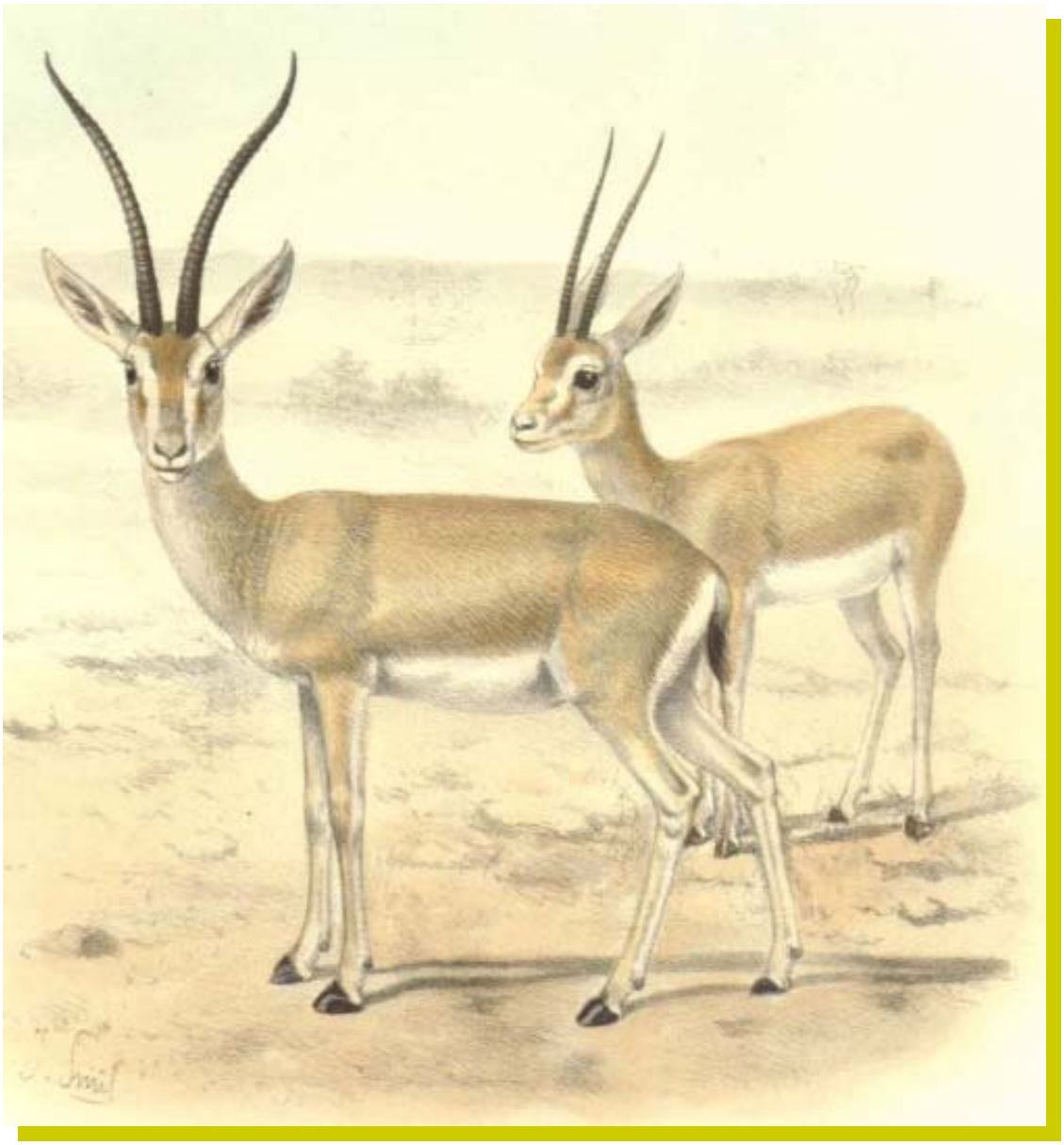
Report on the status and perspectives of a species

Gazella leptoceros



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This report is based on documents prepared for the Convention on Migratory Species by Pierre Pfeffer (1993b, 1995) and on supporting documents for the action plan on Sahelo-Saharan antelopes adopted by the 4th Conference of the Parties of the Convention, documents that were prepared by Roseline C. Beudels, Martine Bigan, Pierre Devillers and Pierre Pfeffer (1994). The information it contains originates mainly from the general accounts and regional action plans edited by Rod East (1988, 1990), and the fundamental work of Hubert Gillet (1965, 1969) and John E. Newby (1974, 1988, in particular). It is completed by a new review of the literature and a survey of actors in the field conducted in 1996 and 1997 by Tommy Smith (1998) with the support of Koen De Smet. Roseline C. Beudels, René-Marie Lafontaine, Marie-Odile Beudels, Tommy Smith, Yves Laurent and Chris Kerwyn have contributed to the preparation and finalising of this report.
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1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomy.

Gazella leptoceros belongs to the tribe Antilopini, sub-family Antilopinae, family Bovidae, which comprises about twenty species in genera *Gazella*, *Antilope*, *Procapra*, *Antidorcas*, *Litocranius*, and *Ammodorcas* (O'Reagan, 1984; Corbet and Hill, 1986; Groves, 1988). Genus *Gazella* comprises one extinct species, and from 10 to 15 surviving species, usually divided into three sub-genera, *Nanger*, *Gazella,* and *Trachelocele* (Corbet, 1978; O'Reagan, 1984; Corbet and Hill, 1986; Groves, 1988). *Gazella leptoceros* is either included in the sub-genus *Gazella* (Groves, 1969; O'Reagan, 1984), or considered as forming, along with the Asian gazelle *Gazella subgutturosa*, the sub-genus *Trachelocele* (Groves, 1988). The species comprises two sub-species, *Gazella leptoceros leptoceros* of the Western Desert of Lower Egypt and northeastern Libya, and *Gazella leptoceros loderi* of the western and middle Sahara. These two forms seem geographically isolated from each other and ecologically distinct, so that they must, from a conservation biology point of view, be treated separately.

1.2. Nomenclature.

1.2.1. Scientific name.

Gazella leptoceros (Cuvier, 1842)
Gazella leptoceros leptoceros (Cuvier, 1842)
Gazella leptoceros loderi (Thomas, 1894)

1.2.2. Synonyms.

Antilope leptoceros, Leptoceros abuharab, Leptoceros cuvieri, Gazella loderi, Gazella subgutturosa loderi, Gazella dorcas, var. 4

1.2.3. Common names.

English: Slender-horned Gazelle, Loder's Gazelle, Sand Gazelle, Algerian Sand Gazelle, Rhim
Arabic: Rhim
French: Gazelle leptocère, Gazelle des sables, Gazelle des dunes, Gazelle blanche, Rhim, Gazelle à longues cornes

2. BIOLOGICAL DATA

2.1. Distribution.

2.1.1. Historical distribution.

Gazella leptoceros leptoceros

Gazella leptoceros leptoceros is characteristic and quasi-endemic of the northern part of the Egyptian Western Desert, where it seems linked in particular to the great oases developed in the aeolian depressions eroded down to the water table that are characteristic of this desert, and to the interdunal valleys occupied by acacias (Flower, 1932; Osborn and Helmy, 1980; Ayyud and Ghabbour, 1986; Le Houérou, 1986; Goodman *et al*., 1986; Saleh, 1987, 1997; Zahran and Willis, 1992). The species is, or was, recorded from Siwa in the northwest, from the Quattara Depression, from Wadi Natroun and Wadi el Ruwayan near the lower Nile, from the Nile valley, from dune fields between Faiyum and the Quattara Depression (Osborn and Helmy, 1980), from Bahariya (Saleh, 1987), and from Kharga (Elbadry, 1998). It has also been found in the same chain of oases beyond the Libyan border in Jaghbub (Bundy, 1976; Essghaier, 1980; Goodman *et al*., 1986). The Slender-horned Gazelles reported more to the west in

Libya, in particular near Ajdabiyah in western Cyrenaica and near Dahra, north of Zella (Hufnagl, 1972; Essghaier, 1980), may also belong to the nominate form.

Gazella leptoceros loderi

Loder's Gazelle is a typically Saharan antelope, linked to sand deserts, and characteristic of the central Sahara (Dragesco-Joffé, 1993). In relation to the distribution of the large zones of ergs of the Sahara (Walter and Breckle, 1986), Loder's Gazelle seems to be lacking in the westernmost complexes, to have its principal distribution in the central archipelago, and to be rare or absent in the southeastern periphery.

In the west, it has not been found in either the great, mainly Mauritanian, dunal system of the Ouarane-Djouf-Majâbat Al-Koubra, or in the Algero-Mauritanian Iguidi and Chech ergs (Lavauden, 1926; Monod, 1958; Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991; Dragesco-Joffé, 1993). The centre of gravity of its distribution is, on the other hand, in the Grand Erg Occidental, the Grand Erg Oriental, the sandy zone which stretches from the Hamada de Tinrhert in Algeria to the Fezzan in Libya, and the smaller ergs in the periphery of the central Saharan massifs of the Hoggar and the Tassili des Ajjers, in particular the Ahmer erg (Setzer, 1957; Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991; Dragesco-Joffé, 1993; Kacem *et al.*, 1994; Khattabi and Mallon, 1997), a region where its presence has been known for a very long time and to which it was thought to be limited (Sclater and Thomas, 1898; Trouessart, 1905; Lavauden, 1920, 1926; Joleaud, 1929). Its distribution in the ergs surrounding the massifs of the Hoggar and the Tassili could extend to Mali in the Tanezrouft (De Smet, 1989) and to the vicinity of the Adrar des Iforas (Pavy, 1996).

There are very few data for the ergs of the southern and eastern Sahara, either because the species is very rare, or because of the difficulties of observation. Precise data are grouped in three regions: the Ténéré in Niger, the periphery of the Tibesti, and the ergs extending from the Borku in northeastern Chad to southeastern Libya. Although the Great Ténéré Erg is poor in vegetation, a plant community similar to the *Aristida, Cornulaca* and *Calligonum* formations of the central Sahara (Quézel, 1965; Ozenda, 1991) grows there, formed by the perennial graminids *Stipagrostis acutiflora, S. plumosa, S. uniplumis, S. vulnerans, Cyperus conglomeratus,* the suffrutescent *Moltkiopsis ciliata,* and the ligneous *Cornulaca monacantha* (Poilecot, 1996a, annex 17). Jones (1973) and Newby observed the species there, in small numbers, on the edge of the Aïr (Jones, 1973; Grettenberger and Newby, 1990; Poilecot, 1996b). In the Tibesti, the species was noted by Malbrant (1952) near Bardaï and Soborom, in the north of the massif. A small number of data, relatively indirect, delimit an area of presence between the zone of the Erdi and the Mourdi depression in the Borku of northeastern Chad and the Jebel Uweinat at the borders of Libya, the Sudan, and Egypt, a region in which a number of dunal systems stretch more or less from southwest to northeast. At the Chadian extremity of this zone, Edmond-Blanc *et al.* (1962) gathered, second-hand, indications of presence. At the Libyan extremity, Misonne (1977) found three skulls on the edge of the Jebel Uweinat massif. Recent data also exist from the Gilf El Kebir in Egypt (Elbadry, 1998). The subspecific affinities of these southern and southeastern animals are not known, but what is known of their ecology brings them close to *G. l. loderi*. Outside these regions, hypotheses of presence exist but apparently no observations. Mentions of the species in Mali (Heringa, 1990; Duvall *et al*., 1997) are based on its inclusion in a table by Newby (1982) apparently without data, except perhaps those from nearby Algerian regions. Sayer (1977) and Sidiyène and Tranier (1990) indicate its absence in the entire country, and in the Adrar des Iforas in particular. Reports of its presence in the Sudan (Wilson, 1980) come from an optimistic interpretation of Edmond-Blanc *et al.*'s data from Chad (1962).

2.1.2. Decline of the range.

Gazella leptoceros leptoceros

The Slender-horned Gazelle has been eliminated from most of its range in the Egyptian Western Desert. In the 1980's, the species was considered extinct in 5 of its 6 known localities in the eastern part of the Western Desert and very rare in the last, the complex of the Wadi el Ruwayan and its extension, the Wadi Muweilih. In the western part of the desert, around the Quattara Depression and the Siwa oasis, its status was uncertain (Saleh, 1987). The situation was not known, either, in Libya, where in the 1970's, Essghaier (1980) noted groups of 10 to 20 around Jaghbub. The small group of about 15 animals which was surviving in the Wadi el Ruwayan has been exterminated since then (Saleh, 1997).

Gazella leptoceros loderi

In spite of undoubted signs of decreasing numbers, there is no objective indication of regression of the range of Loder's Gazelle, in part because of the scarcity of historical data of this difficult to observe taxon.

2.1.3. Residual distribution.

Gazelle leptoceros leptoceros

The Slender-horned Gazelle might be surviving west of the Siwa oasis (Elbadry, 1998), perhaps also around the Quattara Depression (Saleh, 1987, 1997; Elbadry, 1998), the Jaghbub oasis, and the Kharga oasis (Elbadry, 1998).

Gazella leptoceros loderi

There are relatively recent observations in most of the historical zones of distribution of *Gazella leptoceros loderi.*

2.1.4. Recolonisation prospects.

Gazella leptoceros leptoceros

The habitats in most of the oases of the Lybian Desert of Egypt have been profoundly modified by agriculture and urbanization (Goodman *et al.*, 1986). For a small species linked to the dunes and the peripheral acacia formations, it is probable that sufficient potentialities have survived around most of them (Saleh, 1987). Some of these have nevertheless been gravely affected by major infrastructure work (Saleh, 1987, 1997). The Siwa oasis is probably a particularly important site, for this species as for other antelopes.

Gazella leptoceros loderi

The erg habitat which Loder's Gazelle prefers is affected relatively little by the anthropic pressures that bear on most of the Sahelo-Saharan region, although Le Houérou (1986) and Karem *et al*. (1993) note the mutilation of ligneous species for firewood. The reoccupation of possibly lost range would thus not seem very difficult, especially since the species has a high rate of reproduction and exhibits migratory or erratic behaviour, two characteristics that suggert a reasonable colonisation potential. Locally, restoration of the vegetation cover might be necessary, and in all cases protection against human predation and excessive disturbance should be ensured.

2.2. Habitat.

Gazella leptoceros leptoceros

The Slender-horned Gazelle is linked to *Acacia raddiana* woodlands*,* to sandy outskirts of oases supporting *Nitraria retusa*, and to interdunal depressions with *Cornulaca monacantha* (Osborn and Helmy, 1980). It consumes a significant amount of foliage (Saleh, 1997). *Nitraria retusa*, a halophyte plant, *Pituranthos tortuosus, Acacia raddiana, Cornulaca monocantha*, *Launaea capitata,* and *Calligonum comosum* are part of its diet (Osborn and Helmy, 1980). The Slender-horned Gazelles are mostly twilight and nocturnal animals, eating and moving during these periods of the day, and resting during the hot hours in the shade or in hollowed-out depressions (Osborn and Helmy, 1980).

Gazella leptoceros loderi

Loder's Gazelle is principally linked to ergs (Schnell, 1977; White, 1983, units 69, 70, 71; Ozenda, 1991) which seem to constitute its only habitat, at least in the central Sahara (Sclater and Thomas, 1898; Lavauden, 1926; Heim de Balsac, 1936; Dupuy, 1967). It mainly grazes on *Aristida pungens* (Heim de Balsac, 1936) but it also uses plants with a high hydric content, such as *Anabasis articulata*, *Arthrophytum schmittianum*, *Helianthemum kahiricum*, and the fruits of *Colocynthis vulgaris*, to meet its water needs (Kacem *et al*., 1994).

2.3. Evolution and estimation of populations.

Gazella leptoceros leptoceros

In the beginning of the 1980's, the Slender-horned Gazelle was only surviving in small, widely dispersed groups, especially near uninhabited oases and in the Wadi El Rayan (Saleh, 1987). The numbers which seem to survive in the Egyptian northwest and perhaps in Kharga are certainly very low (Elbadry, 1998).

Gazella leptoceros loderi

The size of populations of Loder's Gazelles are very difficult to estimate. It seems clear, however, that it was much more abundant in the Algerian and Tunisian Great Ergs at the end of the last century and in the beginning of this century than in recent years. Large numbers were found, apparently relatively easily, by several naturalists of this period (Sclater and Thomas, 1898; Lavauden, 1926; Heim de Balsac, 1928, 1936) whereas Le Houérou (1986) notes having seen only one in twenty-five years of prospecting for mapping the vegetation of North Africa.

2.4. Migration.

Loder's Gazelle and the Slender-horned Gazelle move frequently between desert depressions in search for food (Kacem *et al*., 1994; Saleh, 1997). Larger movements, likely to carry the species far from its preferred habitat, take place under the effect of long and severe droughts (Heim de Balsac, 1928).

These migrations have a cross-border character, at least between Algeria and Tunisia and between Egypt and Libya. It is also possible between Algeria and Mali, between Libya and Chad, and perhaps between Libya, Egypt or Chad and the Sudan.

3. CONSERVATION STATUS, BY PARTY

Morocco (including ex-Spanish Sahara): Accidental

The only observation of *Gazella leptoceros* in Morocco is from the region of Boumia, southeast of the High Atlas, during the 1950's (Loggers *et al*., 1992). This record, situated outside the species' habitat, corresponds to the movements of large amplitude observed in years of great drought (Heim de Balsac, 1928).

Algeria: Probably endangered

The centre of gravity of the range of *Gazella leptoceros loderi* is in Algeria, east of a line Saoura - Wadi Messaoud, in the Grand Erg Occidental, the Grand Erg Oriental, the Hamada de Tinrhert, and the smaller ergs around the central Saharan massifs of the Hoggar and the Tassili des Ajjers, in particular the Ahmer erg (Sclater and Thomas, 1898; Trouessart, 1905; Lavauden, 1926; Joleaud, 1929; Dupuy, 1967; De Smet, 1989; Kowalski and Rzebik-Kowalska, 1991; Dragesco-Joffé, 1993).

Tunisia: Probably endangered

Loder's Gazelle is present in unknown, probably relatively low, numbers in the Grand Erg Oriental (Lavauden, 1920; Dragesco-Joffé, 1993; Kacem *et al.*, 1994).

Libya: Probably endangered

The distribution of central Saharan populations of *Gazella leptoceros loderi* includes the sandy zones of the Fezzan, where there have been recent observations (Setzer, 1957; Hufnagl, 1972; Khattabi and Mallon, 1997). *Gazella leptoceros leptoceros* is noted in the surroundings of the Jaghbub oasis, where small groups have been observed (Essghaier, 1980). Slender-horned Gazelles noted more to the west in Libya, in particular, near Ajdabiyah in western Cyrenaica and near Dahra, north of Zella (Hufnagl, 1972; Essghaier, 1980), may also belong to the nominate form.

Egypt: Endangered

The principal range of *Gazella leptoceros leptoceros* was situated in the northern part of the Egyptian Western Desert (Flower, 1932; Osborn and Helmy, 1980; Ayyud and Ghabbour, 1986; Le Houérou, 1986; Goodman *et al*., 1986; Saleh, 1987, 1997; Zahran and Willis, 1992). It is or was noted in Siwa in the northwest, in the Quattara Depression, Wadi Natroun and Wadi el Ruwayan near the lower Nile, in the Nile Valley, in dune systems between Faiyum and the Quattara Depression (Osborn and Helmy, 1980), in Bahariya (Saleh, 1987), and in Kharga (Elbadry, 1998). It seems to survive west of the Siwa oasis (Elbadry, 1998), perhaps also around the Quattara Depression (Salet, 1987, 1997; Elbadry, 1998) and the Kharga oasis (Elbadry, 1998). *Gazella leptoceros loderi* perhaps survives in small numbers in the extreme southwest of the country (Saleh, 1987, 1997; Elbadry, 1998).

Mali: Status uncertain

Populations of *Gazella leptoceros loderi* living in the ergs surrounding the massifs of the Hoggar and the Tassili probably extend as far as Mali in the Tanezrouft (De Smet, 1989) and in the vicinity of the Adrar des Iforas (Pavy, 1996).

Niger: Probably endangered

The species was noted in small numbers in the contact zone between the Aïr and the Ténéré (Jones, 1973; Grettenberger and Newby, 1990; Poilecot, 1996b).

Chad: Probably endangered

The species seems rare in Chad where it is noted in two regions, the north of the Tibesti (Malbrant, 1952) and the region of the Erdi and the Mourdi depression in the Borku (Edmond-Blanc *et al.,* 1962; Thomassey and Newby, 1990). There do not seem to be recent data in either of these regions.

4. ACTUAL AND POTENTIAL THREATS

4.1. Degradation and decline of habitats.

Gazella leptoceros leptoceros

The subspecies occupies habitats (acacia woodlands, dunes surrounding oases) which are directly threatened by human pressure. Projects of putting desert depressions under water (Quattara, Wadi El Rayan) are a direct and indirect threat to some of the most important habitats for the survival of residual populations of this subspecies.

Gazella leptoceros loderi

The habitats of this subspecies are less sensitive to human pressure than those of other Sahelo-Saharan antelopes. However, Le Houérou (1986) and Karem *et al*. (1993) document clear cases of overexploitation and degradation of erg vegetation, especially its ligneous components.

4.2. Direct exploitation.

The decline of *Gazella leptoceros loderi* and the near extinction of *Gazella leptoceros leptoceros* have to be attributed primarily to uncontrolled hunting (Saleh, 1987, 1997; Kacem *et al*., 1994). Traditional hunting could have had a substantial impact on local populations (Sclater and Thomas, 1898) but it is modern hunting with firearms and motor vehicles (Newby, 1990) which constitutes the primary threat, likely to drive the species to extinction.

4.3. Other threats.

There are no other known threats.

5. REGULATORY PROVISIONS

5.1. International.

Bonn Convention: Appendix I, Resolution 3. 2, paragraph 4.
Washington Convention (CITES): Appendix III (Tunisia)

5.2. National.

Totally protected in Algeria, Tunisia, Libya, Egypt, and Niger

6. CONSERVATION MEASURES, BY PARTY

6.1. Ban on taking.

Algeria:	protected
Tunisia:	protected
Libya:	protected
Egypt:	protected
Niger:	protected

6.2. Habitat conservation.

Algeria

The Hoggar and the Tassili des Ajjers National Parks probably have populations of the species (Bousquet, 1992) or would be capable of harbouring them.

Tunisia

Djebil National Park was designated especially for the conservation of the species (Dragesco-Joffé, 1993; Kacem *et al*., 1994).

Niger

The species is present in the Aïr-Ténéré National Nature Reserve (Poilecot, 1996b).

6.3. Attenuation of obstacles for migratory animals.

Only protection within a network of protected areas, especially cross-border protected areas, is plausible.

6.4. Regulations concerning other detrimental factors.

Such regulations can only be taken within a framework of management plans for protected areas. This paragraph consequently merges with paragraph 6.2.

6.5. Other measures.

The species appears to exist in captivity in about twenty institutions in North Africa, Europe, and North America. It does not seem that the sub-species *Gazella leptoceros leptoceros* is part of this stock of mainly Tunisian origin (Kingswood, 1995, 1996).

7. RESEARCH ACTIVITIES

7.1. Public authorities.

7.2. N.G.O.s

8. NEEDS AND RECOMMENDED MEASURES

Recommended measures are included in an associated Action Plan (Beudels *et al.*, 1998).

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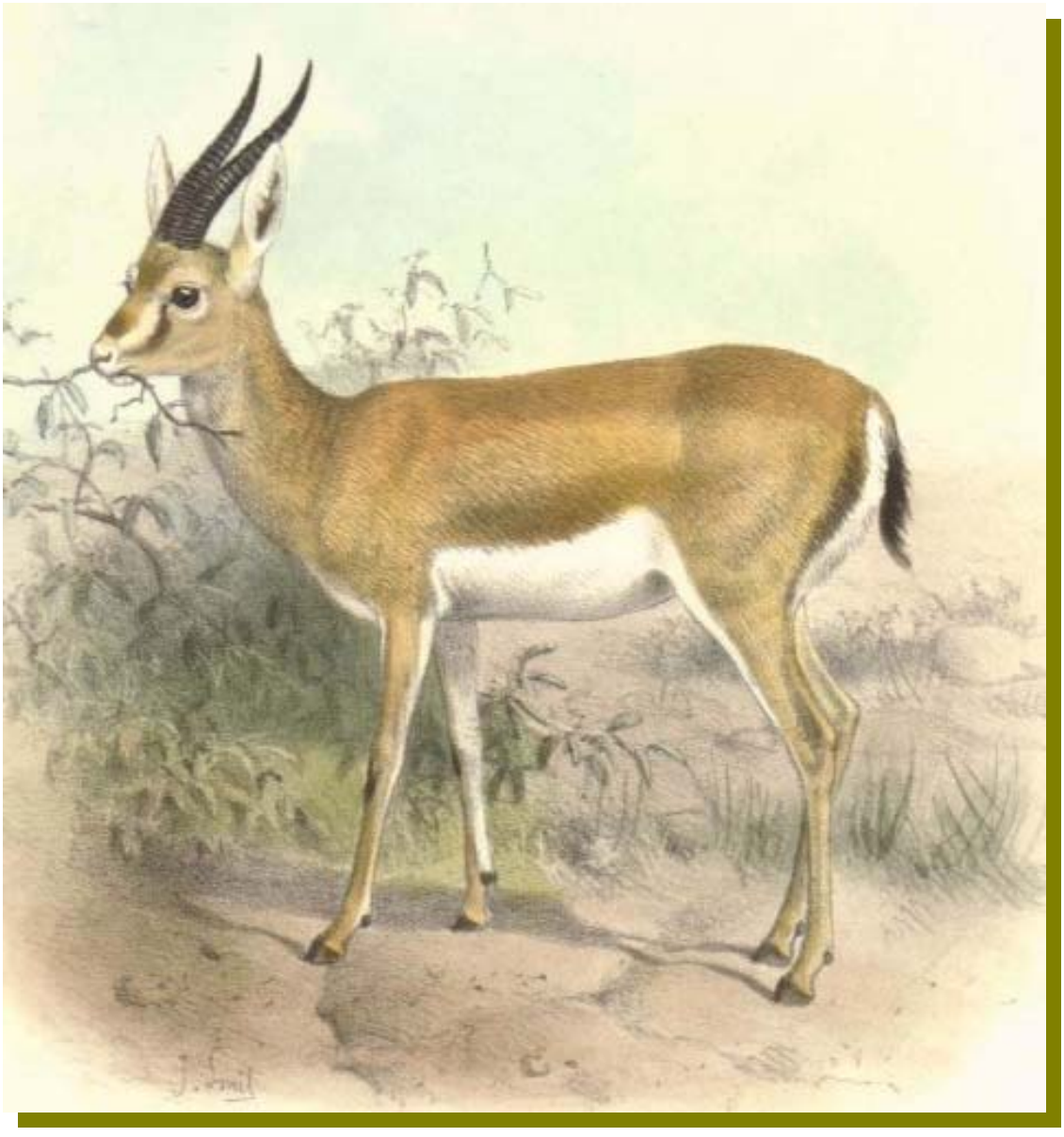
Report on the status and perspectives of a species

Gazella cuvieri



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1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomy.

Gazella cuvieri belongs to the tribe Antilopini, sub-family Antilopinae, family Bovidae, which includes about twenty species in genera *Gazella, Antilope, Procapra, Antidorcas, Litocranius, Ammodorcas* (O'Regan, 1984; Corbet and Hill, 1986; Groves, 1988). Genus *Gazella* comprises one extinct species and 10 to 15 surviving species, usually allocated to three sub-genera, *Nanger*, *Gazella* and *Trachelocele* (Groves, 1969, 1988; O'Regan, 1984; Corbet and Hill, 1986). *Gazella cuvieri* is generally included in sub-genus *Gazella* and considered a monotypic species (O'Regan, 1984; Corbet and Hill, 1986). Groves (1969) treated it as a northern representative of the Sahelo-Sudanese gazelle *Gazella rufifrons*, but later (Groves, 1988), he confirmed, on the contrary, its isolation in the genus *Gazella*, and made it the only element in one of five groups into which he divided this difficult genus.

1.2. Nomenclature.

1.2.1. Scientific name.

Gazella cuvieri (Ogilby, 1841)

1.2.2. Synonyms.

Antilope corinna, Antilope cuvieri, Gazella vera, Gazella cineraceus, Gazella kevella, Dorcas subkevella, Dorcas setifensis

1.2.3. Common names.

English: Cuvier's Gazelle, Edmi Gazelle, Edmi, Atlas Mountain Gazelle
Arabic: Edmi, Ledm
French: Gazelle de Cuvier, Gazelle de montagne

2. BIOLOGICAL DATA

2.1. Distribution.

2.1.1. Historical distribution.

Cuvier's Gazelle is a species endemic to the mountains of the Maghreb. Its range formerly extended to the Mediterranean and Atlantic coasts in a few localities (e.a. Ben Slimane and the Ajou Mountains). In Morocco, it occupies all the mountain chains (eastern Rif, Great Atlas, Middle Atlas and Anti-Atlas, Aydar south of the Drâa) and their associated plateaux, with the exception of the western Rif. In Algeria it occupies or occupied the slopes of the Tell Atlas, those of the more southern massif formed by the Saharan Atlas, and the massifs of the eastern part of the country (De Smet, 1991). In Tunisia it occupied the Dorsale to the region of Tunis and the pre-Saharan massifs (Sclater and Thomas, 1898; De Smet 1989, 1991; Kowalski and Rzebik-Kowalska, 1991; Loggers, 1992; Kacem *et al.*, 1994; Cuzin, 1996). De Beaux (1928) notes the discovery of a Cuvier's Gazelle horn in Al Jaghbub, in eastern Libya, specifying that its origin was unknown. It is the only mention of the species for the country and its natural presence in Libya has not been otherwise confirmed. In 1994, six Tunisian *Gazella cuvieri* were introduced into the Kouf National Park in northern Libya (De Smet, pers. comm.). In this report, Libya is not, however, included in the historical range of the species.

2.1.2. Decline of the range.

In Morocco, the range of *Gazella cuvieri*, which covered the whole of the mountain chains and associated plateaux, diminished considerably in the first half of the 20th century. The species disappeared from the region of Rabat and Casablanca in the 1960's, it was last observed in the region of Figuig in the 1970's, period during which it also disappeared from several localities in the Middle Atlas (Cuzin, 1996).

In Algeria, *Gazella cuvieri* occupied the slopes of the Tell Atlas, those of the more southern massif formed by the Saharan Atlas, and the massifs of the eastern part of the country (Tristam, 1860; Loche, 1867; Pease, 1896; Joleaud, 1929; Heim de Balsac, 1936). It has now disappeared from a large part of the Tell Atlas to the east of Teniet el Had, though it was still recorded on the Mediterranean coast until about 1930 (Joleaud, 1926; Lavauden, 1929; Seurat, 1930).

In Tunisia, where it originally occupied the Dorsale to the region of Tunis and the pre-Saharan massifs, it was still fairly abundant in 1936 in the entire Dorsale from the Algerian border to the Djebel Bou Kornine, 17 kilometres south of Tunis (Kacem *et al*., 1994). In the 1970's, the species only survived in the vicinity of the djebels Chambi and Khchem El Kelb between Kasserine and the Algerian border (Kacem *et al*., 1994).

2.1.3. Residual distribution.

Although the general distribution of Cuvier's Gazelle had not changed much in relation to its historical range until the recent past, the species is now undergoing a strong reduction of range in Morocco (Cuzin, 1996); it disappeared from the northeast (eastern Rif) during the 1980's, and from numerous localities around Agadir in the 1990's (Cuzin, 1996). Its range has also fragmented in the Saharan Atlas. However, recent discoveries, confirming older data, have revealed the presence of substantial populations and a range extension southwards between the lower Drâa and the Aydar massif.

In Algeria, the range of Cuvier's Gazelle is limited to the northern part of the country, between the Tell Atlas and the Saharan Atlas. It has recently disappeared from a few localities only, mainly in the north of its range. The populations of the western Tell Atlas, of Batna-Biskra, and of the Aurès Mountains are no longer in contact and some groups in the Saharan Atlas have recently been eliminated (De Smet *et al.*, in press).

In Tunisia, after having decreased to very low numbers, the population seems to be increasing and extending its range again (Kacem *et al.*, 1994), essentially as a consequence of the efficient conservation measures implemented in and around Chambi National Park. For the Dorsale in general, observations made in 1991 in the region of Siliana indicate that it is progressing northeastwards, mainly from the main population core in the surroundings of Chambi National Park.

2.1.4. Recolonisation prospects.

This species is mobile and can rapidly recolonise sites occupied in the past insofar as passages remain possible, in particular if calm zones with waterholes exist between the sites. The Tunisian project of fixation of the species and natural recolonisation has had good results, and the Tunisian Government proposes continuing the implementation of a network of protected areas in which management measures similar to those applied in the Khchem el Kelb Reserve will be taken to encourage the redeployment of Cuvier's Gazelle along the full length of the Dorsale. In Morocco, the recent localisation of substantial populations in the south between the lower Drâa and the Aydar massif opens up new, interesting prospects for the conservation of the species.

2.2. Habitat.

Cuvier's Gazelle appears linked to the middle and low slopes of the mountains of the Maghreb, occupying the relatively dry forests, of semi-arid thermomediterranean character, dominated by *Pinus halepensis, Juniperus phoenicea, Tetraclinis articulata, Cedrus atlantica, Quercus ilex, Argania spinosa* and perhaps, before their destruction, *Olea europaea*, with an undergrowth of maquis or garrigue which can be relatively dense or relatively open, and often includes *Rosmarinus officinalis, Phyllirea angustifolia, Globularia alypum* (Sclater and Thomas 1898; De Smet, 1989, 1991; Karem *et al*., 1993; Kacem *et al.*, 1994). It also frequents steppes of *Stipa tenacissima* and *Artemisia herba alba* (De Smet, 1991; Karem *et al.*, 1993). The forests were formerly much more widespread (Le Houérou, 1986); the *Stipa tenacissima* steppes constitute their initial substitution stage and have themselves greatly regressed (Le Houérou, 1986).

2.3. Evaluation and evolution of populations. Current numbers

In Morocco, the total population is currently estimated at between 500 and 1500 individuals (Aulagnier *et al*., in press) including a population of several hundred individuals recently rediscovered in the lower Drâa (Cuzin, 1996).

In Algeria, a study of the distribution and numbers of the species carried out at the end of the 1980's estimated the population at 445 individuals (Sellami *et al.*, 1990); De Smet in 1987 estimated the population at a minimum of 400 individuals and a maximum of 500 (De Smet, 1987); in 1991 his estimates were of 560 individuals of which 235 in the Tell Atlas (sites 1 to 5 in the table below), 140 in the Saharan Atlas (sites 6 to 12, 14 and 15), 135 in the east (sites 16 to 19), and 50 in the central group of the Mergueb (site 13) (De Smet, 1991); the table summarizing the distribution and numbers of *Gazella cuvieri* is taken from De Smet (1991):

1 Sidi Bel Abbes-Tlemcen-Telagh	50 individuals
2 Saida	20
3 Mascara	20
4a Tjaret Frenda	100
4b Djebel Nador	30
5 Ouarsenis Mountain	15
6 El Bayad - Brezina	10
7 Aflou-Laghouat	10
8 Ain Sefra-El Abiod Sidi Cheik	10
9 Bechar-Taghit	20
10 Djebel Senalba (Djelfa)	30
11 Djebel Sahari Hunting Reserve	20
12 Guelt es Stel	10
13 Mergueb Nature Reserve	50
14 Bou Saada	20
15 Djebel Bou Kahil	10
16 South Aurès (including Beni Imloul and Barika)	30
17 East of Biskra	15
18 Némentcha Mounts	10
19 Forests of Tebessa	80
Total	560

In Tunisia, the number of Cuvier's Gazelles is not known with precision; currently, the main population in the region of Chambi National Park is estimated at 300 individuals (Kacem *et al*., 1994), with a total population probably only slightly higher. The species is found in 13 hunting reserves and massifs, listed below (Kacem *et al.*, 1994):

1 Djebel Khchem el Kelb	2900 ha (Faunal Reserve 300 ha)
2 Dj. Serrraguia	3000
3 Dj. Gaubeul	3000
4 Dj. Tamesmida	5000
5 Dj. Dernaia	16000
6 Dj. Chambi	10000 (National Park 6723 ha)
7 Dj. Semmama	12000
8 Dj. Seloum	8000
9 Dj. Es Sif	10000
10 Dj. Hamra	3500
11 Dj. Bireno	3000
12 Ain Bou Driss 1st Series	3000
13 Oum Djeddour	3000
Total	82400 ha

There is no precise figure on the former numbers of Cuvier's Gazelle, but it was reputed to be common and locally abundant (i.a. Heim de Balzac, 1936). Harper (1945) cites Cabrera who recorded it in 1932 as particularly numerous in the central part of the Middle Atlas , in the territories of Beni Mguild and Ait Aiach, and along the line of contact between this chain and the High Atlas. Also in 1932, Carpentier notes that the species was formerly abundant in the Zaian district near Sidi Lamine and Khenifra (central Morocco).

2.4. Migration.

The migratory movements of Cuvier's Gazelle are hardly documented at all. Joleaud (1929) mentions erratic movements and a somewhat nomadic life.

3. CONSERVATION STATUS, BY PARTY

Morocco: Endangered

The conservation status of the species in Morocco was described recently by Cuzin (1996), on the basis of data found in Loggers *et al.* (1992), completed by new data gathered by the Water and Forest Service, by his personal observations, and by the observations of resident and visiting naturalists; it is primarily these recent data which are used here. The species seems to be extinct since 1985 in northeastern Morocco. Its range was greatly reduced in the Ida massif or Tanane, north of Agadir, where it would seem that the species disappeared in 1993, following a local drought of several years. The species was discovered on the southern slopes of the eastern Middle Atlas, towards Outat Oulad El Haj, as well as on the High Plateaux, slightly farther south. Small groups were also seen on the southern slopes of the central and eastern High Atlas, from the region of Ouarzazate to that of Rich, reaching an altitude of 2600 meters south of Imilchil, where the species is clearly transhumant: numerous testimonies indicate the presence of the species in summer, and its absence in winter. The species was discovered in the Jbel Saghro, where it seemed abundant in 1981, rare in 1991, and from where it seems to have disappeared at the present time.

In the Sahara, a group of three animals was observed south of Foum Zguid, in 1994. In 1995, the species was found in the entire region situated from the Drâa Wadi, at about a hundred kilometres upstream from its mouth, to the last reliefs northeast of Smara in the Aydar. This confirmed older data (Morales Agacino, 1949; Aulagnier and Thévenot, 1986) and pushed back the southern limit of known distribution by about sixty kilometres southwards (Cuzin, 1996).

Algeria: Endangered

The conservation status of the species in Algeria was recently described by De Smet (1989, 1991) and De Smet *et al.*, (in press), and it is mainly these recent data which are used here. In the northwest of the country, Cuvier's Gazelle is much more widespread than was thought. Almost all the large national forests of Aleppo Pines (*Pinus halepensis*) harbour small populations and there are contact zones between the majority of these populations. It is also relatively common in the hills between Mascara, Relzane, Tiaret, and Frenda, living there in open country with a mosaic of grain crops, vineyards, and pasturelands at the top of the hills. In the Saharan Atlas, most of the higher and less disturbed summits harbour small groups of Cuvier's Gazelle, the most substantial one of these being near Djelfa (Khirreddine, 1977). The most recent information indicates that some of these populations are growing. The easternmost populations are found in the Aurès, the Némentcha mounts, and the hills near the Tunisian border. Near Tebessa there is a concentration of Cuvier's Gazelles which move to and from the Chambi National Park in Tunisia.

Tunisia: Endangered

In the 19th century, Cuvier's Gazelle was present in all the Tunisian mountains, especially in the high chains of the Dorsale in the region of Kasserine, in the northern chains of the Dorsale near Ghardimaou, Tunis, and Zaghouan, and in the southern pre-Saharan chains around Gafsa and Tamerza. Its range decreased considerably until the 1970's, before the Forest Office took energetic measures, and the numbers had fallen very low. Important measures of habitat management for Cuvier's Gazelle, combined with measures to protect the species, have recently enabled the Tunisian Forest Office to greatly improve the state of conservation of Cuvier's Gazelle; the objectives of the Tunisian program aim at natural recolonisation of the historical range.

4. ACTUAL AND POTENTIAL THREATS

The species has declined over its entire ange owing to the increase in human pressure, essentially in the form of direct taking, but also because of the transformation of wooded zones into pastures and cropland.

4.1. Degradation and decline of habitats.

The degradation and decline of habitats is mainly due to the continuous expansion of pastureland for livestock and the deforestation for agriculture or charcoal. As a consequence, the numbers have been severely reduced and the range fragmented. This cause was identified, at least in Morocco, as the main threat at the present time (Aulagnier and Thévenot, 1986). The vast majority of natural forests have now been destroyed and it is not sure that Cuvier's Gazelle can adapt to plantations of rapid-growth pines. *Gazella cuvieri* seems less tolerant of disturbance than *Gazella dorcas*.

4.2. Direct exploitation.

Excessive hunting and taking have strongly contributed to the decline of Cuvier's Gazelle. Even though its preferred habitat ensures a better protection against hunters in vehicles than that of other species of North African gazelles (De Smet *et al*., in press), the species is still subject, at least locally, to high poaching pressure. Its populations have thus been reduced, in places, to a few dispersed groups.

5. REGULATORY PROVISIONS

5.1. International.

Bonn Convention : Appendix I, Resolution 3. 2, paragraph 4.
Washington Convention (CITES): Appendix I

5.2. National.

Completely protected in Algeria, Tunisia, and Morocco

6. CONSERVATION MEASURES, BY PARTY

6.1. Ban on taking.

The species is protected legally and may no longer be hunted, in Morocco since 1958, in Algeria since 1975, and in Tunisia since 1966.

6.2. Habitat conservation.

Morocco: small populations are currently preserved, especially in the Outat el Haj Royal Hunting Reserve (15) and in the forestry reserve at Tafingoult (60). A large population, probably the largest population in the country, numbering several hundred animals, survives in pre-Saharan regions (Cuzin, 1996); a proposal currently exists to create a protected area in this region, i.e. in the basin of the lower Drâa (Müller, 1996). The creation of such a protected area would open up invaluable conservation prospects for the persistence of the species in Morocco.

Algeria : the species is found in the following protected areas: the Saharan Atlas National Park (20,000 ha; 100 gazelles), Belezma National Park (26,500 ha; number unknown), Nature Reserve of the State of Mergueb (32,000 ha; 50 gazelles), and the National Forest of the State of Djebel Senalba (20,000 ha; 30 gazelles). Small numbers of Cuvier's Gazelle also exist in three hunting reserves: the Djebel Achch Hunting Reserve (400 ha), Djebel Nadour Hunting Reserve (200 ha), and the Djebel Aissa Hunting Reserve (500 ha).

Tunisia: since 1974, the regions frequented by the Mountain Gazelle have been designated as hunting reserves, and in 1980 Chambi National Park (6723 ha) was established. Recent observations indicate that Cuvier's Gazelle is moving back again towards the northeast in the massifs of the Tunisian Dorsale. Active management measures in the Djebel Khchem el Kelb Reserve were put into place as of 1975; the installations include fence laying on three

sides of the reserve, the creation of permanent waterholes, fire trenches, provision of salt stones, additional food, and plantations of unarmed *Opuntia* cactus (rich in water and calcium).

6.3. Attenuation of obstacles for migratory animals:

not relevant

6.4. Regulations concerning other detrimental factors.

It does not seem necessary to consider other special regulations for Cuvier's Gazelle in Morocco, Algeria, or Tunisia.

6.5. Other measures.

The Alméria Park, in Spain, shelters a collection of animals which reproduce in captivity. The Rabat Zoo also has captive animals.

Animals originating from Djebel Chambi were introduced into Libya (Smith, 1998), but the results of this introduction are not known.

7. RESEARCH ACTIVITIES

7.1. Public authorities.

Special attention should be devoted to the identification of bottlenecks likely to prevent or impede the dispersal and reinstallation of Cuvier's Gazelle populations, in particular in the Tunisian Dorsale, but also elsewhere in the range of the species.

7.2. N.G.O.s

8. NEEDS AND RECOMMENDED MEASURES

Recommended measures are the object of a plan of action developed in parallel with this report (Beudels *et al.*, 1998). The principal needs that they meet are listed below.

8.1. Total protection of the species.

Cuvier's Gazelle is included in Class A of the African Convention. Consequently, it can only be hunted or collected with the authorisation of the highest competent authorities and only in the interest of the nation or for scientific reasons. Tunisia and Morocco have ratified the African Convention while Algeria has signed it but still not ratified it.

8.2. Conservation measures.

The principal need is to ensure adequate protection, in particular by the creation of a dense network of reserves allowing the species to disperse and re-extend its range. The development of other hunting reserves, on the basis of the model of Khchem El Kelb in Tunisia, should thus enable other sites to effectively play their relay role, especially between Chambi and Bou Kornine National Parks in the Tunisian Dorsale, as well as elsewhere in the range of the species.

8.3. Localisation and monitoring of residual populations, and definition of their ecological requirements.

It seems that on the whole these populations are well-known and relatively well monitored, and this measure does not seem to be a first priority at the present time. The newly rediscovered population in the lower Drâa in Morocco deserves, however, a very special effort of censusing and protection.

8.4. Reinforcement of populations and reintroduction into the potential range.

Reinforcement of populations by individuals born in captivity has been proposed as a measure aimed at accelerating the redeployment of the species in its former range (Kacem *et al*., 1994), for instance at Belezma National Park and Teniel el Had National Park in Algeria, or at Bou Kornine National Park in Tunisia. Such measures contribute to the overall protection strategy for the species only to the extent that the connections between the sites are ensured and permanently secured.

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Report on the status and perspectives of a species

Gazella dorcas

Report prepared by Tommy Smith
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This report is based on documents prepared for the Convention on Migratory Species by Pierre Pfeffer (1993b, 1995) and on supporting documents for the action plan on Sahelo-Saharan antelopes adopted by the 4th Conference of the Parties of the Convention, documents that were prepared by Roseline C. Beudels, Martine Bigan, Pierre Devillers and Pierre Pfeffer (1994). The information it contains originates mainly from the general accounts and regional action plans edited by Rod East (1988, 1990), and the fundamental work of Hubert Gillet (1965, 1969) and John E. Newby (1974, 1988, in particular). It is completed by a new review of the literature and a survey of actors in the field conducted in 1996 and 1997 by Tommy Smith (1998) with the support of Koen De Smet. Roseline C. Beudels, René-Marie Lafontaine, Marie-Odile Beudels, Tommy Smith, Yves Laurent and Chris Kerwyn have contributed to the preparation and finalising of this report.
Original in french; translation by Roseline C. Beudels and Jean Devillers-Terschuren

Cover drawing: J. Smit, in Sclater and Thomas, 1899.
Reproduction

1. TAXONOMY AND NOMENCLATURE

1.1. Taxonomy.

Gazella dorcas belongs to the tribe Antilopini, sub-family Antilopinae, family Bovidae, which comprises about twenty species in genera *Gazella*, *Antilope*, *Procapra*, *Antidorcas*, *Litocranius* and *Ammodorcas* (O'Reagan, 1984; Corbet and Hill, 1986; Groves, 1988). Genus *Gazella* comprises one extinct species, and 10 to 15 surviving species, usually divided into three sub-genera, *Nanger*, *Gazella,* and *Trachelocele* (Corbet, 1978; O'Reagan, 1984; Corbet and Hill, 1986; Groves, 1988). *Gazella dorcas* belongs to sub-genus *Gazella* (Groves, 1969; O'Regan, 1984; Corbet and Hill, 1986) and to its central group (Groves, 1988), within which species limits are not entirely clarified. Groves (1988) distinguishes seven species, *Gazella dorcas* of North Africa, northern Somalia and Ethiopia, the Sinai and southern Israel, *Gazella saudiya* of Saudi Arabia, Kuwait and southern Iraq, *Gazella gazella* of the Arabian peninsula, Israel and Lebanon, *Gazella bilkis* of northern Yemen, *Gazella arabica* of Farasan Island in the Red Sea, *Gazella spekei* of Somalia and eastern Ethiopia, *Gazella bennetti* of Iran, Pakistan and India. *Gazella dorcas* is polytypic and comprises, in Africa, besides *Gazella dorcas pelzelni* of the Somalian region, about four Sahelo-Saharan subspecies, *Gazella dorcas dorcas* in the Western Desert of Egypt, *Gazella dorcas isabella* (*G. d. littoralis*) in the Eastern Desert and the hills of the Red Sea, *Gazella dorcas massaesyla* on the Moroccan high plateaux and in the Atlantic Sahara and its fringes, *Gazella dorcas osiris* (*G. d. neglecta*) in the Sahel, the central Saharan massifs and the northern fringes of the western Sahara (Groves, 1969, 1988; Osborn and Helmy, 1980; Alados, 1988). Possible isolation of these forms does not seem entirely documented and they do not seem to present clear-cut ecological differences congruent with the taxonomic divergences.

1.2. Nomenclature.

1.2.1. Scientific name.

Gazella dorcas (Linnaeus, 1788)

1.2.2. Synonyms.

Capra dorcas, Antilope kevella, Antilope corinna, Antilope dorcas, Gazella lisabella, Gazella littoralis

1.2.3. Common names.

English: Dorcas Gazelle
Arabic: Ghazel, Rhazal, Afri
French: Gazelle dorcas

2. BIOLOGICAL DATA

2.1. Distribution.

2.1.1. Historical distribution.

Available information indicates that Dorcas Gazelle historically occurred throughout the Sahelo-Saharan region, from the Atlantic Ocean to the Red Sea and from the Mediterranean coast to the southern Sahel. Its distribution across this area appears to have been relatively uniform, with the exception of hyper-arid deserts and the upper elevations of the central-Saharan massifs. Literature on the species from the 19th and early 20th centuries typically described it as common and locally abundant (e.g., Whitaker, 1896; Lavauden, 1926b; Joleaud, 1929).

2.1.2. Decline of the range.

The distribution of *Gazella dorcas* has been slowly declining, by fragmentation, in northern Africa since the late 1800s. By the mid-1900s, it had largely disappeared from the Atlas Mountains and Mediterranean coastal

areas, but southward as far as the Sahel, it remained relatively well distributed. During the 1950s, 1960s, and 1970s, motorized hunting and, to a lesser extent, degradation and loss of habitat, severely impacted the species throughout its range, and although its overall distribution remained intact, its numbers had been greatly reduced (Dupuy, 1967), probably by half (Dragesco-Joffé, 1993), and it had been eliminated from large areas of its range, particularly those accessible to motorized vehicles. In the late 1980s, *Gazella dorcas* still occurred in all the Sahelo-Saharan Range States except Senegal, but its numbers had been substantially reduced, and it was considered threatened or endangered throughout the region with the exception of Niger and Chad, where relatively well protected populations occurred in the Aïr-Ténéré and Wadi Rimé-Wadi Achim reserves, respectively (East ,1988, 1990, 1992).

2.1.3. Residual distribution.

The most recent information is that Dorcas Gazelle still naturally occurs in all the Range States, except Senegal; however, with the exception of Algeria and Mali, where the distribution and abundance of gazelles may be increasing due to civil war (K. De Smet, *pers. comm.*, January 1997; East, 1997), and Ethiopia, where several hundred occur in protected areas, *Gazella dorcas* continues to be threatened by illegal hunting and, to a lesser extent, loss of habitat due to livestock overgrazing, and its numbers are declining. About a hundred reportedly still occur in the Aïr-Ténéré National Nature Reserve in Niger (Poilecot, 1996). In Morocco, numbers are estimated at 500-800; about half of which occur in protected areas; an important population of possibly several hundred animals occurs in the Adrar Soutouf in southern Western Sahara (Cuzin, *in litt.*, July 1996). According to recent surveys, a population of 1000-2000 is in rapid decline in Egypt (Saleh, in press). Numbers in Mali are estimated at 2;000-2;500 (East, 1997). It still occurs in the Wadi Rimé-Wadi Achim reserve, but numbers are much reduced (East, 1996a). There are no recent estimates of total numbers of *Gazella dorcas* in Mauritania (O. Hamerlynck, *in litt.*, July 1996; B. Lamarche, *in litt.*, October 1996) or Tunisia (K. De Smet, *pers. comm.*, January 1997). Its status is not known in Burkina Faso or Nigeria. If the current trend of decline of *Gazella dorcas* continues, the species will soon, if it does not already, qualify for vulnerable status (East, 1992).

2.1.4. Recolonisation prospects.

2.2. Habitat.

Dorcas Gazelle is a generalist, more so than any other Sahelo-Saharan antelope. Habitats in which it has been recorded include wadis, plateau canyons, vegetated beaches, sandy and hard deserts, margins of oases, ergs, chotts, sebkas, stony hills, and plateaus (Lavauden, 1926c; Dupuy, 1967; Osborn and Helmy, 1980; Kacem *et al.,* 1994). It occurs from coastal plains and desert depressions (Osborn and Helmy, 1980) to 2;000m elevations in the Hoggar Mountains (Dupuy, 1967). Higher elevations, as well as interiors of deserts, are apparently avoided (Grettenberger, 1987).

Like other Sahelo-Saharan antelopes, Dorcas Gazelle does not need free water (Kowalski and Rzebik-Kowalska, 1991) and is capable of satisfying its water requirements by selecting plant foods with high water content (Osborn and Helmy, 1980). It is a flexible browser and a grazer and emphasizes either feeding strategy depending on habitat conditions and the availability of food. In the Aïr-Ténéré reserve in Niger, during a relatively dry period, Dorcas Gazelles primarily browsed, apparently due to a lack of grasses and legumes, whereas in Chad, where these foods were available, it primarily grazed (Newby, 1981). Food habits in these two areas nonetheless overlapped substantially.

Important dry season food items include *Acacia spp.*, *Maerua crassifolia, Nitraria retusa*, *Citrullus colocynthis* (= *vulgaris*), *Chrozophora brocchiana*, *Leptadenia pyrotechnica, Zizyphus spp., Balanites aegyptiaca,* (Carlisle and Ghobrial, 1968; Osborn and Helmy, 1980; Newby, 1974; Grettenberger, 1987; Anon., 1987f). During the wet season, perennial grasses and forbs, such as *Panicum turgidum, Tribulus spp.* and *Stipagrostis spp.*, are heavily utilized (Grettenberger, 1987).

Use of wooded riparian habitats reportedly is high during the dry season, whereas use of more open habitats, such as gravelly piedmonts and outwash steppes, is relatively high during the wet season (Newby, 1974; Grettenberger, 1987).

2.3. Evolution and estimation of populations.

Formerly common in its entire range, *Gazella dorcas* has entirely disappeared from many regions and been gravely reduced in numbers where it subsists.

2.4. Migration.

Dorcas Gazelle are nomadic and exhibit relatively small-scale movements in response to the availability of pasture (Heim de Balsac, 1936; Newby, 1974), sometimes of a trans-border character, but within the same geographical region.

3. CONSERVATION STATUS, BY PARTY

Morocco (including **ex-Spanish Sahara**): Endangered (Cuzin, 1996).

With the possible exception of the high elevation of the Atlas Mountains, Dorcas Gazelle was historically distributed throughout Morocco and Western Sahara (Aulagnier, 1992). In the 1800s, it reportedly occurred west of the Atlas Mountains at low densities and remained uniformly distributed and abundant elsewhere. By the 1950s, the species had disappeared west of the Atlas, except for one population in the vicinity of Safi, and had been reduced to low numbers on the northern, eastern and southern flanks of the Atlas; at the time, it also had become rare along the coast in the Western Sahara nearly to Dakhla (Aulagnier, 1992). In the early 1990s, the extent of the species' range had not changed, but it had been reduced to small widely dispersed groups east and south of the Atlas and throughout the Western Sahara (Aulagnier, 1992; Loggers *et al.*, 1992).

It was recently estimated that a population of approximately 80 animals occurs west of the Atlas, from the M'Sabih Talaa Reserve northward to Chichaoua. East of the Atlas it is very rare, typically occurring in widely dispersed populations of 20-50 animals. A population of about 100 occurs at the base of Jebel Gouz and west to Figuig along the Algerian border. Approximately 50 are found in the upper Draa Valley in the vicinity of Zagora; 100-200 remain in the Middle Draa, primarily in the Tata Province, and about 200 occur in the Lower Draa between Assa and Msseyed (F. Cuzin, *in litt.*, May 1996; Aulagnier *et al.,* in press). The remnant population in the Souss Valley has been extirpated (Cuzin, 1996). The total number in Morocco, from the Draa Valley northwards, is estimated at 500-800 (F. Cuzin, *in litt.*, May 1996). Southward through the Western Sahara, the distribution and abundance of the species has been considerably reduced, but several hundred are thought to remain, mostly in the Adrar Soutouf in the far south (F. Cuzin, *in litt.*, May 1996; Aulagnier *et al.,* in press).

Habitat loss due to overgrazing and permanent agriculture is the primary threat to the species, and poaching is common (Aulagnier *et al.*, in press).

Algeria: Probably Vulnerable.

With the possible exception of the dunes in the southwest (i.e., Erg Chech and Erg d'Iguidi), Dorcas Gazelle historically occurred throughout Algeria (Lavauden, 1926; Dupuy, 1967; DeSmet, 1988; Kowalski and Rzebik-Kowalski, 1991). There is some question of the validity of, 19th century reports of the species in the Mediterraneon coastal area, because of possible confusion with *Gazella cuvieri* (Kowalski and Rzebik-Kowalski, 1991), but given the species broad occurrence in coastal areas elsewhere in its range, it is likely that the reports are valid.

The distribution of *Gazella dorcas* has gradually retracted southward throughout the 19th and 20th centuries. In the 1920s and 1930s, it remained widely distributed and common on the High Plateau from Morocco to Tunisia, on the plateaux south of the Saharan Atlas, between the Great Eastern and Great Western ergs, and throughout the southeastern portion of the country (Joleaud, 1929; Maydon, 1935).

Its distribution and numbers declined through the mid-1900s, particularly during the 1960s and 1970s due to motorized hunting, but it remained common and locally abundant in many parts of its Algerian range into the 1970s and 1980s (Dupuy, 1966; Anon., 1987f). The northern limits of the species' range continued to move southward, however, and by the 1980s, it did no longer occurred north of the Saharan Atlas (Kowalski and Rzebik-Kowalski, 1991; De Smet and Mallon, in press).

Dorcas Gazelle presumably remains widely distributed in the Saharan zone of Algeria, but numbers are believed to greatly reduced (De Smet and Mallon, in press). Control of firearms due to military activity in recent years apparently has reduced poaching (De Smet, *pers. comm.,* March 1997) but not enough to stop the decline of the species (De Smet and Mallon, in press). No estimate of numbers in the wild is available.

Tunisia: Vulnerable.

Dorcas Gazelle formerly occurred throughout Tunisia, south and east of the Tell Atlas, and north and east of the Great Eastern Erg (Whitaker 1896; Lavauden, 1926b, Joleaud, 1929; De Smet, *pers. comm.*, May 1996). In the early 1900s, the species remained well distributed in the country and was observed in large herds in areas such as the grassland plains bordering the Mehedra plateaux (Lavauden, 1926b, Schomber and Kock, 1961). At that time herds, of 50-80 were not uncommon, and occassionally concentrations of several hundred animals were seen. By the 1920s, however, the species reportedly was in decline. The northern limit of its range was moving southward, and large herds were uncommon (Lavauden, 1920). In the 1960s, *Gazella dorcas* had largely disappeared from the north. It still occurred north of Chott El Jerid to the Saharan Atlas (Müller, 1966), but it was markedly less numerous in the central than in southern districts, where moderate herds could still be found in sub-desert steppe east of the Great Eastern Erg (Schomber and Kock, 1961).

Dorcas Gazelle is presently limited to the southern half of the country, approximately south of a line between Gafsa and Gabes (i.e., 34^0 -35^0 N Latitude) (Smith *et al.*, in press). Specific information on distribution and numbers of the species within this range is largely lacking. Illegal hunting and habitat degradation due to livestock overgrazing continue to be threats.

Libya: Endangered.

Limited information from Libya, coupled with reports of the species in bordering areas of Algeria (De Smet, 1988), Tunisia (Lavauden, 1926b), Niger (Grettenberger and Newby, 1990), Sudan (Hillman and Fryxell, 1990), and Egypt (Saleh, 1987), indicate that *Gazella dorcas* was historically distributed throughout the country (Hufnagl, 1972; Essghaier, 1980; Esschaier and Johnson, 1981; Anon., 1987; Khattabi and Mallon, in press).

In the 1960s and 1970s, the species was still widely distributed across the northern and central regions (Essghaier, 1980), and in the southeast, and it remained abundant in a few areas, such as the Hammada El Hamra in the west and Djebil Uwenait in the southeast (Misonne, 1977; Essghaier, 1980). Overall, however, its numbers and distribution were declining rapidly at that time, due to uncontrolled motorised hunting (Hufnagl, 1972).

In the late 1980s, the species still occurred locally in Libya but in greatly reduced numbers (East, 1992). The situation reportedly remains the same (Khattabi and Mallon, in press), however, information on the current distribution and numbers of the species is lacking.

Egypt: Vulnerable.

The historical range of *Gazella dorcas* included the northern, central, and eastern parts of Egypt (Saleh, 1987). With the exception of the vicinity of Djebil Uwenait and Gilf Kebir (Osborn and Krombein, 1969), there are no records of the species in the arid west-central and southwestern districts (Osborn and Helmy, 1980; Saleh, in press). Due to human pressure, primarily hunting and trapping, the distribution and abundance of the species declined considerably during the late 1800s and early 1900s, and by the 1920s, it had disappeared from entire districts (Flower, 1932). By the 1960s, *Gazella dorcas* had been eliminated from the immediate vicinity of the Mediterraen coast and semi-desert areas with good pasture; elsewhere herds were small and uncommon (Hoogstraal, 1964).

In the late 1980s, Dorcas Gazelle no longer occurred in the northcentral region of the country from the Suez Canal through the Nile delta and westwards to the Quattara Depression, where important populations historically occurred. It still occurred over most of the remainder (i.e., southern parts) of the country, but populations were widely scattered. The few concentrations that remained were limited to remote, inaccessible areas, and the species was considered in eminent danger of extinction (Saleh, 1987).

Recent information is that Dorcas Gazelle populations continue to decline throughout Egypt, due to uncontrolled hunting; it is estimated that between 1;000 and 2;000 survive, mostly outside of protected areas (Saleh, in press).

Mauritania: Endangered.

Trotignon (1975) concluded that Dorcas Gazelle historically was abundant throughout Mauritania, with the exception of the desertic heart of the Majabat Al Koubra in the east, and the southern portion of the Sahel zone in the south. Given the occurrence of the species in northern Sengal (Sournia and Dupuy, 1990) and in Mali adjacent to the southeastern corner of Mauritania (Heringa, 1990), it is very likely that the historical range of Dorcas Gazelle encompassed all of the country.

The species experienced a catastrophic decline during the 1950s and 1960s. I areas where herds numbering in the dozens were once common, only isolated individuals were observed by the early 1970s (Trotignon, 1975). In the late 1970s, Lamarche (1980) reported that it was rare in the Majabat al Koubra. A population in the Banc d'Arguin National Park, which once numbered 200 (Anon., 1987f), declined from approximately 100 to less than 10 between 1970 and 1983 (Verschuren, 1985). In the early 1980s, Dorcas Gazelle was considered threatened (Newby, 1981a), and by the late 1980s, it had been largely extirpated and survived only in small numbers in very remote areas (Sournia and Verschuren, 1990).

Dorcas Gazelle has recently been observed in the Maqteir in the northwest, and it probably still occurs in the Areg Chach and Hank Escaptment in the northeast (B. Lamarche and O. Hammerlynck, *in litt.*, April 1997). Information on the status of the species elsewhere, e.g., Bank d'Arguin NP, is unavailable. Illegal hunting is a serious threat to this and other antelope species, and it largely occurs in inaccessible areas. (O. Hammerlynck, *in litt*., April 1997).

Mali: Probably Endangered.

Heringa's (1990) range map for Dorcas Gazelle includes all of the Sahel and Sahara zones of Mali, i.e., everything north of about 15^{o}N latitude, which probably represents the overall historical distribution of the species. It apparently never occurred, however, in most arid deserts in the north (Heringa, 1990). This is consistent with the lack of records for the species in adjoining, hyper-arid areas of Algeria (De Smet, 1988). However, records of *Gazella leptoceros*, a desert-loving species, also are lacking from northern Mali and southwestern Algeria, and the absence of records of Dorcas Gazelle (and other antelopes) in this area (Sayer, 1977) may be related to its remoteness.

Gazella dorcas was formerly locally common in Mali (Heringa, 1990). In the 1970s, it still occurred throughout the country, but it was rare and locally extirpated in much of the Sahel zone, and its numbers had been greatly reduced in the northeast (Adrar des Iforhas and Tilemsi) (Sayer, 1977). In the early 1980s, its distribution and overall abundance had been further reduced, but it remained locally abundant in a few areas, such as the vicinity of Gao (J.M. Pavy, *in litt.*, September 1996). In the late 1980s, small populations also survived in the Elephant Faunal Reserve and the Ansongo-Manaka Faunal Reserve in the Sahel zone, at the southern extremity of the species' range (Heringa, 1990).

Uncontrolled hunting and severe drought have severely impacted the Dorcas Gazelle population in northern Mali in recent years (East, 1997a). To the south in the sub-desert zone (northern Sahel), the species remains widely distributed in small populations that may total 2;000 to 2;500 animals (Niagate, 1996; J.M. Pavy, *in litt*., September 1996). Numbers apparently increased during the rebellion in early 1990s (Niagate, 1996). Information is lacking on the status of remnant populations in the Elephant and Ansongo-Manaka. If present population estimates are reasonably accurate, the species undoubtedly is threatened.

Niger: Probably Vulnerable or Endangered.

The historical range of *Gazella dorcas* in Niger likely was not substantially different from that in the 1980s, when the species occurred throughout the country north of approximately the 14th parallel (Grettenberger, 1987; Grettenberger and Newby, 1990). Within this area, it apparently was absent from the high elevations of the Aïr Mountains and the interior of the Ténéré Desert to the northeast.

In the early 1980s, it was estimated that 5;000 or more survived within the Aïr Ténéré National Nature Reserve, and several thousand occurred in the Termit area to the southeast (Grettenberger and Newby, 1990). Historically the species probably numbered in the tens of thousands, or more.

Recent estimates of 20;000 country-wide (Dragesco-Joffe, 1993) and several thousand in the Aïr Ténéré National Nature Reserve (Poilecot, 1996) are based on dated from, 1991; or before, and the present status of the species is unknown. Illegal hunting, habitat degradation, and competition with livestock (Grettenberger and Newby, 1990) probably remain threats.

Chad: Probably Vulnerable or Endangered.

In the late 1970s, Dorcas Gazelle occurred throughout Chad north of 13^{o} 30$^{'}$ N latitude (Newby, 1981a), and this probably represents the species' historical distribution in the country. It reportedly does not occur on the high massifs (Thomassey and Newby, 1988), but elsewhere its former distribution probably was uniform. In the late 1970s, it was estimated that approximately 35;000 to 40;000 Dorcas Gazelles occurred in the Oued Rimé Oued Achim Faunal Reserve, which encompasses possibly a quarter of the species distributional range in Chad (Newby, 1981a).

Despite intensive hunting pressure, particularly during the civil war, Dorcas Gazelle remained widely distributed in Chad through the 1980s, when it was estimated that the species numbered in the low tens of thousands (Thomassey and Newby, 1990).

Information on the status of the species since the 1980s is lacking. The Chadian Direction of National Parks and Faunal Reserves recently reported that Dorcas Gazelle remains in the Oued Rimé Oued Achim Faunal Reserve but in greatly reduced numbers (East, 1996a), and this likely is indicative of the species' status elsewhere in the country.

Sudan: Probably Near Threatened or Vulnerable.

Dorcas Gazelle was formerly well distributed throughout the desert and sub-desert zones of central and northern Sudan, from Chad and Libya to the Red Sea (Hillman and Fryxell, 1988). The southern limits of its range were approximately 14^{o} N latitude in the West and $\pm$16^{o}N latitude in the East. It was probably common and locally abundant throughout this range. *Gazella dorcas* was once particularly abundant in the vicinity of the Nile, from Wadi Halfa at the Egyptian border southward through Dongola and the Bayuda Desert (Hassaballa and Nimir, 1991) and in the vicinity of Wadi Howar in Northern Darfur (Maydon, 1923). It was common in the Red Sea Hills (Maydon, 1935).

Dorcas Gazelle undoubtedly has declined considerably in recent decades due to uncontrolled hunting and degradation/loss of habitat due to livestock overgrazing and agricultural encroachment (Hillman and Fryxell, 1988; East, 1996). The effects of land degradatin have been compounded by drought. In the 1930s, *Gazella dorcas* remained well distributed throughout its historical range (Brockelhurst, 1931; Maydon, 1935), but by the 1970s, it had disappeared from most of the northwestern and northeastern parts of the country (Ghobrial, 1974). In the 1980s, it remained widely distributed but in ever-fragmented and greatly reduced populations (Newby, 1981a, Hillman and Fryxell, 1988).

The species still occurs in the deserts of northern Sudan, and unconfirmed information from hunters is that numbers in the region are locally good, and recent surveys have indicated that the species is still common in the Red Sea Hills (I. Hashim *in litt.,* November 1996, December 1996).

Senegal: Reintroduced

Poulet's (1972) sighting of Dorcas Gazelle in the Fete-Ole area 100km east of St. Louis is the only record for the species in Senegal. Peul tribesmen in the Ferlo region apparently have no name for the species, and it is likely that it historically occurred in Senegal only as a vagrant (Dupuy, 1984). Newby (1981) considered it rare in the country. In 1972; the Senegalese National Park Service introduced 15 Dorcas Gazelles at the Djoudj National Park in the extreme northwest (Dupuy, 1984). This captive herd grew to approximately 50 by the early 1980s (Dupuy, 1984) but experienced a serious decline during the late 1980s (Sournia and Dupuy, 1990). It reportedly still exists, but numbers are not known (B. Clark, *in litt.*, September 1996)

Burkina Faso: Probably Endangered.

Gazella dorcas historically occurred in the Sahel zone of northern Burkina Faso, where it still survived in the late 1980s. It was considered endangered at the time, due to poaching and habitat lost, and largely confined to the Seno-Mango area at the northern extremity within the Sahel Partial Faunal Reserve, at the Mali border (Heringa *et al*., 1990).

There was no mention of Dorcas Gazelle in a recent update on antelopes in Burkina Faso (East, 1996a), and its status in the country is unreported. Given the present level of human activity in the Sahel region, illegal hunting and habitat degradation probably remain serious threats to the species.

Nigeria: Possibly Extinct.

Dorcas Gazelle reportedly is a rare inhabitant of the small area of Sahel in northeastern Nigeria, in the vicinity of Lake Chad (Anadu and Green, 1990). In the late 1980s, its status in the area was unknown, but it very possibly was extinct, due to overhunting hunting and habitat encroachment by livestock (Anadu and Green, 1990).

Ethiopia: Lower Risk.

The historical range of *Gazella dorcas* included the arid lowlands (steppe, semi-desert, and desert) of northern and eastern Ethiopia from the extreme north of the Eritrea province through the Danakil plains and to the foothills of the Chercher Mountains (Anonymous, 1987f, Hillman, 1988; Yom-Tov et al., 1995; Kingdon, 1997). In the mid-1980s, its numbers were unknown, but presumably stable, and its conservation status was considered satisfactory (Hillman, 1988).

Gazella dorcas was not observed in recent aerial and ground surveys in Yangudi NP, but a population of several thousand is estimated to occur in the adjacent Mille-Serdo reserve and Danakil desert to the north (East, 1997b). No information is available on the status of the species in the northwest, but given estimated numbers and tribal stability in the Mille-Serdo/Danakil area, the species presently appears to be stable and not threatened.

4. ACTUAL AND POTENTIAL THREATS

4.1. Degradation and decline of habitats.

The species has suffered, though to a lesser degree than other sahelo-saharan antelopes, , because of its greater ecological flexibility, from catastrophic droughts, degradation of pastures through overgrazing, cutting of woody plants and loss of optimal habitats to development pressures.

4.2. Direct exploitation.

The decline of *Gazella dorcas* has to be attributed primarily to uncontrolled hunting. Traditional hunting could have had a substantial impact on local populations but it is modern hunting with firearms and motor vehicles (Newby, 1990) which constitutes the primary threat.

4.3. Other threats.

There are no other known threats.

5. REGULATORY PROVISIONS

5.1. International.

Bonn Convention: Appendix I, Resolution 3. 2; paragraph 4.
Washington Convention (CITES): Appendix III (Tunisia).

5.2. National.

Protected or partially protected in Morocco, Algeria, Tunisia, Libya, Egypt, Mali, Sudan, Burkina Faso, Nigeria, Ethiopia, Somalia

6. CONSERVATION MEASURES, BY PARTY

6.1. Ban on taking.

Algeria:	protected
Tunisia:	protected
Morocco:	protected
Egypt:	protected
Mali:	protected
Ethiopia:	taking under license

6.2. Habitat conservation.

Morocco (including **ex-Spanish Sahara**)

Dorcas Gazelle occurs in the M'Sabih Talaa reserve (N=±80), the El Kheng Reserve (N=+15) (Aulagnier *et al., in press*), and a recently gazetted reserve in the Lower Draa Valley (N=±200) (F. Cuzin, *in litt.*, May 1996). Small herds may intermittently occupy permanent hunting reserves, but no specific measures for conservation of the species are taken in such areas.

Protection of remnant populations in the M'Sabih Talaa and Lower Draa reserves and evaluation of the potential for establishing a protected area in the Adrar Soutouf are priority actions for the *Gazella dorcas* in Morocco and the Western Sahara (F. Cuzin, *in litt*., May 1996).

Establishment of a reserve at Jebel Grouz would protect remnant populations in eastern Morocco, and enlargement of El Kheng reserve would help ensure protection of the Tafilalt population (Aulagnier *et al*., in press). Restoration of the species in the semi-desert zones of northeastern Morocco, along the Eastern Plateau, may be accomplish by reintroductions and reinforcements in several large hunting reserves that occur in the area (Aulagnier *et al*., in press).

Algeria:

Dorcas Gazelle occurs in large numbers in the Hoggar and Tassili national parks in the south of the country, but receives little protection there.

Gazella dorcas is included in the Algerian Agency for Nature Conservation's proposed captive-breeding programme for Sahelo-Saharan wildlife (B. Kadik, *in litt.*, June 1996). Surveys are needed to determine the distribution and abundance of the species. Establishment of a reserve in the western High Plateau would protect a distinct geographic form of the species (De Smet and Mallon, in press).

Tunisia:

Approximately 120-150 Dorcas Gazelle occur in Bou Hedma National Park, near the northern extremity of the species current distribution (H. Lazhar, *pers. comm.,* June, 1997), and approximately 30 are estimated to inhabit Sidi Toui National Park in the southeast (A. Mertah, *pers. comm.*, June 1997). The species also occurs in Djebil National Park on the northeastern edge of the Great Eastern Erg, as well as in several smaller reserves (Anon., 1987; De Smet and Mallon, in press), but numbers in these areas are not known.

Dorcas Gazelle is among the species identified in the DGF's programme for restoration of wild fauna in Tunisia, but no measures aimed specifically at conservation of the species have been proposed. Illegal hunting is the greatest threat to the species and strict enforcement of hunting laws is essential. The fundamental priority for the species is systematic survey to determine its status in the wild and identify areas with needs and potential for conservation action.

Libya:

Approximately 150 Dorcas Gazelles occur in the 1;000 km^2 New Hisha Nature Reserve. In 1991; 15 animals were translocated from Sudan to El-Kouf NP (85km^2).

The Libyan Wildlife Technical Committee plans to establish a network of protected areas that will include the southern parts of the country (Khattabi and Mallon, in press). Selection of sites for protection should consider existing needs and potentials for restoration and conservation of Dorcas Gazelle and other antelopes. In the short-term, conservation actions should focus on protection of populations that occur in conservation areas, particularly New Hisha Reserve, and reintroduction of the species into suitable protected areas, such as the Zellah Nature Reserve.

Egypt:

Dorcas Gazelle occurs in the Djebil Elba protected area in the southeast and the El Omayed Scientific (Biosphere) Reserve west of Alexandria (Anon., 1987f). Protection in these reserve is very limited, however, and considerable poaching occurs (Saleh, in press).

Stronger enforcement of hunting regulations and effective management of protected areas are conservation priorities for the species. Reintroduction into a planned protected area in northern Sinai has been proposed (Saleh, in press).

Mauritania:

Dorcas Gazelle occurs in Banc d'Arguin National Park. The population suffered tremendous losses in the 1980s due to illegal (Sournia and Veschuren, 1990) but reportedly is currently stable (O. Hammerlynck, *in litt*., April 1997). No other protected areas are located in the range of the species, and no measures have otherwise been taken for its conservation.

Effective management of Banc d'Arguin NP is a priority for conservation of the species in Mauritania (Sournia and Verschuren, 1990). Establishment of protected areas for restoration of scimitar-horned, oryx, addax, and dama gazelle would benefit the species.

Mali:

Dorcas Gazelle may still occur in the Elephant and Ansongo-Manaka faunal reserves, but these areas are seriously threatened by habitat degradation and hunting (East, 1997). There are no protected areas in the sub-desert and desert zones to the north.

Rehabilitation of the Ansongo-Manaka and Elephant reserves is important for restoration of *Gazella dorcas* in Mali. The latter reserve lies in the Gourma area, which has been identified as an important site for biodiversity conservation (J.M. Pavy, *in litt.*, January 1996) and may be the best opportunity for conservation of the species (East, 1997). The Adrar des Iforhas and associated plains of Tilemsi and Tamesna, where Dorcas Gazelle still occurs, also has been proposed for biodiversity conservation (J.M. Pavy, *in litt.*, January 1996).

Niger:
Dorcas Gazelle occurs in the Aïr Ténéré National Nature Reserve. The Gadabedgi Faunal Reserve formerly harboured a small population (Grettenberger and Newby, 1990), but there is no recent information of the status of the species in this area. Effective management of the Aïr Ténéré National Nature Reserve and establishment of a protected area in the Termit region are actions that would improve the conservation status of the species.

Chad:

The species occurs in the Oued Rimé Oued Achim Faunal Reserve, where control has been regained. It also may occur in the unmanaged Fada Archei reserve in the Ennedi east of the Oued Rimé Oued Achim Faunal Reserve (Thomassey and Newby, 1990). Systematic survey of the Oued Rimé Oued Achim Faunal Reserve and other areas of Chad for Scimitar-horned Oryx and Addax will provide information on the status of Dorcas Gazelles. This and rehabilitation of the Oued Rimé Oued Achim Faunal Reserve are priority actions for conservation of the species.

Sudan:

There are no protected areas within the range of Dorcas Gazelle in Sudan. Survey and protection of remnant populations and habitat in the desert and sub-desert regions of the northwestern section of the country are priority actions for conservation action (I. Hashim, *in litt.,* November 1996). Specifically, planning and development of the proposed Wadi Howar National Park (East, 1996b) would be a major step towards regional restoration and protection of the species.

Senegal:

In 1972; the Senegalese National Park Service introduced 15 Dorcas Gazelles at the Djoudj National Park in the extreme northwest (Dupuy, 1984). This captive herd reportedly still exists, but numbers are not known (B. Clark, *in litt.* September 1996). If Ferlo Faunal Reserve is upgraded to national park status and receives adequate protection, (re)introduction of Dorcas Gazelle into the area could be accomplished in conjunction with planned reintroductions of Scimitar-horned Oryx and Dama Gazelle (B. Clark, *in litt*., September 1996).

Burkina Faso:

The range of Dorcas Gazelle lies entirely within the Sahel Partial Faunal Reserve, where hunting is restricted (IUCN, 1987). The Seno-Mango area in the north of the Sahel zone was proposed for development of a Biosphere Reserve. Establishment and effective management of this proposed protected area is essential for conservation of the Dorcas Gazelle in Burkina Faso (Heringa *et al*. , 1990).

Nigeria:

There are no protected area within the range of Dorcas Gazelle in Nigeria (Anadu and Green, 1990).

Ethiopia:

Dorcas Gazelle occurs (or occurred, Hillman, 1988) in Yangudi Rassa National Park and adjacent Gewane and Mille-Sardo wildlife reserves in the northcentral section of the country, and in Nakfa and Yob wildlife reserves in the northwest; the latter two reserves are in Eritrea.

In the 1980s, priorities for conservation of Dorcas Gazelle and other wildlife were to enhance the capacity of the Ethiopian Wildlife Conservation Agency, through international support, and to develop the existing framework of conservation areas into an effective protected area system (Hillman, 1988). Planning to improve protected area management has begun, but implementation of actions has not (East, 1997b). In the case of Dorcas Gazelle, development of the Mille-Sardo wildlife reserve and Yangudi NP are priorities.

6.3. Attenuation of obstacles for migratory animals.

Only protection within a network of protected areas, especially cross-border protected areas, is plausible.

6.4. Regulations concerning other detrimental factors.

Such regulations can only be taken within a framework of management plans for protected areas. This paragraph consequently merges with paragraph 6.2.

6.5. Other measures.

Morocco:

Captive herds that total >200 animals have been established at the Royal farms of Bouznika and Douyiet and, more recently, R'Mila Royal Reserve and Souss-Massa National Park (Aulagnier *et al*., in press). The latter area is the site of a large-scale captive management programme for Sahelo-Saharan wildlife with the aim of producing stock for reintroductions elsewhere in the country, primarily proposed reserves in southern Morocco (Lower Draa-Aydar) and the Western Sahara (Adrar Souttouf) (H.P. Müller, *in litt*., December 1996).

Sudan:

Dorcas Gazelle is not protected by law and there are no protected areas within its range in Sudan. It is found in captivity in and around Khartoum, where many wildlife farms exist.

Outside Sahelo-Saharan range:

Dorcas Gazelles in semi-captivity are present in various locations, in particular in the United States, in Spain and in Israel.

7. RESEARCH ACTIVITIES

7.1. Public authorities.

7.2. N.G.O.s

8. NEEDS AND RECOMMENDED MEASURES

Recommended measures are included in an associated Action Plan (Beudels *et al.*, 1998).

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Oryx dammah

Range States : Morocco, Tunisia, Algeria, Libya, Egypt, Sudan, Mauritania, Mali, Chad, Niger, Burkina Faso, Senegal.

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence	1. Compile historical data on habitat preference in each part of the current and historical range	CMS –SC	Range States, IUCN ASG
		2. Compile, on the basis of 1.1.1, a catalogue of habitat-favouring management techniques specific to each broad geographical area	CMS- SC	Range States, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the current distribution of suitable habitats or on the feasability of their restoration, locate favourable areas in each Range State. To be considered in particular : central-southern Tunisia (Bou Hedma, Sidi Toui region), Atlantic Morocco (Dakhla, Lower Drâa), Tassili and Hoggar in Algeria, south-eastern Mauritania, the Gourma and the Ansongo-Menaka NP in central Mali, the Seno-Mango in Burkina Faso, the Aïr-Ténéré NNR in Niger, northern Darfur in Sudan.	Tunisia, Morocco, Algeria, Mauritania, Mali, Niger, Sudan ; other Range States (within former distribution) if appropriate	CMS-SC, IUCN ASG
		4. Establish protected areas in these favourable areas to permit recolonisation or reintroduction, and establish corridors between protected areas wherever possible	Tunisia, Morocco, Algeria, Mauritania, Mali, Niger, Sudan ; other Range States (within former distribution) if appropriate	

		5. Develop management plans for each of these protected areas	Tunisia, Algeria, Morocco, Mauritania, Mali, Niger, Sudan ; other Range States (within former distribution) if appropriate	CMS- SC
1. Restore range and numbers	2. Consolidate or reinforce populations	1. Analyse population dynamics and limiting factors of any remnant populations that will be detected. This action depends on the results of 2.2.1.	CMS-SC	Niger, Chad, Sudan?, IUCN ASG
		2. Manage habitat in areas of relict presence to increase recruitment rates and decrease mortality. Subject to same conditions as 1.2.1. above. With present information, first priorities are the Termit massif in Niger, and the Ouadi Rime-Ouadi Achim Reserve in Chad. Management capability is dependent on creation or rehabilitation of protected areas of adequate size	Niger, Chad	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near-site captive management techniques and release techniques. Study the feasability of pursuing Gadabedji regional center for captive breeding and reintroduction of Sahelo-Saharan antilopes project in Niger.	Niger, Chad	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG, Niger, Chad	CMS-SC
		5. Monitor consolidation or reinforcement results closely.	Niger, Chad	

1. Restore range and numbers	3. Reintroduce populations	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns. Areas concerned include central-southern Tunisia (Bou Hedma, Sidi Toui region) and Atlantic Morocco (Dakhla, Lower Drâa) where programs are in progress. Also to be considered, if preliminary investigations under 1.1.3 are positive, and if protection is effective, are: Tassili and Hoggar in Algeria, south-eastern Mauritania, the Gourma and Ansongo-Menaka NP in central Mali, Sahelian Burkina Faso (Seno-Mango), Senegal (Ferlo), the Aïr-Ténéré NR in Niger, northern Darfur in Sudan.	Tunisia and Morocco (ongoing programmes), Algeria, Mauritania, Mali, Burkina Faso, Senegal, Niger, Sudan, if conditions met; other Range States if appropriate	CMS-SC, IUCN ASG
		2. Acquire and perfect near-site captive management techniques as well as effective release techniques. Study the feasability of pursuing Gadabedji regional center for captive breeding and reintroduction of Sahelo-Saharan antilopes project in Niger.	Tunisia and Morocco (ongoing programmes), Niger, other Range States if appropriate	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AZA
		3. Locate appropriate captive stock.	IUCN CBSG, Range States	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Range States	
2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat

		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations	1. Locate and evaluate remnant populations, study their movements. With present information, probably mostly limited to confirmation of presence in the Termit massif in Niger, and in the Ouadi Rime-Ouadi Achim Reserve in Chad. Efforts at locating other nuclei should be continued, notably in other former sites in Niger and Chad, in particular in the Ennedi, Tibesti, Borkou, Kanem and Batha prefectures in Chad, as well as elsewhere in the Sahelian zone and in the periphery of the central-Saharan mountain ranges	Niger, Chad , Algeria, Mauritania, Mali, Burkina Faso, Libya, Sudan	CMS-SC, IUCN ASG
2. Reduce mortality	3. Conserve relict habitats	1. Locate favorable areas of relict important habitats for the conservation of *Oryx dammah,* within or near areas of presence located under 2.2.1. or within or near areas of succesfull reintroduction	Niger, Chad, other Range States as appropriate	CMS-SC, IUCN ASG
		2. Conduct education programmes to combat, through collaboration with local communities, overgrazing by domestic stock.	Niger, Chad, Other Range States	

		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Oryx dammah*.	Range States	
		4. Establish protected areas in newly identified zones of importance for *Oryx dammah,* in particular around the Termit massif in Niger .	Range States	
		5. Establish transboundary protected areas where approriate to cover *Oryx dammah* movements.	Burkina Faso, Mali, Niger, Chad, Algeria, Sudan, Other Range States if appropriate	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Oryx dammah* habitats.	Range States	
2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for *Oryx dammah*. Top priorities are the rehabilitation of the Ouadi Rime-Ouadi Achim Reserve in Chad, the establishment of a protected area in the Termit massif of Niger.	Niger, Chad, other Range States as appropriate	
		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programmes to enlist local community support and collaboration for the enforcement of desert habitat and *Oryx dammah* conservation.	Range States	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

Addax nasomaculatus

Range States : Morocco, Tunisia, Algeria, Libya, Egypt, Sudan, Mauritania, Mali, Chad, Niger.

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence	1. Compile historical data on habitat preference in each part of the present and historical range	CMS –SC	Range States, IUCN ASG
		2. Compile, on the basis of 1.1.1, a catalogue of habitat-favouring management techniques specific to each broad geographical area	CMS- SC	Range States, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favourable areas in each Range State. To be considered in particular: southern Tunisia (Djebil NP), Morocco (Dakhla-Adrar Souttouf), Hoggar NP, Tassili des Ajjers NP, Grand Erg Oriental, Grand Erg Occidental in Algeria, northwestern Sudan (northern Darfur and northern province)	Tunisia, Algeria, Morocco, Sudan	CMS-SC, IUCN ASG
		4. Establish or reinforce protected areas in these favourable areas to permit recolonisation or reintroduction	Tunisia, Algeria, Morocco, Sudan	
		5. Develop management plans for each of these protected areas	Tunisia, Algeria, Morocco, Sudan	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations	1. Analyse population dynamics and limiting factors of remnant populations. This action depends on the results of 2.2.1	CMS-SC	Mauritania, Mali, Niger, Chad, IUCN ASG
		2. Manage habitat in areas of relict presence to increase recruitment rates and decrease mortality. To be considered in particular: eastern Mauritania (Mreyye area in the eastern part of Majabat al Koubra), northern Mali (western border with Mauritania and northeastern border with Algeria in the Adrar des Iforas), southwestern Libya, the western Ténéré desert in the Aïr-Ténéré NNR in Niger, the Ouadi Rime-Ouadi Achim FR,the Tibesti piedmont and the Mourdi depression in Chad.	Mauritania, Mali, Libya, Niger, Chad	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near-site captive management techniques and release techniques. Study the feasability of pursuing the regional center for captive breeding and reintroduction of Sahelo-Saharan antilopes project in Niger.	Mauritania, Mali, Libya, Niger, Chad	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AAZA
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Range States	

1. Restore range and numbers	3. Reintroduce populations	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns. Areas concerned include eastern Tunisia (Djebil NP) and Morocco (Dakhla-Adrar Souttouf) where programmes are in progress. Also to be considered, if preliminary investigations under 1.1.3 are positive, and if protection is effective, are: Hoggar and Tassili des Ajjers in Algeria, Wadi Howar in Sudan.	Tunisia and Morocco (ongoing programmes), Algeria, Libya, Sudan; if conditions met; other Range States if appropriate	CMS-SC, IUCN ASG
		2. Acquire and perfect near-site captive management techniques as well as effective release techniques. Study the feasability of pursuing the regional center for captive breeding and reintroduction of Sahelo-Saharan antilopes project in Niger.	Tunisia and Morocco (ongoing programmes), Algeria, Sudan, Niger, other Range States if appropriate	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	IUCN CBSG, Range States	CMS-SC
		4. Monitor reintroduction results closely.	Range States	

2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them councel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations	1. Locate and evaluate remnant populations, study their movements. With present information, probably mostly limited to systematic surveys to confirm presence in the east and northeast of the Termit region, the Ténéré desert in the Aïr-Ténéré NNR, and in the northwest near the Algerian border in Niger; in the Ouadi Rime-Ouadi Achim Reserve and the Tibesti in Chad; in the Mreyye area in the eastern part of the Majabat al Koubra along the Mali border in eastern Mauritania; in Mali, near the western border with Mauritania, and near the north eastern border with Algeria in the Adrar de Iforas.	Mauritania, Mali, Libya, Niger, Chad	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats	1. Locate favourable areas of relict important habitats for the conservation of *Addax nasomaculatus,* within or near areas of presence located under 2.2.1. or within or near areas of succesfull reintroduction.	Mauritania, Mali, Niger, Chad, , other Range States as appropriate	CMS-SC, IUCN ASG
		2. Conduct education programmes to combat, through collaboration with local communities, overgrazing by domestic stock.	Range States	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Addax nasomaculatus*.	Range States	
		4. Establish protected areas in newly identified zones of importance for *Addax nasomaculatus*.	Range States	
		5. Establish transboundary protected areas where approriate to cover *Addax nasomaculatus* movements.	Mauritania, Mali, Niger, Chad, Sudan, Libya, Algeria, Tunisia	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Addax nasomaculatus* habitats.	Range States	
2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for *Addax nasomaculatus*. Top priorities are the rehabilitation of the Ouadi Rime-Ouadi Achim Reserve in Chad, garanteed protection in Aïr-Ténéré NNR, the establishment of a protected area in the Termit massif of Niger.	Range States	

		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programmes to enlist local community support and collaboration for the enforcement of desert habitat and *Addax nasomaculatus* conservation.	Range States	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

Gazella dama

Range States : Morocco, Tunisia, Algeria, Libya, Sudan, Mauritania, Mali, Chad, Niger, Burkina Faso, Nigeria, Senegal

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurence	1. Compile historical data on habitat preference in each part of the present and historical range	CMS –SC	Range States, IUCN ASG
		2. Compile, on the basis of 1.1.1, a catalogue of habitat-favouring management techniques specific to each broad geographical area	CMS- SC	Range States, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on present distribution or possible restoration of these habitats, locate favourable areas in each Range State. To be considered in particular are Atlantic Sahara (Lower Drâa, Dakhla-Adrar Souttouf), southeastern Algeria (Hoggar, Tassili des Ajjers), the Akle Aouana region in south eastern Mauritania, the Gourma and Ansongo areas and the southeast of Arouane in central Mali, northern Chad, the Sahelian part of Burkina Faso, the Ferlo in northern Senegal, and northwestern Sudan.	Range States	CMS-SC, IUCN ASG
		4. Establish protected areas in these favourable areas to permit recolonisation or reintroduction	Range States	
		5. Develop management plans for each of these protected areas	Range States	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations	1. Analyse population dynamics and limiting factors of any remnant populations. This action depends on the results of 2.2.1.	CMS-SC	Mali, Chad, Niger, IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality. Subject to same conditions as 1.2.1. above. First priorities are the Termit and Aïr regions in Niger, and the Ouadi Rime-Ouadi Achim Faunal Reserve and northern part of the Ennedi in Chad.	Mali, Niger, Chad	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near-site captive management techniques and release techniques. Study the faisability of pursuing Gadabedji regional center for captive breeding and reintroduction of Sahlelo-Sahlaran antilopes project in Niger.	Range States	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AAZA
		4. If reinforcement appropriate, locate compatible captive stock, with particular attention to the most distinct subspecies, *G.d.mohrr.*	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely ; proper training of personnel involved in the monitoring should be insured.	Range States	

1. Restore range and numbers	3. Reintroduce populations	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns. Areas concerned could include Atlantic Morocco (Dakhla, Lower Drâa) where programmes are in progress, as well as the Guembeul Faunal Reserve in Senegal, where a reintroduction programme was initiated. Also to be considered, if preliminary investigations under 1.1.3 are positive, and if protection is effective, are: south-eastern Mauritania, central Mali, Sahelian Burkina Faso, Senegal (Ferlo-Nord).	Range States	CMS-SC, IUCN ASG
		2. Acquire and perfect near-site captive management techniques as well as effective release techniques.	Range States	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	IUCN CBSG	CMS-SC, EAZA and AZA
		4. Monitor reintroduction results closely.	Range States	
2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat

2. Reduce mortality	2. Census populations	1. Locate and evaluate remnant populations, study their movements. In Chad, in and around the Ouadi Rimé-Ouadi Achim FR, in the Aïr-Ténéré NNR and in the Termit region in Niger, in the Gourma area and near the Mauritanian border in central Mali, north and north western Sudan (Northern Darfur, Northern Province).	Mali, Niger, Chad, Sudan	CMS-SC, IUCN ASG
2. Reduce mortality	3. Conserve relict habitats	1. Locate favourable areas of relict important habitats for the conservation of Sahlelo-Sahlaran ungulates.	Range States	CMS-SC, IUCN ASG
		2. Conduct education programmes to combat, through collaboration with local communities, overgrazing by domestic stock.	Range States	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Gazella dama*.	Range States	
		4. Establish protected areas in newly identified zones of importance for *Gazella dama*.	Range States	
		5. Establish transboundary protected areas where approriate to cover *Gazella dama* movements.	Range States	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Gazella dama* habitats.	Range States	

2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for *Gazella dama*.	Range States	
		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programmes to enlist local communitites support and collaboration for the enforcement of desert habitat and *Gazella dama* conservation.	Range States	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff, possibly through a network of relevant institutions.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

Gazella leptoceros

Range States : Tunisia, Algeria, Morocco, Libya, Egypt, Sudan, Chad, Niger, Mali.

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence	1. Compare and complete historical data on habitat preference in each part of the current and historical range of both *G.l.leptoceros* and *G.l.loderi*	CMS –SC	Range States, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques for *G. l. leptoceros*	CMS- SC	Range States, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favourable areas in each Range State, in particular within the historical range of *G.l. leptoceros* and the eastern, fragmented, part of the range of *G. l. loderi*	Egypt, Sudan, Libya, other Range States if appropriate	CMS-SC, IUCN ASG
		4. Establish protected areas in these favourable areas to permit recolonisation or reintroduction . The Siwa oasis could potentially be an important site for *G.l.leptoceros*, whose entire remnant populations are scattered outside any protected area.	Egypt, Sudan, Libya, Other Range States if appropriate	
		5. Develop protected areas management plans for each of these protected areas	Egypt, Sudan, Libya, other Range States if appropriate	CMS- SC

1. Restore range and numbers	2. Consolidate or reinforce populations	1. Analyse population dynamics and limiting factors of remnant populations. This action depends on the results of 2.2.1.	CMS-SC	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan, IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality, essentially through antipoaching measures, and through fencing when and where possible	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	CMS-SC
		3. Where reinforcement appears necessary as a result of 1.2.1., acquire and perfect near-site captive management techniques and release techniques. Applies in particular to *G.l.leptoceros*, and perhaps to some of the eastern and southern populations of *G.l.loderi* (Libya, Niger, Chad, Sudan); latter not evident on present data.	Range States, where need demonstrated	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AAZA
		4. If consolidation decided under 1.2.3. for *G.l.leptoceros,* study the feasibility of captive breeding. If reinforcement decided under 1.2.3. for *G.l.loderi*, locate compatible captive stock.	IUCN CBSG, Range States	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Range States	

2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations	1. Locate and evaluate remnant populations, study their movements. In particular, evaluation of the main western populations in the Algero-Tunisian ergs ; detection, confirmation and evaluation of more scattered southern and eastern populations	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats	1. Locate favorable areas of important habitats for the conservation of *Gazella leptoceros,* in particular vegetated ergs and, for *G.l.leptoceros* acacia groves .	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	CMS-SC, IUCN ASG
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Gazella leptoceros*.	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	
		4. Establish protected areas in zones of importance for *Gazella leptoceros,* in particular in the western desert of northern Egypt, within the range of *G.l.leptoceros*. To be considered also are, within the range of *G.l.loderi,* the Grands Ergs, mostly the Algerian part of the Grand Erg oriental in continuity with Djebil NP in Tunisia;.	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	
		5. Establish transboundary protected areas where approriate to cover *Gazella leptoceros* movements.	Algeria- Tunisia, Egypt-Libya	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Gazella leptoceros* habitats.	Tunisia, Algeria, Egypt, Niger, Chad, Libya, Sudan	

2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for *Gazella leptoceros*.	Range States	
		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programmes to enlist local communitites support and collaboration for the enforcement of desert habitat and *Gazella leptoceros* conservation.	Range States	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

Gazella cuvieri

Range States : Morocco, Tunisia, Algeria.

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurence	1. Compile historical data on habitat preference in each part of the present and historical range	CMS –SC	Range States, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Range States, IUCN ASG
		3. Locate favourable areas	Range States	CMS-SC, IUCN ASG
		4. Establish protected areas in these favourable areas to permit reexpansion of range through natural colonisation from remnant nuclei, in particular in the Tunisian Dorsale, in northwestern Algeria, in northwestern Morocco, in the Agadir region and in the Msseyed (Lower Draâ) area.	Range States	
		5. Develop and update protected areas management plans	Range States	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations	1. Analyse population dynamics and limiting factors of remnant populations	CMS-SC	Range States IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality; fencing of habitats if necessary and possible	Tunisia (ongoing programme), Algeria, Morocco	CMS-SC
		5. Monitor consolidation results closely.	Range States	

2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations	2. Continue populations censusing	Range States	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats	1. Complete identification of favourable areas of important habitats for the conservation of *Gazella cuvieri*.	Range States	CMS-SC, IUCN ASG
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Gazella cuvieri*.	Range States	
		4. Establish protected areas in newly identified zones of importance for *Gazella cuvieri*.	Range States	
		5. Establish transboundary protected areas where approriate to cover *Gazella cuvieri* movements.	Algeria-Tunisia, Algeria-Morocco ?	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Gazella cuvieri* habitats.	Range States	

2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for *Gazella cuvieri*.	Range States	
		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programmes to enlist local communitites support and collaboration for the enforcement of desert habitat and *Gazella cuvieri* conservation.	Range States	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

Gazella dorcas

Range States : Morocco, Tunisia, Algeria, Libya, Egypt, Sudan, Mauritania, Mali, Chad, Niger, Burkina Faso, Nigeria, Senegal, Ethiopia.

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	2. Consolidate populations	2. Manage habitat to increase recruitement rates and decrease mortality essentially through antipoaching measures	Range States	CMS- SC
2. Reduce mortality	1. Increase public awareness	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Range States	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations	3. Estimate populations	Range States	

2. Reduce mortality	3. Conserve habitats	1. Locate favorable areas of important habitats for the conservation of *Gazella dorcas*.	Range States	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Range States	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Gazella dorcas*.	Range States	
		4. Establish protected areas in newly identified zones of importance for desert antelopes, including *Gazella dorcas*.	Range States	
		5. Establish transboundary protected areas where approriate to cover desert antelopes, including *Gazella dorcas,* movements.	Range States	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Gazella dorcas* habitats.	Range States	

2. Reduce mortality	4. Enact and enforce legislative measures	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes, including *Gazella dorcas*.	Range States	
		2. Assess hunting legislations ; improve them where necessary.	Range States	
		3. Develop programs to enlist local communities support and collaboration for the enforcement of desert habitat and *Gazella dorcas* conservation.	Range States	
²3. Enhance international cooperation	1. Improve exchange of information and technical expertise	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Range States	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Range States	CMS Secretariat, CMS-SC

ACTION PLAN / RANGE STATES

Morocco

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella cuvieri, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurence Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Morocco, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Morocco, IUCN ASG
		3. Complete inventory of favourable areas for recolonisation of the northwestern plateaux by *Gazella cuvieri;* of sites of potential habitat rehabilitation for reimplantation of *Oryx dammah* and *Addax nasomaculatus.* To be considered in particular are the Lower Dräa-Aydar, and Dakhla-Adrar Souttouf		CMS-SC, IUCN ASG
		4. Establish protected areas in priority in the Msseyed (lower Draâ) area for *Gazella cuvieri, Gazella dorcas* and possible reintroduction of *Gazella dama* and *Oryx dammah*; the Aït Oumribet area, Jbel Krouz (Grouz), Tafinegoult and Bou Nacer for *Gazella cuvieri* (and *Gazella dorcas*). Establish corridors between protected areas wherever possible	Morocco	
		5. Develop management plans for each of these protected areas (management plans exist already for Dakhla and for High Atlas oriental NP)	Morocco	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella dama Gazella cuvieri	1. Analyse population dynamics and limiting factors of remaining populations of *Gazella cuvieri* and *Gazella dama mohrr* (if persistence confirmed)	CMS-SC	Range States IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality	Morocco	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near-site captive management techniques and release techniques for *Gazella dama mohrr*.	Morocco	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Morocco	
1. Restore range and numbers	3. Reintroduce populations Oryx dammah Addax nasomaculatus Gazella dama	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns for reimplantation of *Oryx dammah* and *Addax nasomaculatus*. The region of the Lower Drâa-Aydar area and vicinity, and the Dakhla-Adrar Souttouf area may be appropriate choices for the Oryx.	Morocco	CMS-SC, IUCN ASG
		2. Continue the current captive breeding project. Perfect effective release techniques.	Morocco	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock, particularly for *Gazella dama mohrr* .	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Morocco	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella dorcas	1. Persue education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Morocco	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella dama Gazella cuvieri Gazella dorcas	1. Locate and evaluate remaining populations, and study their movements, particularly in theJbel Krouz, Lower Drâa-Aydar area and vicinity, and in the Dakhla-Adrar Souttouf area , for *Gazella dama mohrr* and *Gazella cuvieri*.	Morocco	CMS-SC, IUCN ASG
		2.Census populations in the Agadir region, the three Atlas ranges and the Lower Drâa-Aydar area northeast of Smara for *Gazella cuvieri*	Morocco	CMS-SC, IUCN ASG
		3. Estimate populations of *Gazella dorcas*	Morocco	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of antelopes and gazelles, such as the Jbel Krouz, Lower Drâa-Aydar area and the Dakhla-Adrar Souttouf area.	Morocco	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Morocco	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Morocco	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Morocco	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements.	Morocco, Algeria, Mauritania.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Morocco	

2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Morocco	
		2. Assess hunting legislation; improve them where necessary.	Morocco	
		3. Develop programs to enlist local communities support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Morocco	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Morocco	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Morocco	CMS Secretariat, CMS-SC

Algeria

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella cuvieri, Gazella leptoceros, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas od former occurence Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros	1. Complete data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Algeria, IUCN ASG
		2. Complete catalogue of habitat favouring management techniques	CMS- SC	Algeria, IUCN ASG
		3. Complete inventory of favourable areas for recolonisation of *Gazella cuvieri* and for possible reintroduction of *Addax nasomaculatus* and *Oryx dammah*	Algeria	CMS-SC, IUCN ASG
		4. Establish protected areas in areas identified in 1.1.3	Algeria	
		5. Develop management plans for protected areas identified under 1.1.3 and for which such plans do not exist	Algeria	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella dama Gazella cuvieri Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations of *Gazella cuvieri* and *Gazella leptoceros*	CMS-SC	Algeria IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality, particularly in protected areas such as Saharan Atlas NP, Belezma NP, Mergueb NR for *Gazella cuvieri ;* the Hoggar NP for *Gazella dama*	Algeria	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques.	Algeria	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Algeria	

1. Restore range and numbers	3. Reintroduce populations Oryx dammah Addax nasomaculatus	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns, for reimplantation of *Oryx dammah* and *Addax nasomaculatus*. Sites of possible intervention, in view of their uniquely large size are the Tassili NP and Hoggar NP, possibly with habitat rehabilitation measures	Algeria	CMS-SC, IUCN ASG
		2. Acquire and perfect near site captive management techniques as well as effective release techniques.	Algeria	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AAZA
		3. Locate appropriate captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Algeria	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Algeria	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant populations, study their movements of *Gazella dama* in the Hoggar NP	Algeria	CMS-SC, IUCN ASG
		2.Census populations of *Gazella cuvieri* and *Gazella leptoceros*	Algeria	CMS-SC, IUCN ASG
		3. Estimate populations of Gazella dorcas	Algeria	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of Sahelo-Saharan ungulates.	Algeria	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Algeria	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Algeria	
		4. Establish protected areas in newly identified zones of importance for desert antelopes ; of particular impoertance for *Gazella leptoceros* would be the establishment of a PA in the Grand Erg Oriental close to the Djebil NP in Tunisia.	Algeria	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements.	Algeria, Morocco, Tunisia, Lybia, Niger, Mali, Mauritania.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Algeria	

2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Algeria	
		2. Assess hunting legislation ; improve them where necessary.	Algeria	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Algeria	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Algeria	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella cuvieri Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Algeria	CMS Secretariat, CMS-SC

Tunisia

Oryx dammah, Addax nasomaculatus, Gazella cuvieri, Gazella leptoceros, Gazella dorcas

* Gazella dama, : the species was introduced in Tunisia, within Bou Hedma NP in 1993

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella cuvieri	1. Complete data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Tunisia, IUCN ASG
		2. Complete catalogue of habitat favouring management techniques	CMS- SC	Tunisia, IUCN ASG
		3. Complete inventory of favourable areas for recolonisation of the Dorsale or sub-saharan ranges by *Gazella cuvieri;* of possible areas for *Addax* reintroduction ; of sites of potential habitat rehabilitation, along the lines of successful Bou Hedma project, for reimplantation of *Oryx dammah* in additional sites	Tunisia	CMS-SC, IUCN ASG
		4. Establish protected areas in areas identified under 1.1.3.	Tunisia	
		5. Develop protected areas management plans for areas identified under 1.1.3. and for which such plans are not already in existence	Tunisia	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella cuvieri Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations of *Gazella cuvieri* and *Gazella leptoceros*	CMS-SC	Tunisia, IUCN ASG
		2. Manage habitat to increase recruitment rates, decrease natural mortality of *Gazella cuvieri* and *Gazella leptoceros,* fencing habitas where and when appropriate	Tunisia	CMS-SC
		5. Monitor consolidation results.	Tunisia	
1. Restore range and numbers	3. Reintroduce populations Oryx dammah Addax nasomaculatus	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns, along the lines of successful Bou Hedma project, for reimplantation of *Oryx dammah* and *Addax nasomaculatus*. The region of Sidi Toui NP and the regions adjacent to the Grand Erg Oriental between Djebil-Zemlet el Borma and the Erg Djeneien may be appropriate choices for the Oryx, if Acacia raddiana and its cortege is restored ; the area of Djebil NP seems an appropriate choice for the reintroduction of the Addax.	Tunisia	CMS-SC, IUCN ASG
		3. Continue the highly successful Bou Hedma Oryx reintroduction project, in particular continue efforts to extent the vegetation regeneration area within the Park.	Tunisia	CMS-SC
		4. Continue monitoring of reintroduction results.	Tunisia	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Persue education programmes for local communities to increase consciousness and appreciation of heritage	Tunisia	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants or other visitors, as an assistance to the Tunisian Authorities in their efforts to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant populations of *Gazella leptoceros*, study their movements	Tunisia	CMS-SC, IUCN ASG
		2.Continue censusing populations of *Gazella cuvieri*	Tunisia	CMS-SC, IUCN ASG
		3. Estimate populations *Gazella dorcas*	Tunisia	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Continue inventory of favourable areas of relict important habitats for the conservation of surviving gazelles and of reintroduced antelopes.	Tunisia	CMS-SC, IUCN ASG
		2. Persue education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Tunisia	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Tunisia	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Tunisia	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements, in particular in the region of Djebel Chambi on the border with Algeria for *Gazella cuvieri*, and around Djebil NP in the Grand Erg Oriental for *Gazella leptoceros* and *Addax nasomaculatus*..	Tunisia, Algeria, Lybia.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas created under 2.3.4 or 2.3.5.	Tunisia	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Consolidate, where necessary and effective, through legal measures, the protection of areas of importance for desert antelopes.	Tunisia	
		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Tunisia	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella cuvieri Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Tunisia	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella cuvieri Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Tunisia	CMS Secretariat, CMS-SC

Libya

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros, Gazella dorcas

Ojective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile historical data on habitat preference	CMS –SC	Libya, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Libya, IUCN ASG
		3. Complete inventory of favourable areas	Libya	CMS-SC, IUCN ASG
		4. Persue establishment of protected areas, in particular in the Hamada el Homra	Libya	
		5. Develop management plans for these protected areas	Libya	CMS- SC
1. Restore range and numbers	2. Consolidate or reinforce populations Addax nasomaculatus Gazella dama Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations of *Gazella leptoceros*	CMS-SC	Libya IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality	Libya	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques.	Libya	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Libya	

2. Reduce mortality	1. Increase public awareness Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Libya	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them councel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant populations of *Addax nasomaculatus*, *Gazella leptoceros, Gazella dama*	Libya	CMS-SC, IUCN ASG
		3. Estimate populations Gazella dorcas	Libya	

2. Reduce mortality	3. Conserve relict habitats Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of antelopes and gazelles.	Libya	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Libya	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Libya	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Libya	
		5. Investigate the possibility of establishing transboundary protected areas where approriate to cover desert antelope movements, possibly in the vicinity of the Egyptian Siwa oasis, of the Tibesti mountains, the Jebel Uweinat .	Libya-Egypt, Chad, Sudan, Algeria, Tunisia, Niger.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Libya	

2. Reduce mortality	4. Enact and enforce legislative measures Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Libya	
		2. Assess hunting legislation ; improve them where necessary.	Libya	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Libya	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Libya	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Libya	CMS Secretariat, CMS-SC

Egypt

Oryx dammah, Addax nasomaculatus, Gazella leptoceros, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurence Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat in and around the oases of the Western Desert, and in the Mediterranean coastal desert, in particular within historical range of *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas*	CMS –SC	Egypt, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Egypt, IUCN ASG
		3. Locate favourable areas for gazelle or antelope habitat rehabilitation	Egypt	CMS-SC, IUCN ASG
		4. Establish protected areas, in particular in the historical Western Desert range of *Gazella leptoceros leptoceros* and Western Desert and Mediterranean coastal desert range of *Gazella dorcas dorcas*. The Siwa oasis appears an optimal candidate among the Western desert oasis.	Egypt	
		5. Develop protected areas management plans	Egypt	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella leptoceros Gazella dorcas	1. Analyse population dynamics and limiting factors of remnant populations of *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas*	CMS-SC	Egypt IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease natural mortality	Egypt	CMS-SC
		3. If reinforcement appropriate for *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas*, acquire and perfect near-site captive management techniques and release techniques.	Egypt	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas* captive stock or investigate, with uttermost prudence and thoroughness, possibility of multiplication of remnant stock through captive breeding, followed by in- site release.	IUCN CBSG, Egypt	CMS-SC
		5. Monitor consolidation or reinforcement results closely.	Egypt	

1. Restore range and numbers	3. Reintroduce populations Oryx dammah Addax nasomaculatus Gazella leptoceros	1. If evaluation of historical evolution, present state and present anthropic pressure in and around Western Desert oases indicates potentialities, select reintroduction sites for one or more species, prepare management plan, initiate management measures, conduct awareness campaigns. Priority should be given to *Gazella leptoceros leptoceros*, because of world uniqueness of population.	Egypt	CMS-SC, IUCN ASG
		2. Acquire and perfect near-site captive management techniques as well as effective release techniques.	Egypt	CMS-SC, IUCN ASG, IUCN CBSG, EAZA and AAZA
		3. Locate appropriate captive stock, in particular *Gazella leptoceros leptoceros* stock, or, for this form, investigate, with uttermost prudence and thouroughness, possibility of multiplication of remnant stock through captive breeding, followed by translocation to new sites.	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Egypt	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Egypt	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities.	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant populations of *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas*, in and around Western Desert oases and in the Mediterranean coastal desert	Egypt	CMS-SC, IUCN ASG
		3. Verify presence and estimate populations of *Gazella leptoceros,* presumably *Gazella leptoceros loderi* around Jebel Uweinat and of *Gazella dorcas* outside historical range of *Gazella dorcas dorcas*	Egypt	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of gazelles or antelopes.	Egypt	CMS-SC, IUCN ASG
		3. Secure protection, through cooperation with local communities, for inadequately protected areas of importance for desert antelopes.	Egypt	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Egypt	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements, in particular for *Gazella leptoceros leptoceros* and *Gazella dorcas dorcas* in Libyo-Egyptian groups of oases in the northern Western Desert and in the Mediterranean coastal desert; secondarily, for other gazelles, in the Jebel Uweinat area, and possibly in the Egypto-Sudanese Eastern Desert.	Egypt, Libya, Sudan	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas.	Egypt	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Egypt	
		2. Assess hunting legislations ; improve them where necessary.	Egypt	
		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Egypt	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Egypt	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Egypt	CMS Secretariat, CMS-SC

Sudan

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile historical data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Sudan, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Sudan, IUCN ASG
		3. Locate favourable areas, essentially in the Northern Darfur Province, in particular around Wadi Howar	Sudan	CMS-SC, IUCN ASG
		4. If appropriate and feasible, establish protected areas, in particular in the proposed Wadi Howar area.	Sudan	
		5. Develop management plans for these areas	Sudan	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations	CMS-SC	Sudan IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality	Sudan	CMS-SC
		5. Monitor consolidation results.	Sudan	
2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Sudan	CMS- SC

2. Reduce mortality	2. Census populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant antelope populations, in Northern Darfur Province and the western part of the Northern Province, and if possible study their movements.	Sudan	CMS-SC, IUCN ASG
2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate favourable areas of important habitats for the conservation of Sahelo-Saharan ungulates.	Sudan	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Sudan	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Sudan	
		4. If appropriate and feasible, establish protected areas in newly identified zones of importance for desert antelopes	Sudan	
		5. If appropriate and feasible, establish transboundary protected areas where appropriate to cover desert antelopes movements.	Sudan, Egypt, Lybia, Chad.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Sudan	

2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Sudan	
		2. Assess hunting legislation ; improve them where necessary.	Sudan	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Sudan	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Sudan	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Sudan	CMS Secretariat, CMS-SC

Chad

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile historical data on habitat preference in present and historical range	CMS –SC	Chad, IUCN ASG
		2. Complete, on the basis of 1.1.1., catalogue of habitat favouring management techniques	CMS- SC	Chad, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasibility of their restoration, complete location of favourable areas in particular in Kanem, Batha, Borkou, Ennedi and Tibesti prefectures.	Chad	CMS-SC, IUCN ASG
		4. Establish protected areas in the Tibesti area for *Gazella leptoceros*; the rehabilitation of the existing Ouadi Rimé-Ouadi Achim Reserve is of the utmost importance for the persistence of *Oryx dammah, Addax nasomaculatus,* and *Gazella dama* populations in the wild.	Chad	
		5. Develop management plans for these protected areas	Chad	CMS- SC

1. Restore range and numbers	2. Consolidate or Reinforce populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations	CMS-SC	Chad IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality : the rehabilitation of the Ouadi Rimé-Ouadi Achim FR is of the utmost importance for the persistence of *Oryx dammah, Addax nasomaculatus,* and *Gazella dama* populations in the wild ; the Reserve should be specifically managed for the consolidation or the reinforcement of viable populations of those species	Chad	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques, taking into account recommendations of 1989 Aridland Antelope Workshop (CBSG).	Chad	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Chad	
1. Restore range and numbers	3. Reintroduce populations Oryx dammah (if no remnant nucleus can be found)	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns. Ouadi Rimé-Ouadi Achim NNR, if rehabilitated, is an obvious reintroduction site for *Oryx dammah.*	Chad	CMS-SC, IUCN ASG
		2. Acquire and perfect near site captive management techniques as well as effective release techniques.	Chad	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Chad	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Chad	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant antelope populations in particular in the Tibesti massif, the Ennedi, Djourab, Mourdi areas, and study their movements, for *Addax nasomaculatus, Gazella dama, Gazella leptoceros* and possibly for *Oryx dammah*	Chad	CMS-SC, IUCN ASG
		3. Estimate populations *Gazella dorcas*	Chad	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of gazelles and antelopes.	Chad	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Chad	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Chad	
		4. Establish protected areas in zones of importance for desert antelopes and gazelles.	Chad	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements.	Chad, Niger, Lybia, Sudan	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas.	Chad	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Chad	
		2. Assess hunting legislation; improve them where necessary.	Chad	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Chad	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Chad	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Chad	CMS Secretariat, CMS-SC

Niger

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella leptoceros, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Niger, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Niger, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favorable areas for those species. Of particular importance is the Termit region	Niger	CMS-SC, IUCN ASG
		4. Establish protected areas : in particular a protected area in the Termit region would be of the utmost importance for the persistence of populations of *Oryx dammah, Addax nasomaculatus* and *Gazella dama* in the wild.	Niger	
		5. Develop protected areas management plans for these areas	Niger	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Analyse population dynamics and limiting factors of remnant populations	CMS-SC	Niger IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease natural mortality	Niger	CMS-SC

1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Niger, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Niger, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favorable areas for those species. Of particular importance is the Termit region	Niger	CMS-SC, IUCN ASG
		4. Establish protected areas : in particular a protected area in the Termit region would be of the utmost importance for the persistence of populations of *Oryx dammah, Addax nasomaculatus* and *Gazella dama* in the wild.	Niger	
		5. Develop protected areas management plans for these areas	Niger	CMS- SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques. Study the feasability of pursuing Gadabedji regional center for captive breeding and reintroduction of sahelo-saharan antilopes project	Niger	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock or investigate, with prudence, possibility of multiplication of remnant stock through captive breeding, followed by in-site release.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Niger	

1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Niger, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Niger, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favorable areas for those species. Of particular importance is the Termit region	Niger	CMS-SC, IUCN ASG
		4. Establish protected areas : in particular a protected area in the Termit region would be of the utmost importance for the persistence of populations of *Oryx dammah, Addax nasomaculatus* and *Gazella dama* in the wild.	Niger	
		5. Develop protected areas management plans for these areas	Niger	CMS- SC
1. Restore range and numbers	3. Reintroduce populations Oryx dammah Gazella dama	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns, in particular in the Aïr-Tenere NNR for the rehabilitation of *Oryx dammah*.	Niger	CMS-SC, IUCN ASG
		2. Acquire and perfect near site captive management techniques as well as effective release techniques. Study the feasability of pursuing Gadabedji regional center for captive breeding and reintroduction of sahelo-saharan antilopes project	Niger	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock or investigate, with prudence, possibility of multiplication of remnant stock through captive breeding, followed by translocation in other sites.	IUCN CBSG	CMS-SC, EAZA and AAZA

1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Niger, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Niger, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favorable areas for those species. Of particular importance is the Termit region	Niger	CMS-SC, IUCN ASG
		4. Establish protected areas : in particular a protected area in the Termit region would be of the utmost importance for the persistence of populations of *Oryx dammah, Addax nasomaculatus* and *Gazella dama* in the wild.	Niger	
		5. Develop protected areas management plans for these areas	Niger	CMS- SC
		4. Monitor reintroduction results closely.	Niger	
2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Niger	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them councel cooperants and other visitors to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat

1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurrence Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Niger, IUCN ASG
		2. Compile, on the basis of 1.1.1., a catalogue of habitat favouring management techniques	CMS- SC	Niger, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasability of their restoration, locate favorable areas for those species. Of particular importance is the Termit region	Niger	CMS-SC, IUCN ASG
		4. Establish protected areas : in particular a protected area in the Termit region would be of the utmost importance for the persistence of populations of *Oryx dammah, Addax nasomaculatus* and *Gazella dama* in the wild.	Niger	
		5. Develop protected areas management plans for these areas	Niger	CMS- SC
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate and evaluate remnant antelope populations, in particular in the Aïr-Tenere NR and the Termit area, study their movements Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros	Niger	CMS-SC, IUCN ASG
		3. Estimate populations Gazella dorcas	Niger	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Locate favorable areas of relict important habitats for the conservation of sahelo-saharan ungulates.	Niger	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Niger	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Niger	
		4. Establish protected areas in newly identified zones of importance for desert antelopes. Of particular importance would be a protected area established around the Termit massif .	Niger	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements, in particular …..	Niger, Chad, Lybia, Mali, Algeria, Nigeria, Burkina Faso	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Niger	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Niger	
		2. Assess hunting legislations ; improve them where necessary.	Niger	

		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Niger	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Niger	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella leptoceros Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Niger	CMS Secretariat, CMS-SC

Mali

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats in areas of former occurence Oryx dammah Addax nasomaculatus Gazella dama	1. Compile data on detailed characteristics and evolution of present or former gazelle and antelope habitat	CMS –SC	Mali, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Mali, IUCN ASG
		3. On the basis of 1.1.1, supplemented by data on the present distribution of suitable habitats or on the feasibility of their restoration, complete location of favourable areas in particular in the area of the Gourma and the Ansongo-Menaka NP in central Mali for *Oryx dammah*, the Malian Majabat Al Koubra and the Adrar des Iforas for *Addax nasomaculatus*, in western central Mali (close to the Akle Aouna in Mauritania) for *Gazella dama* and the Gourma region		CMS-SC, IUCN ASG
		4. Establish protected areas in areas identified under 1.1.3.	Mali	
		5. Develop management plans for protected areas identified under 1.1.3	Mali	CMS- SC

1. Restore range and numbers	2. Consolidate or reinforce populations Addax nasomaculatus Gazella dama	1. Analyse population dynamics and limiting factors of remnant populations of *Addax nasomaculatus*	CMS-SC	Mali IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality. Of particular importance would be the rehabilitation of the Elephant Reserve for *Gazella dama*	Mali	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques.	Mali	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Mali	
1. Restore range and numbers	3. Reintroduce populations Oryx dammah Addax nasomaculatus Gazella dama	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns.	Mali	CMS-SC, IUCN ASG
		2. Acquire and perfect near site captive management techniques as well as effective release techniques.	Mali	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Mali	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Mali	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Locate and evaluate remnant populations, in particular the remnant *Addax nasomaculatus* populations of the Majabat Al Koubra and of the Adrar des Iforas, and if possible study their movements. Locate and evaluate population of *Gazella dama*	Mali	CMS-SC, IUCN ASG
		3. Estimate populations of *Gazella dorcas*	Mali	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Locate favourable areas of important habitats for the conservation of gazelles and antelopes.	Mali	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Mali	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Mali	
		4. Establish protected areas in zones of importance for desert antelopes, in particular in the Malian Majabat Al Koubra, in the Adrar des Iforas, and in the Gourma area.	Mali	
		5. Establish transboundary protected areas where appropriate to cover desert antelopes movements. Such a PA extending over the Majabat al Koubra in Mali and Mauritania would be invaluable for the persistence of the Addax.	Mali, Mauritania, Algeria, Niger, Senegal, Burkina Faso.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Mali	

2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Mali	
		2. Assess hunting legislation ; improve them where necessary.	Mali	
		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Mali	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Mali	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Mali	CMS Secretariat, CMS-SC

Mauritania

Oryx dammah, Addax nasomaculatus, Gazella dama, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Oryx dammah Addax nasomaculatus Gazella dama	1. Compile historical data on habitat preference	CMS –SC	Mauritania, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Mauritania, IUCN ASG
		3. Locate favourable areas, in particular in the Mreyye area in the eastern part of the Majabat al Koubra for *Addax nasomaculatus*, and in the Oualata Nema area for *Oryx dammah*, and in the vicinity of the Guelb el Richat area.	Mauritania	CMS-SC, IUCN ASG
		4. Establish protected areas in areas identified under 1.1.3	Mauritania	
		5. Develop management plans for protected areas identified under 1.1.3	Mauritania	CMS- SC
1. Restore range and numbers	2. Consolidate populations Addax nasomaculatus Gazella dama	1. Analyse population dynamics and limiting factors of remnant populations of *Addax nasomaculatus*	CMS-SC	Mauritania IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease mortality. Establish antipoaching units with the necessary facilities to implement the legislation. Of particular importance is the Majabat al Koubra, which may represent one of the three ultimate important areas for *Addax nasomaculatus*	Mauritania	CMS-SC
		5. Monitor consolidation results closely.	Mauritania	

2. Reduce mortality	1. Increase public awareness Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Mauritania	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Addax nasomaculatus Gazella dama Gazella dorcas	1. Locate and evaluate remnant populations, in particular the remnant *Addax nasomaculatus* population of the Majabat Al Koubra, study their movements	Mauritania	CMS-SC, IUCN ASG
		3. Estimate populations of *Gazella dorcas*	Mauritania	

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Locate favourable areas of relict important habitats for the conservation of antelopes and gazelles.	Mauritania	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Mauritania	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Mauritania	
		4. Establish protected areas in zones of importance for desert antelopes, in particular in the Mreyye area in the eastern part of the Majabat al Koubra, for the Addax.	Mauritania	
		5. Establish transboundary protected areas where approriate to cover desert antelope movements. Such a PA extending over the Majabat al Koubra in Mauritania and its extension in Mali would be invaluable for the persistence of the Addax	Mauritania, Mali, Senegal, Algeria, Morocco.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas . Monitor all potential threats to desert antelopes habitats.	Mauritania	

2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Mauritania	
		2. Assess hunting legislation; improve them where necessary.	Mauritania	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Mauritania	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Mauritania	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Addax nasomaculatus Gazella dama Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Mauritania	CMS Secretariat, CMS-SC

Senegal

Oryx dammah, Gazella dama, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Oryx dammah Gazella dama	1. Complete historical data on detailed characteristics and evolution of present or former *Oryx dammah* and *Gazella dama* habitat	CMS –SC	Senegal, IUCN ASG
		2. Complete catalogue of habitat favouring management techniques	CMS- SC	Senegal, IUCN ASG
		3. Complete location of favourable areas in particular in the Fete-Ole region and adjacent areas in northern Senegal	Senegal	CMS-SC, IUCN ASG
		4. Establish protected areas in these favourable areas	Senegal	
		5. Develop protected areas management plans for these areas	Senegal	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella dama	1. Complete analysis of population dynamics and limiting factors of reintroduced population within Gueumbeul Faunal Reserve	CMS-SC	Senegal, IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease natural mortality within Gueumbeul Faunal Reserve	Senegal	CMS-SC
		5. Monitor consolidation results.	Senegal	

1. Restore range and numbers	3. Reintroduce populations Oryx dammah Gazella dama	1. Prepare management plans for selected reintroduction sites, initiate management measures, conduct awareness campaigns, in particular for the Ferlo Nature Reserve for *Oryx dammah*, and the sandy plains adjacent to the Ferlo River in central Ferlo for *Gazella dama*.	Senegal	CMS-SC, IUCN ASG
		2. Perfect near site captive management techniques as well as effective release techniques; evaluate the feasability to use the Guembeul Reserve as a captive breeding center.	Senegal	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	Senegal, IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Senegal	
2. Reduce mortality	1. Increase public awareness Oryx dammah Gazella dama Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Senegal	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat

2. Reduce mortality	2. Census populations Gazella dorcas	1. Locate and evaluate remnant populations of *Gazella dorcas*, reintroduced in Djoudj National Park	Senegal	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Gazella dama Gazella dorcas	1. Locate favorable areas of relict important habitats for the conservation of the Oryx and the gazelles in northern Senegal.	Senegal	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Senegal	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Senegal	
		4. Establish protected areas and reinforce protection of existing PA in zones of importance for the Oryx and for the gazelles, in particular the Fete Ole region and the central Ferlo.	Senegal	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements.	Senegal- Mauritania.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for these protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Senegal	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Gazella dama Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Senegal	
		2. Assess hunting legislations; improve them where necessary.	Senegal	

		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Senegal	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Gazella dama Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Senegal	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Gazella dama Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Senegal	CMS Secretariat, CMS-SC

Burkina Faso

Oryx dammah, Gazella dama, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Oryx dammah Gazella dama Gazella dorcas	1. Compile historical data on detailed characteristics and evolution of present or former gazelle and antelope habitat in the Sahelian zone	CMS –SC	Burkina Faso, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Burkina Faso, IUCN ASG
		3. Persue surveys in the Sahelian region to locate favorable areas	Burkina Faso	CMS-SC, IUCN ASG
		4. Establish protected areas in the Sahelian zone, in particular in the Seno Mango area	Burkina Faso	
		5. Develop protected area management plans for these newly established PA.	Burkina Faso	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella dama Gazella dorcas	1. Analyse population dynamics and limiting factors of remnant populations of gazelles	CMS-SC	Burkina Faso IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease natural mortality of gazelles, fencing habitats when and where necessary		CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques.	Burkina Faso	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Burkina Faso	

1. Restore range and numbers	3. Reintroduce populations Oryx dammah	1. Select reintroduction sites, prepare management plan, initiate management measures, conduct awareness campaigns, in particular in the Seno Mango area.	Burkina Faso	CMS-SC, IUCN ASG
		2. Acquire and perfect near site captive management techniques as well as effective release techniques.	Burkina Faso	CMS-SC, IUCN ASG, IUCN CBSG
		3. Locate appropriate captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		4. Monitor reintroduction results closely.	Burkina Faso	
2. Reduce mortality	1. Increase public awareness Oryx dammah Gazella dama Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Burkina Faso	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	All Parties to CMS	CMS Secretariat
		3. Provide information to diplomatic services to help them counsel cooperants to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella dama Gazella dorcas	1. Locate and evaluate remnant populations essentially in the Seno Mango area, study their movements Gazella dama Gazella dorcas	Burkina Faso	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats Oryx dammah Gazella dama Gazella dorcas	1. Locate favorable areas of relict important habitats for the conservation of gazelles and antelopes in the Sahelian zone.	Burkina Faso	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Burkina Faso	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Burkina Faso	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Burkina Faso	
		5. Establish transboundary protected areas where approriate to cover desert antelope movements (Seno-Mango and Laga Koundiri area).	Burkina- Faso, Mali, Niger.	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Burkina Faso	
2. Reduce mortality	4. Enact and enforce legislative measures Oryx dammah Gazella dama Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Burkina Faso	
		2. Assess hunting legislation ; improve them where necessary.	Burkina Faso	
		3. Develop programs to enlist local community support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Burkina Faso	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Oryx dammah Gazella dama Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Burkina Faso	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Oryx dammah Gazella dama Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Burkina Faso	CMS Secretariat, CMS-SC

Nigeria

Oryx dammah, Gazella dama, Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	1. Conserve or restore potential habitats Oryx dammah Gazella dama Gazella dorcas	1. Compile historical data on habitat preference	CMS –SC	Nigeria, IUCN ASG
		2. Compile catalogue of habitat favouring management techniques	CMS- SC	Nigeria, IUCN ASG
		3. Locate favorable areas in the sahelian zone, such as Chinguruma-Duguma proposed PA	Nigeria	CMS-SC, IUCN ASG
		4. Establish protected areas in the sahelian zone	Nigeria	
		5. Develop protected areas management plans	Nigeria	CMS- SC
1. Restore range and numbers	2. Consolidate or Reinforce populations Gazella dama Gazella dorcas	1. Analyse population dynamics and limiting factors of remnant populations	CMS-SC	Nigeria IUCN ASG
		2. Manage habitat to increase recruitment rates and decrease natural mortality	Nigeria	CMS-SC
		3. If reinforcement appropriate, acquire and perfect near site captive management techniques and release techniques.	Nigeria	CMS-SC, IUCN ASG, IUCN CBSG
		4. If reinforcement appropriate, locate compatible captive stock.	IUCN CBSG	CMS-SC, EAZA and AAZA
		5. Monitor consolidation or reinforcement results closely.	Nigeria	

2. Reduce mortality	1. Increase public awareness Oryx dammah Gazella dama Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Nigeria	CMS- SC
		3. Provide information to diplomatic services to help them counsel cooperants and other visitors to curb poaching and other disturbances	All Parties to CMS	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	All Parties to CMS	CMS Secretariat
2. Reduce mortality	2. Census populations Gazella dama Gazella dorcas	1. Locate and evaluate remnant populations, study their movements Gazella dama Gazella dorcas	Nigeria	CMS-SC, IUCN ASG

2. Reduce mortality	3. Conserve relict habitats Gazella dama Gazella dorcas	1. Locate favorable areas of relict important habitats for the conservation of the gazelles.	Nigeria	CMS-SC, IUCN ASG
		2. Conduct education programs to combat, through collaboration with local communities, overgrazing by domestic stock.	Nigeria	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for desert antelopes.	Nigeria	
		4. Establish protected areas in newly identified zones of importance for desert antelopes.	Nigeria	
		5. Establish transboundary protected areas where approriate to cover desert antelopes movements.	Nigeria, Chad, Niger	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to desert antelopes habitats.	Nigeria	
2. Reduce mortality	4. Enact and enforce legislative measures Gazella dama Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for desert antelopes.	Nigeria	
		2. Assess hunting legislations ; improve them where necessary.	Nigeria	
		3. Develop programs to enlist local communitites support and collaboration for the enforcement of desert habitat and desert antelope conservation.	Nigeria	

3. Enhance international cooperation	1. Improve exchange of information and technical expertise Gazella dama Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Nigeria	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Gazella dama Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programs, for submission to appropriate agencies.	Nigeria	CMS Secretariat, CMS-SC

Ethiopia

Gazella dorcas

Objective	Programme	Activity	Responsible	Collaborators
1. Restore range and numbers	2. Consolidate populations	2. Manage habitat to increase recruitment rates and decrease mortality	Ethiopia	CMS-SC
2. Reduce mortality	1. Increase public awareness Gazella dorcas	1. Conduct education programmes for local communities to increase consciousness and appreciation of heritage, and integrate those communities into conservation projects from the start	Ethiopia	CMS- SC
		2. Provide documentation destined for tour operators to limit irresponsible hunting, killing or harassment	Ethiopia	CMS Secretariat
		3. Provide information to diplomatic services to help them councel cooperants to curb poaching and other disturbances	Ethiopia	CMS Secretariat
		4. Locate companies that employ cooperants susceptible of presenting a considerable threat and enlist their assistance in curbing detrimental activities ;	Ethiopia	CMS Secretariat
2. Reduce mortality	2. Census populations	3. Estimate populations Gazella dorcas	Ethiopia	

2. Reduce mortality	3. Conserve relict habitats Gazella dorcas	1. Locate favorable areas of relict important habitats for the conservation of *Gazella dorcas*.	Ethiopia	CMS-SC, IUCN ASG
		2. Conduct education programmes to combat, through collaboration with local communities, overgrazing by domestic stock.	Ethiopia	
		3. Secure protection, through collaboration with local communities, for inadequately protected areas of importance for *Gazella dorcas*.	Ethiopia	
		4. Establish protected areas in newly identified zones of importance for *Gazella dorcas*.	Ethiopia	
		5. Establish transboundary protected areas where approriate to cover *Gazella dorcas* movements.	Ethiopia,	CMS Secretariat, CMS-SC, IUCN ASG
		6. Develop management plans for protected areas. Determine and monitor all potential threats to *Gazella dorcas* habitats.	Ethiopia	

2. Reduce mortality	4. Enact and enforce legislative measures Gazella dorcas	1. Consolidate, through legal measures, the protection of areas of importance for *Gazella dorcas*.	Ethiopia	
		2. Assess hunting legislation ; improve them where necessary.	Ethiopia	
		3. Develop programmes to enlist local community support and collaboration for the enforcement of desert habitat and *Gazella dorcas* conservation.	Ethiopia	
3. Enhance international cooperation	1. Improve exchange of information and technical expertise Gazella dorcas	1. Designate national co-ordinators with responsibility for liaising with counterparts in other Range States and with co-operating organizations.	Ethiopia	
		2. Provide central co-ordination of information exchange	CMS- SC	CMS Secretariat
		3. Organize regular meetings of African desert antelopes Range States.	CMS Secretariat	CMS-SC
		4. Provide technical training for field staff.	CMS Parties	CMS Secretariat, CMS-SC
3. Enhance international cooperation	2. Raise funds for conservation programmes Gazella dorcas	Develop comprehensive project proposals, both on country basis and transborder programmes, for submission to appropriate agencies.	Ethiopia	CMS Secretariat, CMS-SC

APPENDIX

MAIN RECOMMENDATIONS FROM THE SIX WORKING GROUPS AT THE DJERBA SEMINAR

1. *RESEARCH AND MONITORING*

The group supported the concept of identifying "Antelope HOT SPOTS" areas which were significant for more than one species which could be targeted for intensive efforts and resources.

The need for research on habitat restoration and sustainable offtake rates was also highlighted. It was also stressed that release projects should be monitored and evaluated, should otherwise valuable information be lost and overall success impossible to assess.

a). Oryx dammah

The species is considered probably extinct in the wild but there is a possibility that some survive in Niger-Chad.

Action needed:

- survey of GADAFAOUA, TERMIT, NORTH KANEM and the BET

b). Addax nasomaculatus

Action needed:

- survey of MOURDI depression in North-eastern Chad (one week with aircraft)
- survey of AIR-TENERE-TERMIT in Niger
- survey of MAZABAT EL KOUBRA in Mauritania/Mali

c). Gazella dama

Action needed:

- survey of Northeast Nigeria
- survey of DARFUR in Sudan up to Chad
- survey f ADRAR SOUTTOUF/GUELTAZEMMOUR in Morocco
- study of biology in the wild in AIR-TENERE in Niger
- study of biology in the wild OUADI ACHIME-OUADI RIME in Chad

Absolute high priority to monitor population in ADRAS DES IFORHAS in MALI

d). Gazella leptoceros

Action needed:

- Surveys of known populations:
  - QATTARA depression up and into Libya (Egypt and Libya)
  - GREAT EASTERN ERG in Algeria and Tunisia
  - AIR-TENERE in Niger
- identify East SUDAN population

e). Gazella cuvieri

Action needed:

- survey in the Bas DRAA in MOROCCO
- survey in Western SAHARA in Morocco and Algeria

f). Gazella dorcas

Action needed:
ascertain subspecific profiles before too difficult due to reduced numbers

2. HABITATS: THE DESERTIC AND SEMI-DESERTIC HABITATS, THEIR CONSERVATION AND RESTORATION

The working group felt the urgent need for a country-by-country list of the most important sites for the conservation and the restoration in situ of the six Sahelo-Saharan antelopes.

In order to establish such a list, criteria were identified. Criteria selected are (i) the presence of Sahelo-Saharan antelopes, the area of sites, the tranborder aspect, the biological diversity of the site, the presence of other threatened species, the human pressure, the level of anthropic degradation, the potential level of participation of local communities, the quality of habitats, the national priorities and the legal status of the area.

When applying these criteria, a list of fifty priority sites emerged (Table 1). It is clear that ALL these sites are top priorities. The objective of this exercise was not to establish an absolute hierarchy of sites for potential actions. It is rather an attempt to orientate priority actions for the conservation of the six antelopes for which concerted actions must be undertaken under the Bonn Convention. .These actions will or will not be translated into projects, depending on their feasibility in the field.

Table 1: Priority sites for the conservation and restoration of Sahelo-Saharan antelopes

Sites	Countries	*Addax*	*Oryx*	*Dama*	*Leptoceros*	*Cuvier*	*Dorcas*	Surface of the area	Transborder aspect	Human pressure	Exceptionnality of the site	Biodiversity	Other threatened species	Legal status of the area
Adrar des Iforas	ML	**1**	**1**	**2**	**0**	**0**	**2**	2	2	1	2	2	2	0
Ain Sefra	DZ	**0**	**0**	**0**	**0**	**2**	**2**	1	2	0	0	2	2	0
Air Tenere	NI	**4**	**1**	**3**	**2**	**0**	**2**	2	2	1	2	2	2	2
Akle Aouana	MR	**1**	**1**	**1**	**0**	**0**	**2**	1	0	1	0	0	2	0
Ansong-Menaka	ML	**1**	**1**	**1**	**0**	**0**	**2**	2	2	1	0	1	2	2
Banc d'Arguin	MR	**0**	**1**	**1**	**0**	**0**	**1**	1	0	1	2	2	2	2
Bas Draa	MA	**0**	**1**	**1**	**0**	**2**	**2**	1	0	2	1	2	2	1
Bouhedma	TN	**0**	**1,5**	**0**	**0**	**1**	**2**	0	0	0	1	2	2	2
Boukornine	TU	**0**	**0**	**0**	**0**	**1,5**	**0**	0	0	1	0	1	2	1
Dakhla	MA	**1**	**1**	**1**	**0**	**0**	**2**	1	0	2	0	2	2	1
Djebil	TN	**1**	**1**	**0**	**2**	**0**	**2**	1	2	2	0	0	2	1
El Aager	MR	**0**	**1**	**0**	**0**	**0**	**2**	1	0	2	0	1	2	0
Farafra	EG	**1**	**1**	**0**	**2**	**0**	**2**	0	0	1	0	1	0	1
Ferlo	SN	**0**	**1**	**1**	**0**	**0**	**1**	1	0	1	0	0	2	2
Gadabedji	NI	**0**	**1**	**1**	**0**	**0**	**2**	0	0	0	0	1	1	0
Geumbeul	SN	**0**	**1**	**3**	**0**	**0**	**0**	0	0	0	0	1	1	2
Gilf el Kebir	LY	**1**	**1**	**0**	**2**	**0**	**2**	2	2	2	0	2	2	0
Gourma	ML	**1**	**1**	**1**	**0**	**0**	**2**	2	2	0	2	1	2	2
Grd. Erg Occ.	DZ	**1**	**1**	**1**	**2**	**0**	**2**	2	0	2	1	1	2	0
Grd. Erg Ori.	DZ	**1**	**1**	**0**	**2**	**0**	**2**	2	2	2	1	1	2	0
Gumsu For. Res	NIG	**0**	**0**	**1**	**0**	**0**	**2**	0	2	0	0	1	2	2
Hamada el Homra	LI	**1**	**1**	**0**	**0**	**0**	**2**	2	0	2	0	2	0	0
Ida ou Tanane NW anti Atlas	MR	**0**	**0**	**0**	**0**	**2**	**1**	1	0	0	0	2	2	1
Ikrafene	NI	**0**	**1**	**1**	**0**	**0**	**1**	0	2	1	0	1	1	0
Jaghbub	LY	**1**	**1**	**0**	**2**	**0**	**0**	1	2	1	0	2	2	0
Jbel Grouz	MA	**0**	**0**	**0**	**0**	**2**	**2**	0	2	1	0	1	2	1
Jebel Uweinat	EG	**1**	**1**	**0**	**2**	**0**	**2**	2	2	2	0	2	2	2
Jebel Uweinat	SU	**1**	**1**	**0**	**2**	**0**	**2**	2	2	2	0	2	2	0
Kilboa / Chad Basin NP	NIG	**0**	**0**	**1**	**0**	**0**	**2**	0	2	0	0	1	2	2
Majabat Al K.	MR	**4**	**0**	**0**	**0**	**0**	**2**	2	2	2	1	1	2	0
Majabat Al K.	ML	**4**	**0**	**0**	**0**	**0**	**2**	2	2	2	1	1	2	0
Markoye	BU	**0**	**1**	**1**	**0**	**0**	**1**	0	0	0	0	0	1	0
Mergueb	DZ	**0**	**0**	**0**	**0**	**2**	**2**	0	0	0	0	2	2	2
Mille Serdo	ETH	**0**	**0**	**0**	**0**	**0**	**2**	1	2	1	0	1	2	2
Mourdi	CD	**3**	**1**	**1**	**2**	**0**	**2**	1	2	1	0	2	2	0
Mrhillar	TU	**0**	**0**	**0**	**0**	**2**	**0**	0	0	1	0	1	2	1
Ouadi Howar	SD	**1**	**1**	**2**	**0**	**0**	**2**	2	2	2	0	2	2	1
Ouadi Rimé / Ouadi Achim	CD	**3**	**1**	**4**	**2**	**0**	**2**	2	0	2	1	2	2	2
Qatara (Siwa)	EG	**1**	**1**	**0**	**2**	**0**	**2**	2	2	1	0	2	2	1
Seno Mango	BU	**0**	**1**	**1**	**0**	**0**	**1**	1	2	1	0	1	2	2
Sidi Toui	TN	**0**	**1**	**0**	**0**	**0**	**2**	0	2	1	0	0	2	2
Souss Massa	MA	**1,5**	**1,5**	**1,5**	**0**	**1**	**1,5**	0	0	0	0	2	2	2
Tassili Hoggar	DZ	**2**	**1**	**2**	**2**	**0**	**2**	2	2	2	2	2	2	2
Termit	NI	**4**	**2**	**4**	**0**	**0**	**2**	1	0	2	2	2	2	1
Tibesti Piemont	CD	**2**	**1**	**1**	**2**	**0**	**2**	1	0	1	2	2	2	0
Tilimsi	MR	**1**	**1**	**1**	**0**	**0**	**2**	2	0	1	0	1	2	0
Wadi el Rayen	EG	**0**	**0**	**0**	**1**	**0**	**2**	0	0	1	0	0	0	1

3. *CAPTIVE BREEDING AND REINTRODUCTION:*

The objective of captive breeding and reintroduction is to restore wild populations to their native habitats. Maintenance of semi-captive populations in enclosures may be a temporary step in, but should not be the end-product of, the reintroduction process.
Captive breeding and reintroduction programmes for regional restoration of species should attempt to preserve distinct subspecies and geographic forms, if possible.
In certain cases, scientific considerations (i.e., subspecific status and genetic diversity of founder stock) may be secondary to national interests in developing and implementing captive breeding and reintroduction programmes.
The initiative to establish a regional captive-breeding and reintroduction centre in Niger should be pursued, and the feasibility of regional captive breeding and reintroduction centres elsewhere should be evaluated.
Determination of the availability of captive stock, particularly for distinct subspecies, must precede activities to select reintroduction sites.
On-going reintroduction projects should incorporate ecological and demographic monitoring in their activities.
Reintroduction sites should encompass, or be adjacent to, areas of suitable habitat large enough to cover the seasonal migrations of reintroduced populations.
The issue of disease transmission is relevant to the reintroduction process and should be assessed during each project.

4. *EXPLOITATION OF SAHELO-SAHELO-SAHARIAN ANTELOPES*

- Take into account (i) the perception of the fauna by local communities living with that fauna and (ii) their knowledge of that fauna and its habitats.
- within the zonation of planned protected areas, include buffer zones where local communities can benefit from natural resources.
- include the traditional context, in particular local chiefs and authorities, within conservation programs.
- the social aspect of conservation is important: promote the participative approach, integrate local populations and develop public awareness before, not after, the action.

a). Ecological aspects

Experience with the reintroduction of Sahelo-Saharan antelopes demonstrates their positive contribution to habitat restoration, mostly through fencing, but also by animals themselves:

- contrary to livestock, antelopes do not degrade their habitats, particularly when carrying capacities of sites are appropriate: surplus of animals can be exploited.
- management of the fauna and its habitat must be applied globally and not only to protected areas, to avoid well protected areas with more devastation outside.
- address problems linked with predation and conservation of predators

b). Economic aspects

- wild fauna can be an important support to economic development in regions where other natural resources are limited.
- reintroduction actions represent short terms objectives; long term valorisation actions must follow: tourism, hunting, farming
- wildlife viewing is an important aspect of valorisation: it must be developed and remain ecologically sustainable.
- sport hunting can have a positive role in economic development if well controlled
- farming can be developed for certain species with a high productive rate in extreme habitats where livestock cannot survive: this can have important economic perspectives: Sahelo-Saharan gazelles demonstrate high reproductive rates.
- need to quantify the value of wildlife and their habitats for the countries economies.

c). Scientific aspects

- the Sahelo-Saharan antelopes have extraordinary adaptive characteristics to extreme climatic conditions which must be studied and researched in situ
- the following aspects must also be investigated: the role of these species in the maintenance and the restoration of habitats, notably in plant dissemination, the relationship plant/animal, the exploration of zootechnic potential of these species, and the relations between these species and livestock concerning ecological, economic, and sanitary aspects

d). Funding aspects

if too little investment has been consented so far on these species, it is probably because their economic value has not been clearly demonstrated yet.

- local communities must be encouraged to participate actively to field operations which concerns them.

e). Feasibility

Operations must be initiated preferentially in regions where adequate security can insure a certain perpetuity of results.

f). Technical aspects

Technical co-operation must be promoted on the basis of successful operations achieved elsewhere, in order to avoid reinventing everything for each operation.

- The Bonn Convention can be used to promote such technical co-operation.

g). Means to circulate the message: Action Plan

- circulate the Action Plan as widely as possible
- circulate the Djerba Declaration as widely as possible
- inform and influence financing organisms, co-operation agencies and institutions such as zoos and museums in the North who have captive populations of these species

h). Multiply field actions

increase numbers of experimental actions in different Range States

i). Contribution of development projects :

Include conservation actions within national development plans. A certain percentage of development projects could be systematically allocated to conservation actions.

5. IMPROVEMENT OF EXCHANGE OF TECHNICAL EXPERTISE AND INFORMATION

- Need to increase international co-operation in training and exchange of information between Range States of the Sahelo-Saharan antelopes.
- A co-ordination meeting should take place every two years. Such meetings should be held in countries that already have experience in protected areas management and where wildlife management is more advanced.
- As for training itself, it should aim at protected areas and surrounding sites, where technicians can be trained in antelope observation and census methods. The following themes were selected:
  - wildlife and habitat management

- monitoring and evaluation of wildlife and habitats
- participative approach to be adopted with local communities concerned
- public awareness directed at rural communities and nomadic communities, on the usefulness of antelopes and the need for conservation of species and habitats, through various media (verbally, posters, brochures, TV, video..)

- Training should be organised in modules, related respectively to:
  - species reintroduction
  - rehabilitation of fauna and flora
  - population dynamics
  - elaboration and implementation of protected areas management plans

6. DEVELOPMENT AND FUNDING OF NATIONAL AND INTERNATIONAL PROJECTS

If too few antelopes conservation projects have been initiated so far in the Sahelo-Saharan region, it is at least partially because **the economic value of these extraordinary species**, adapted to some of the most extreme environmental conditions of the planet, have not been sufficiently demonstrated. Such natural resources could prove highly important in the framework of sustainable development of the regions where they originate from. Project proposals must be constructed in the conservation-development framework.

The Bonn Convention (CMS) can play a catalytic role in the development, the implementation and funding of migratory species related projects.
There are different possibilities for developing projects:

- the classic bilateral projects
- the regional or sub-regional projects
- Projects financed by the European Union, in this case essentially DG VIII
- Projects funded through GEF, via UNDP, UNEP and the World Bank
- International NGO's projects (i.a. IUCN, WWF international)
- Assistance from north American/North European zoos

There is a Memorandum of Understanding developed between the Biodiversity Convention (CBD) and the Convention on Migratory Species (CMS), which insures the integration of CMS actions in national biodiversity programs.
One difficulty with GEF funds, is that they do not cover species specific projects. Proposals must therefore be developed in the framework of desertic and semi-desertic habitat degradation, desertification, overexploitation of natural and wildlife resources, sustainable development of Sahelo-Saharan countries.