الحيوانات المفترسة والظباء العربية
في شبه الجزيرة العربية

تقييم برامج الحماية والخطط الإدارية

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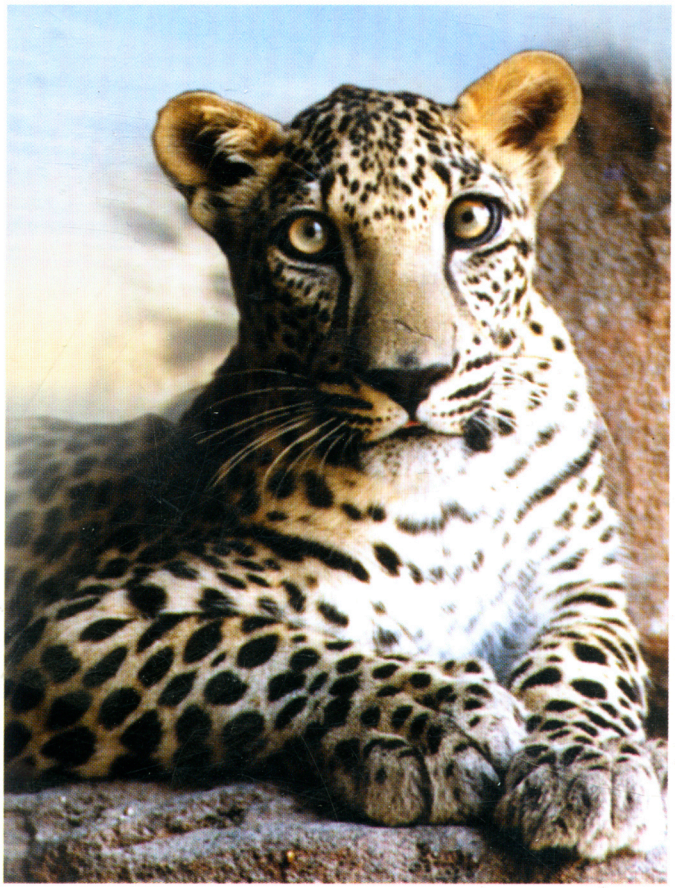
CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP) FOR THE ARABIAN LEOPARD AND ARABIAN UNGULATES

19-23 FEBRUARY 2001

BREEDING CENTER FOR ENDANGERED ARABIAN WILDLIFE

SHARJAH-UAE



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FINAL REPORT

Conservation Assessment and Management Plan (CAMP)
For The

Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the

Arabian Leopard, Tahr, and Arabian Oryx

A contribution of the IUCN/SSC Conservation Breeding Specialist Group.

Conservation Breeding Specialist Group (SSC/IUCN). 2001. *Conservation Assessment and Management Plan for the Arabian Leopard and Arabian Ungulates with Population and Habitat Viability Assessments for the Arabian Leopard, Arabian Oryx, and Tahr Reports.* CBSG, Apple Valley, MN. USA.

Additional copies of *Conservation Assessment and Management Plan for the Arabian Leopard and Arabian Ungulates with Population and Habitat Viability Assessments for the Arabian Leopard, Arabian Oryx, and Tahr Reports* can be ordered through the IUCN/SSC Conservation Breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124. USA.

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SECTION 1

EXECUTIVE SUMMARY

Executive Summary

The ungulates of the Arabian peninsula region - Arabian oryx, Arabian tahr, ibex, and the gazelles - generally are poorly known among local communities and the general public. However, there is a widespread impression that they are under severe threat because of overgrazing, lack of protection, lack of knowledge, and that the animals are fragmented into small populations. Most of the gazelles have received little attention and their taxonomic status and relationships are uncertain. Many are held in private collections which are poorly documented, not managed as biological populations, and in some cases poorly managed. The Arabian tahr was of special concern in the CAMP 2000 because of its low numbers 25 years ago and the uncertainty about the continued direct impacts of local human populations and overgrazing by goats on the population and its habitat. There are active research groups in each of the countries but there continues to be a need for pooling and synthesis of the new information that has been accumulated in recent years to provide a systematic assessment of the status of these species.

Increasing concern about the impact of human populations and shifts in the distribution of some species as well as an increased interest in collaboration between conservation and wildlife groups in the region provided the motivation to convene a second regional CAMP and PHVA workshop to address some of these issues. This workshop was intended to build on the results of the similar workshop held in February 2000 and to allow researchers and wildlife managers from throughout the region to combine their information and field experience in order to provide an overall regional as well as a country by country review of the status of these species. An invitation was extended to CBSG to follow the workshops done in February 2000, which was accepted, to again assist in these evaluations through the use of CBSG CAMP and PHVA workshop processes. The Arabian leopard, the Arabian oryx, and the Arabian tahr were selected for a more intensive single taxon status assessment and planning process because of continuing concerns that they are in urgent need for effective management and conservation action and the wish to review progress for the leopard and tahr after last year's workshop. Recommendations for the gazelles were made for all of the taxa as a group as well as the individual recommendations developed in the CAMP process. This report presents the results of these workshop processes conducted 19-23 February 2001.

This workshop continued and expanded work begun at the first workshop in Sharjah, 5-11 February 2000. The present workshop was a joint collaboration of the Breeding Centre for Endangered Arabian Wildlife in Sharjah with the Cat Specialist Group, the Antelope Specialist Group, and CBSG of the IUCN/SSC. Wildlife experts from the countries of the Arabian peninsula, Iran, and Europe plus two facilitators from CBSG participated. The Breeding Centre for Endangered Arabian Wildlife in Sharjah compiled the briefing book and will coordinate editing, preparation, and distribution of the workshop report.

The 5-day combined workshops were held 17-23, February, 2001 at the Breeding Centre for Endangered Arabian Wildlife in Sharjah, which provided outstanding logistical support. The Breeding Centre also arranged the financial support for the workshop. The countries and numbers participating included Kingdom of Saudi Arabia (8), Republic of Yemen (2), Sultanate of Oman (6), Bahrain (1), Iran (1), Qatar (1), United Arab Emirates: Abu Dhabi (4), Sharjah (10), Dubai (3), Netherlands (1), Switzerland (2), Belgium (2), United Kingdom (1), and the United States (2). The CAMP review included 8 gazelle taxa (species and subspecies), the leopard, the Arabian tahr, and the ibex.

The workshop was opened by our host, Abdul Aziz al Midfa, who participated in the entire process. The workshop was initiated with an overview of CBSG and the CAMP and PHVA workshop process. Documents presenting the new Red List criteria of 2000 were distributed as part of the information needed to assign a category of threat. Four working groups were formed along taxonomic lines: gazelles, oryx, tahr and ibex, and leopard. During the CAMP workshop the detailed species information was entered on special data forms – Taxon Data Sheets – which are included in the report. CAMP information was also entered in the database program for ease of printing the TDS reports, to provide for analysis, and for submission to the IUCN Red List Officer for review and inclusion in the next edition of the Red List. .

The detailed management planning process for the leopard, tahr, and oryx started Tuesday morning (the second day), after completion of the CAMP data sheets, with an overview of the process and the use of handouts for each step of the problem analysis and decision process. The structure of process, a decision making cycle (Figure 1), was implemented in a series of steps (Figure 2) which were described in greater detail in other handouts as shown for the critical Action Steps (Figure 3) which constitute the action plan and conservation management recommendations of the workshop. Particular emphasis was placed on developing action steps which could be organized or implemented by people participating in the workshop – a difficult challenge but one which allows for real achievements in the near future. This is important for building programs.

The 2001 CAMP review provided evaluations of 11 taxa with 1 listed as extinct in the wild, 2 listed as critically endangered, 1 as endangered, 3 as vulnerable, 2 as near threatened, 1 as data deficient, and 1 as not evaluated. These results are tabulated by taxon and category of threat for the 2001 workshop and for the combine results from the 2000 and 2001 Workshops (Tables). Detailed Taxon Data Sheets for each taxon as well as species distribution maps are included in the report sections for each group. The leopard was listed as critically endangered and the tahr as vulnerable – an improvement in status for the tahr. Projection of outcome for various scenarios for the Arabian leopard clearly indicated that this species is at high risk for extinction but that this outcome could be drastically altered with specific changes in population management and protection. Specific recommendations for the leopard focused on regional cooperation and collaboration including survey and protection actions, particularly in Yemen, with cooperation from multiple regional organizations and regionally organized international cooperation in a captive management program. Resolution of the relationship of the isolated small northern population remains an issue. The tahr is acknowledged to be vulnerable to extinction and in need of protection. In particular, threats to the tahr population due to disease transmission from domestic livestock were recognized as potentially highly significant. The Arabian oryx numbers more than 4000 animals in the Arabian peninsula with 710 in 3 wild populations and the remainder in private and public captive collections. The status of the gazelle taxa has also been difficult to resolve because of uncertainties about relationships and even the existence and separate identity of several taxa.

The executive summaries and working group recommendations were reviewed in plenary session on Friday morning with resolution of disagreements. Thus the workshop report with its recommendations represents the combined judgment of the participants that they are the best that can be made based upon the available information.

The workshop was closed Friday at 1200 PM by our host Abdul Aziz expressing his satisfaction with the dedication and productivity of the participants. He extended an invitation to the participants and to CBSG for a third workshop in February of 2002.

Arabian Gazelles Executive Summary

Using CAMP Taxon data sheets the Gazelle group put together a report listing population numbers, distribution, and management proposals on known populations of the Gazelle species in Arabia. These included four species, one of which was divided into four subspecies. The breakdown was as follows:

1) *Gazella dorcas saudiya*
2) *Gazella bilkis*
3) *Gazella subgutterosa marica*
4) *Gazella gazella*
    a) *Gazella gazella* muscatensis
    b) *Gazella gazella* erlangeri
    c) *Gazella gazella farasani*
    d) *Gazella gazella* cora

Gazella bilkis was not covered by the group due to the fact only five specimens are known and these have not yet been genetically proven to be a different subspecies from the other gazelles.

The group identified 29 problems which affected the gazelle species as a whole. These were broken down into six main groups and ranked accordingly. The three main groups were taken and goals established for these groups of problems. It was decided that without solving the main problem not many actions could be taken to solve problems further down on the list. The main problem in this case was genetic identification of the different gazelle species. Since there is no way to identify many of the gazelle populations in Arabia without use of molecular genetics, it was decided that this would have to be sorted out first. In order to do this a genetic database needs to be put together in order to once and for all determine the taxonomic breakdown of gazelles in Arabia. Once this is up and running and it is known for sure what species we have, proper management of wild and captive populations can then be implemented.

The second major problem group was determined to be lack of knowledge and communication. To counter this, it was decided to form a contact team from all areas present in the group. These would be in contact by e-mail and would pass on all new information about gazelles in Arabia and their respective areas. This would also provide a type of gazelle help line if people require information on gazelles.

Overall the major problems appear to be lack of information on gazelles in the wild and also on captive populations which the range states hold. It is not even sure which gazelle species are present in certain institutions and this needs to be resolved before management recommendations can proceed.

Arabian Tahr Executive Summary

The Arabian Tahr (Wa'al) is a medium sized ungulate which is endemic to the Hajar Mountains of the Sultanate of Oman and the United Arab Emirates. The species is listed by the IUCN as vulnerable and is currently under extreme threat as a result of intense grazing competition from livestock, illegal hunting and habitat degradation.

To prevent further decline in population numbers and decrease in habitat quality, the following objectives have been recommended by the Arabian Tahr Working Group (established at CAMP 2001):

- Obtain a clear picture of the impact of domestic and feral livestock herds on Arabian Tahr habitat.
- Develop a coordinated Oman/UAE survey and monitoring programme for the Arabian Tahr.
- Increase the awareness of local law enforcement agencies of the presence of Arabian Tahr, legislation on hunting, and penalties enforced for hunting.
- Increase public awareness of the importance and uniqueness of the Arabian Tahr.

To achieve the above-mentioned goals, the following plans of action have been proposed:

- Determine the scale of goat infestation in Arabian Tahr area and known Arabian Tahr habitats, by using vaccination records from local vet services, surveys and questionnaires.
- Surveys of Arabian Tahr range using camera trapping, observations, transect surveys and communication with locals to determine the number and distribution of Arabian Tahr populations.
- Create informative posters (information on Arabian Tahr, legislation, and associated penalties), and distribute these to all law enforcement offices within or near Arabian Tahr ranges.
- Create educational posters on Tahr and distribute these to schools, villages, tour operators, and shops.

Regional collaborators for the United Arab Emirates and the Sultanate of Oman have been identified, and specific tasks of the action plan allocated to them. Several deadlines for completion of these taska have been set, with the aim of compiling a final report of the findings at CAMP 2002.

Based on the results of the survey and monitoring programme, the Tahr Working Group will recommend an appropriate conservation plan for the Arabian Tahr in the Sultanate of Oman and the United Arab Emirates. The Tahr Working Group was created to facilitate cooperation between regions and countries where the Arabian Tahr occurs, and it is

our hope that the above-mentioned objectives will contribute towards greater cooperation in conserving the Arabian Tahr.

Arabian Oryx Executive summary

The global population of the Arabian oryx (both wild and captive) contains at least 4591animals.

There are currently approximately 710 Arabian oryx living in the wild, in three different populations, each the result of reintroductions:

- The Arabian Oryx Sanctuary in the Sultanate of Oman: a population of about 160 animals, of which approximately 80% are males (a further 50 animals are in a fenced area at the sanctuary)
- Uruq Bany Ma'arid in the Kingdom of Saudi Arabia: a population of 250 individuals
- Mahasat as-Sayd in the Kingdom of Saudi Arabia: a 2500 km² fenced area containing about 300 individuals

There are a further approximately 3462 semi-wild and captive oryx in at least 21 institutions and private collections in the Arabian peninsula. This number is only an estimate, based to some extent on census and monitoring, and the knowledge of the participants of the workshop, plus a significant dose of "hear say".

At least 419 Arabian oryx live in registered zoos in Europe, North America, Africa and Asia (European studbook, 2000; International Studbook 1995).

Using the 2000 IUCN Red List Criteria, the Arabian Oryx was considered by the CAMP participants to be no longer "Endangered" but "Vulnerable" (VU-D1).

The current top four problems for the Arabian oryx were considered to be:

(1) Poaching was, and potentially still could be, a major factor affecting the population growth of the Arabian oryx. Other human impact factors such as livestock competition, off-road driving, oil/gas exploitation, etc. are certainly factors to take into account, but are of comparatively less importance.

(2) There is insufficient law enforcement in the regions where oryx occur in the wild.

(3) Some countries (like the Kingdom of Saudi Arabia, possibly the Sultanate of Oman) do have a national action plan. However, there is no action plan for the conservation of the Arabian oryx, involving all range countries and all *in situ* and *ex situ* activities/contributions.

(4) Most oryx alive in the world today live in captivity in the Arabian peninsula. The majority of these captive populations are not, or are poorly, managed, resulting in a lack of information on numbers of animals, their origins, relationships etc. Consequently, some of these populations severely suffer from inbreeding.

The following recommendations were made to help remedy these problems:

- For the Kingdom of Saudi Arabia, it is recommended that the current rangers be placed directly under the Ministry of the Interior so they can officially carry arms.

- For the Arabian Oryx Sanctuary (Sultanate of Oman), where rangers not only have a policing function but also a monitoring/wildlife managing function, it is recommended: 1) that rangers are supported by giving them more possibilities to act by providing them with modern anti-poaching equipment such as better cars and communication equipment, 2) to balance the existing White Oryx Project rangers force by recruiting more rangers, including those from other tribes, 3) to provide training on how to deal with professional poachers, 4) to increase cooperation with the Royal Oman Police and Wali Offices by increasing awareness of the importance of the police task in the protection of the Arabian oryx.

- For all range countries, it is suggested to investigate the possibility of new legislation to 1) register all institutions (private and non-private) holding Arabian oryx (and possibly other non-domestic species), 2) register all individuals in these institutions and 3) update this on a regular basis.

- For Sultanate of Oman (Arabian Oryx Sanctuary) it is recommended to: 1) assign, but more importantly maintain, designated tracks to be used by the inhabiting tribes and by the rangers and researchers in order to decrease the amount of off road driving and, 2) investigate the possibility of establishing/controlling an official point of entry and exit (e.g. education centre, visitor centre …).

- It is recommended to better inform the people on existing legislation for the Arabian oryx and its reserves, by using sign boards (not only text signs but also pictorial signs (for illiterate people)) at the main entry points of the reserves, around the main roads, around the settlements, and other obvious places.

- It is recommended that the recently established Committee for the Coordination of Conservation of the Arabian Oryx (Secretariat in Abu Dhabi), meets as soon as possible in order to: 1) start the implementation of the goals and actions outlined in the document "General Recommendations of the Constituting Meeting of the Coordinating Body for the Conservation of the Arabian oryx", 2) consider the recommendations made by the current CAMP working group, 3) come to on overall action plan for the conservation of the Arabian oryx, involving all range countries and all *in situ* and *ex situ* activities/contributions.

- Considering that there are still only about 710 Arabian oryx in the wild, distributed over three populations, the captive population has a critical role to play as a pool of animals for further reintroductions, as a back up population for the wild populations and as an educational tool in zoos.

- It is therefore recommended that:

    1. All institutions holding Arabian oryx in the Arabian peninsula (including private collections), introduce <u>for themselves</u> a basic form of management in their herd(s) to make maximum use of the available genetic material (as is already the case in Taïf, Sharjah, H.H. Sheikh Butti Maktoem etc.). This includes: a) develop a form of register including all available information on animals in your collection (e.g. origin

of founder stock, family relationships and/or broad genetic lines, number of births, number of deaths, death causes etc.), b) to provide individual identification of animals by means of ear tags, or ear notches, or microchips, or tattoos, etc., c) terminate breeding with animals that look phenotypically substantially different from wild oryx.

2. In order to avoid successive inbreeding and to secure long term survival of this species in the Arabian peninsula, it is strongly recommended that national and/or regional register(s) are established in which member institutions agree to work together to exchange animals and information (on the animals and on husbandry). There is enough expertise already in the Arabian peninsula to start this type of cooperation. It is suggested that this activity be started immediately in the form of a regional register containing data from those institutions already willing to participate in such a program. Arabia's Wildlife Center, Sharjah would be willing to perform this role and will communicate with the Secretariat of the Committee for the Coordination of Conservation of the Arabian Oryx (Abu Dhabi).

Implementation of the recommended actions is not only the responsibility of the range states. Financial and technical support may also need to be found outside the Arabian peninsula.

Arabian Leopard Executive Summary

The captive management group of the Arabian leopard met prior to the CAMP and produced a number of recommendations. The group wants to evolve into a valuable tool for the management of the Arabian leopard in captivity, and it is ready to take on further responsibilities as needed.

The first task of the CAMP group work was to fill in the Taxon Data Sheet. This led to a lot of discussions on various aspects with a wealth of details from all countries, but also a clear demonstration of lack of information. One of the open questions concerned population estimations. For each region a minimum and a maximum was given and it added up to a total population of 82 to 290 animals. This was more than given at last year's CAMP workshop. Nevertheless, everybody agreed that the leopard population is decreasing. The discrepancy was explained by the fact that more information was available this year.

The group then identified 6 groups of threats and ranked them as follows: (1) habitat loss, (2) human persecution, (3) shortage of wild prey, (4) lack of legislation, (5) lack of baseline information and (6) public awareness. In each of these 6 categories, factors causing the threat were listed.

In the next step, goals were defined to reduce or eliminate these threats. Some of the prominent ones were:

(1) develop the appropriate legislation where needed,
(2) improve the law enforcement,
(3) limit the increase of livestock (which is responsible at the first place for the habitat deterioration),
(4) develop community assistance for leopard presence, and
(5) define the target groups for public awareness programs.

Finally, specific actions were listed that can be performed in the short term (12-18 months). The first one was to establish a leopard working group in each country within the leopard's range, draft a status report for each country involved, prepare training material for field workers, produce a poster for police stations and the general public, and organize the following meetings:

(1) leopard working group meetings in each country by June 2001,

(2) a first meeting of the advisory group in fall 2001 in Sharjah, and

(3) a workshop on field techniques and monitoring in Yemen probably in early 2002.

Summary CAMP tables - 5 pages

Figure 1.

THE DECISION MAKING CYCLE

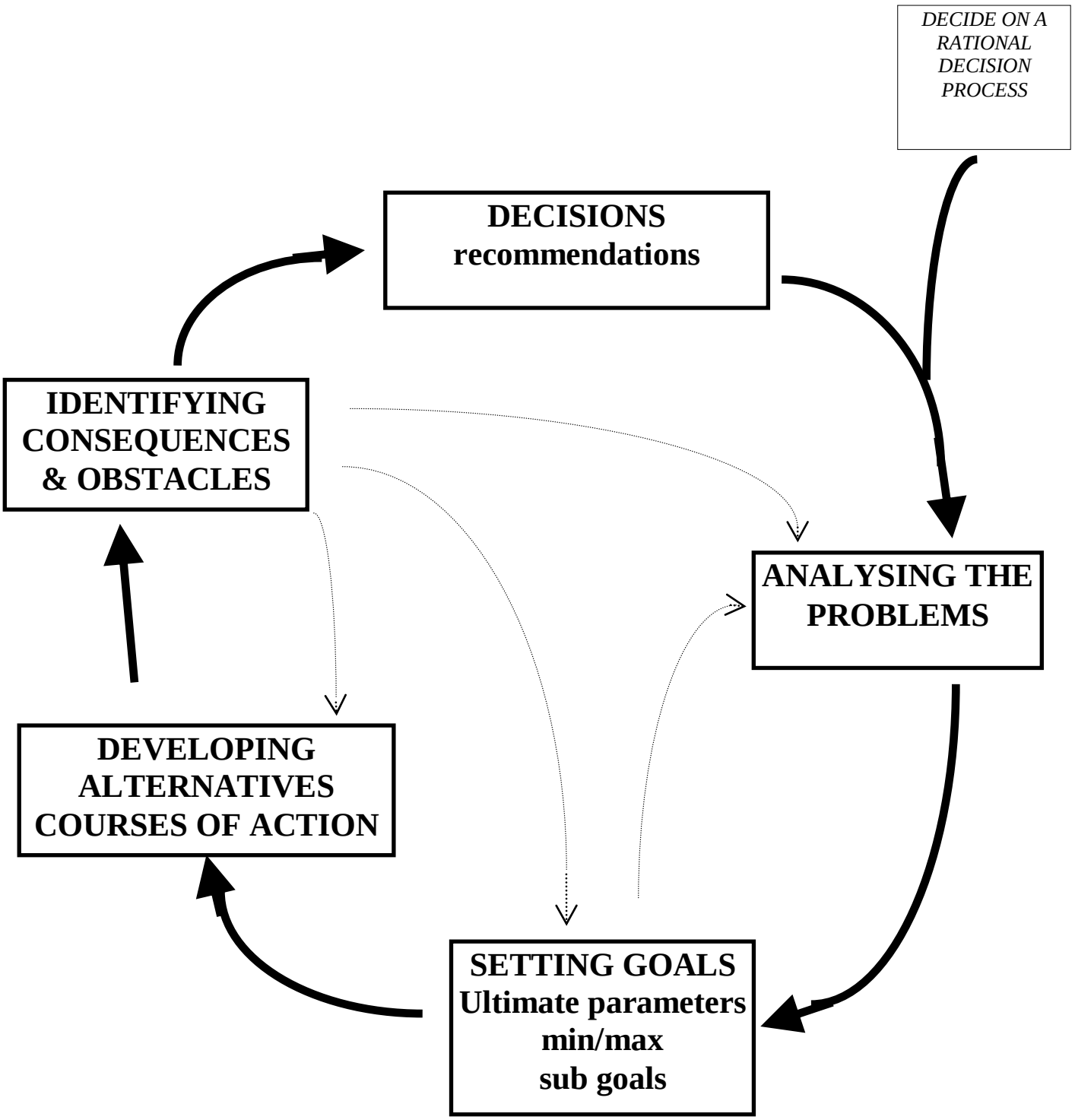

Figure 2. Working Group Instructions

Each group will need to select:

1. ***Discussion leader*** (facilitator) – to assist organized participation and focused discussions.
2. ***Flip chart note taker*** (may be the discussion leader) – to write notes of the ideas and discussions about the task on flip chart pages. The pages provide the 'group memory' of the discussion and provide the visual aid for presentations in plenary sessions.
3. ***Computer note taker*** – notes from the flip charts and the group discussion as basis for the draft report from each working group.
4. ***Presenter*** – to present the results of the working group's discussion to the assembled groups. Usually 5-10 minutes is sufficient for the presentation,
5. ***Time keeper*** – to keep the group on schedule.

TASK 1. Brainstorm Problems/Issues for your group's topic (see attached description of the process). This is not the time to develop solutions or actions or research projects for the problems. This will be done in later steps in the process.

TASK 2. Group and consolidate the ideas and problems generated in the first step into a smaller number of topics – usually less than 10 items. Write a one or two sentence 'problem statement' for each problem (see attached description of the process). Retain a listing of the individual 'brainstorm' problems under the consolidated topics.

TASK 3. Prioritize the problem statements. Use the paired ranking technique (see handout). Report the total score and the rank. This process helps careful examination of each statement and possible further consolidation or better definition. It also assists making choices for the next step if time is limited.

TASK 4. Prepare short (1 year) and long-term (5 years) goals (maximum and minimum) for each problem. See the 'Working Groups Process' handout (Task 2) for more details on how to develop goals. Goals are intended to guided actions to help solve the problem. There will likely be more one goal needed. You also may develop sub-goals for a complex goal.

TASK 5. Prioritize all of the goals across each problem and across all of the problems. Use paired ranking.

TASK 6. Develop Action Steps for each of the high priority goals. You may need 5-10 actions for one goal. Use the handout on Actions for information on the **characteristics** of Action Steps and the **information** to be included with each Action.

TASK 7. Prioritize the action steps under each problem. Use the paired ranking technique. The high priority actions will form the body of the recommendations from the workshop.

TASK 8. Complete and turn in your group's draft report each day.

FIGURE 3. MANAGEMENT ACTION PLAN

ACTIONS

Specific Action Steps that contribute to achieving your goal.

Characteristics of an Action Step:

Specific **-** for each goal

Measurable **-** outcome or an indicator

Attainable – can be accomplished under current conditions

Relevant – helps solve the specific problem and needs to be done

Timely – can be undertaken in time to achieve the goal

Information to include in each Action Step

Description - a short statement which can be understood by a non-participant reader. Relate the action to achievement of a specific goal and solving the problem.

Responsibility – who **in the room** is responsible for organizing or doing the action?

Time line – beginning and completion of the action. Dates.

Measurable - outcome or result. A specific product or change in condition.

Collaborators or Partners – who is essential to get the action accomplished?

Resources

Personnel and time required
Costs – rough estimate
Special to project

Consequences – Expected impact or outcome or result of the action if accomplished. A change in condition or state of the situation Contribution to achievement of the goal.

Obstacles - For example: Specific conflicts in interests of stakeholders or regulatory requirements or lack of local support that may need to be resolved or specific lack of resources preventing accomplishment of the action.

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SECTION 2

Gazelles: Action Plan and Reports

GAZELLE GROUP

GROUP MEMBERS

1. David Mallon
2. Catrin Hammer
3. Dr Sven Hammer
4. Declan O'Donner
5. Nagi Thowabeh
6. Shamsa Mohamed
7. Hayat Mallah Al Ali
8. Harig Tatwany
9. Mubarak Ali Al Dosary
10. Shaikha Salem Al Dhaheri
11. Iyad A Nader
12. Peter Phelan

Executive Summary

Using CAMP Taxon data sheets the Gazelle group put together a report listing population numbers, distribution, and management proposals on known populations of the Gazelle species in Arabia. These included four species, one of which was divided into four subspecies. The breakdown was as follows:

5) *Gazella dorcas saudiya*
6) *Gazella bilkis*
7) *Gazella subgutterosa marica*
8) *Gazella gazella*
    e) *Gazella gazella* muscatensis
    f) *Gazella gazella* erlangeri
    g) *Gazella gazella farasani*
    h) *Gazella gazella* cora

Gazella bilkis was not covered by the group due to the fact only five specimens are known of and these have not yet been genetically proven to be a different subspecies from the other gazelles.

The group identified 29 problems which effected the gazelle species as a whole. These were broken down into six main groups and ranked accordingly. The three main groups were taken and goals established for these groups of problems. It was decided that without solving the main problem not many actions could be taken to solve problems further down on the list. The main problem in this case was genetic identification of the different gazelle species. Since there is no way to identify many of the gazelle populations in Arabia without genetics, it was decided that this would have to be sorted out first. In order to do this a genetic database needs to be put together in order to once and for all determine the taxonomic breakdown of gazelles in Arabia. Once this is up and running and it is known for sure what species we have, proper management of wild and captive populations can then be implemented.

The second major problem group was determined to be lack of knowledge and communication. To counter this, it was decided to form a contact team from all areas present in the group. These would be in contact by e-mail and would pass on all new information about gazelles in Arabia and their respective areas. This would also provide a type of gazelle help line if people require information on gazelles.

Overall the major problems appear to be lack of information on gazelles in the wild and also on captive populations which the range states hold. It is not even sure which gazelle species are present in certain institution and this needs to be solved before management recommendations can proceed.

Saudi Gazelle *Gazella dorcas saudiya*

IUCN CATEGORY: EW

Distribution:

Historical distribution of this subspecies occurred both in Saudi Arabia and Yemen, east of the Hijaz mountains and south to the Hadrhamaut. However current distribution is unknown since this subspecies is considered to be extinct in the wild. Historically it was thought to occur in open desert plains.

Since there is no population known to exist in the wild and the possible captive collections have not yet been proven to be *G. d. saudiya*, a number of facts could not be determined. Three captive populations thought to be *G. d. saudiya*, were checked but were shown to be hybrids. However there are a number of collections which still need to be genetically checked before it can be determined that this subspecies is extinct.

The following management recommendations and supporting research was suggested on the condition that a population was found, whether in the wild or whether there was a proven captive population.

Management Recommendations were as follows:

Habitat Management
Limiting Factor Management
Public education
Captive Breeding

Supporting Research was recommended in the following fields:

Survey
Genetic research

The survey and genetic studies were considered to be of great importance since without these two we cannot determine whether populations exist or not.

Mountain Gazelle *Gazella gazella*

This particular species was divided into four subspecies groups, these being the following:

1) *Gazella gazella erlangeri*
   IUCN: DD

2) *Gazella gazella muscatensis*
   IUCN: CR C2a

3) *Gazella gazella farasani*
   IUCN: Vulnerable D1

4) *Gazella gazella cora*
   IUCN: NT

Gazella gazella erlangeri:

This particular species has not been reported in the wild since 1906 and the two possible captive populations, one in KKWRC and one in Al Wabra, have not yet been proven to be *Gazella gazella erlangeri*. As a result this species was given a IUCN criteria of DD, since not enough data has been collected about this species in order to determine a result.

Historical distribution was thought to be Yemen and possibly Saudi Arabia, but this cannot be confirmed due to lack of data

The first research to be undertaken is definitely genetic studies and surveys to determine if the population exists, whether in captivity or the wild
Once again the management recommendations are dependent on proving whether the population actually exists or not but if it does exist then the first and main recommendation is to be captive breeding for the purposes of :

1) Species recovery
2) Research
3) Education
4) Reintroduction
5) Preservation of live genome

Gazella gazella muscatensis

Distribution:

Historically this particular subspecies was known to occur along the Batinah coastal plain and adjacent hills of Oman. It is not sure yet if some animals still exist in this area or not
There are two possible captive populations in Al Wabra and Al Areen but it is not yet proven for certain if they are *G. g. muscatensis* or not.

For this reason the recommendation is to undertake genetic studies first to determine if the captive populations are a different subspecies from other Arabian gazelles or not and secondly to survey the historical range where the gazelle was known to occur

If a section of this population is still found to exist in the wild then the next recommendations would be the following:

1) Habitat management
2) Public Awareness
3) Monitoring
4) Captive breeding

If a captive population exists or specimens can be caught then captive breeding of the species needs to be undertaken. The reasons for the captive breeding would be for:

1) Species recovery
2) Research
3) Education
4) Reintroduction
5) Preservation of live genome

Gazella gazella farasani

Distribution

Historical and present distribution of the Farasan gazelle has not changed. This particular gazelle species only occur on the Farasan Islands off the coast of Saudi Arabia. It was at first not sure whether these were originally an introduced species that has adapted to the islands or whether this is a separate subspecies that has always existed on the islands but it was suggested that they have always occurred on the islands and genetics studies in comparison to other gazelle species would confirm this.

Population Numbers:

The population is known to be stable at approximately 800-1000 individuals although they are fragmented on four different islands within the Farasan island range.

Management recommendations for this group of gazelles were as follows:

1) Sustainable utilization
2) Wild population management
3) Public Education
4) Monitoring

Supporting research was once again suggested as surveys and genetic studies in order to determine for certain subspecies status.

Gazella gazella cora

Unlike other gazelle subspecies much more is known about this group. However it is still important to do genetic studies so as to have a comparison with other gazelle species

Distribution:

Current and historical distribution has remained the same over the years and encompasses Yemen, Saudi Arabia, Oman, UAE and encompasses an area greater than 20000 square km. It was determined however that the population was subdivided into approximately 20 subpopulations.

Population Trends:

It was decided that the population was increasing and as such received an IUCN category of Lower risk-conservation dependent.

Despite what is known about the subspecies, research in genetics and surveying is still recommended, especially to build up genetic databases for comparison and to properly manage the wild and captive populations.

Management recommendations were as follows:

1) Habitat management
2) Public awareness
3) Captive breeding
4) Monitoring
5) Work in local communities

The captive breeding was recommended for the purposes of research, education, reintroduction and preservation of live genome. At present the captive population is known to be at approximately 1750 individuals. These populations are situated at KKWRC, AL Areen, Al Wabra as well as many other private collections and zoos.

Bilkis Gazelle *Gazella bilkis*

IUCN Category: EX

The group did not cover *Gazella bilkis* since only five specimens are known, these still need to be checked by genetic study. If it is proved that this is definitely another species then further analysis can take place. The fact that no other specimens have been found since these samples in the 1950's seems to suggest that they are extinct.

Sand Gazelle ***Gazella subgutterosa marica***

IUCN CATEGORY: Vulnerable C2a

It was noted by the group that current genetic research indicates that *G. s. marica* is closer to *G. leptoceros* than to *G. subgutterosa* but it was agreed to continue to refer to it as *G. s. marica* until the results had been published.

Distribution:

Historical distribution and present distribution for this species are the same except for two countries. Countries included in current distribution are Saudi Arabia, Yemen, Oman, UAE, Bahrain, Syria, Jordan, Iraq. There are no more individuals known to exist in Kuwait and there is no confirmation as to whether they existed in Qatar in the past. Whatever the distribution it has been determined that they have an area of Occurrence greater than 20000 square km although this area is fragmented, and an area of occupancy greater than 2000 square km.

Population Numbers:

The global population has been estimated at 4000-4500 individuals divided into approximately 25 subpopulations.

Population Trends:

It was determined that the population is actually increasing and so the species was given an IUCN category of Near Threatened

Management recommendations were as follows for this particular species:

1) Habitat Management
2) Sustainable utilization
3) Public education
4) Captive Breeding
5) Monitoring
6) Work in local communities

Captive breeding was recommended for the following reasons:

1) Research
2) Education
3) Reintroduction
4) Preservation of live genome

Captive Populations exist in numerous institutions and private collections but the total captive population is unknown.

Supporting research was as with the other gazelle species, surveys and genetic studies. Once again, as with all the gazelle species covered, genetic studies seems to be the crucial research necessary before any major management can be undertaken.

Problems:	3)	Genetics/taxon
	1)	No surveys/info
	3)	No central data/coordination
	4)	Regional and international cooperation1
	1)	Captive management
	1)	Sampling methods/techniques(none standard
	5)	Capacity- building
	5)	Lack of funds
	2)	Fragmentation
	4)	Planning
	2)	Livestock Competition
	2)	Exotic invasive plants
	2)	Illegal Import of non-endemic gazelle species and unofficial release
	1)	Lack of knowledge
	5)	Not enough staff/researchers
	6)	Public awareness
	6)	Awareness of decision makers
	4)	Legal protection/laws
	2)	Overgrazing
	1)	Field identification
	2)	Pollution
	2)	Live capture/trade
	2)	Shooting
	5)	Lack of equipment/facilities
	5)	Lack of training
	2)	Disease transmission
	4)	Protected areas
	4)	Law enforcement
	6)	Add conservation to national curriculum

Problem Groupings:

1)	Knowledge	III
2)	Threat	V
3)	Taxonomy	I
4)	Legal	IV
5)	Resources	II
6)	Educational/Public Awareness	VI

Ranked problems, Goals, Actions

I) Taxonomy

Problems: Genetics/Taxonomy
Central genetic database coordination

Goals: To establish an agreed taxonomy of the gazelles of Arabia

Actions:

- Extend current work by KKWRC/ZSL to *Gazella bilkis, G. g. muscatensis, G. g. erlangeri*
- Collate/coordinate existing gazelle DNA databases and methods. Action by S and C Hammer from Qatar.
- Initiate routine sampling of existing captive stocks (Al Wabra, Al Areen, KKWRC, BCEAW)
- Establish a standard sampling procedure. Action by KKWRC.

II) Resources

Problems: Capacity building
Lack of funds
Lack of equipment and buildings
Lack of staff/researchers
Lack of field staff training

Goals: Conduct a joint survey (Saudi Arabia/Yemen) of gazelles in Yemen.

Action: by KKWRC and EPC.

III) Lack of Knowledge

Problems: Surveys of wild populations
Captive population management
Standard methods and techniques for sampling
Field Identification

Goal: Increase communication and data

Actions: Initiate Arabian gazelles e-mail-loop to enhance communication (ASG, BCEAW, Al Areen, ERWDA, Al Wabra, NCWCD)

IV) Legal

Problems: Co-operation (regional and international)
Urban development
Protected Areas
Legal protection, laws, National
Law Enforcement

V) Threats

Problems: Pollution
Live capture/trade, hunting
Overgrazing
Illegal import of non-native gazelles and release of exotic species

Livestock Competition
Exotic Plants
Disease transfer form livestock and alien species
Habitat fragmentation

VI) Education/Public Awareness

Problems: Public Awareness
Address Decision Makers with regards to the needs for gazelle species.
No Conservation in National Curriculum

TDS

? pages

MAP

Conservation Assessment and Management Plan (CAMP)
For The
Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the
Arabian Leopard, Tahr, and Arabian Oryx

SECTION 3

Tahr and Nubian Ibex: Action Plan and Report
(Hemitragus jayakari)

Tahr Group Members

- Richard John Wood - Manager of Omani Mammal BC, DRC, Oman
- Lanral Ruddock - BCEAW, Environment & Protected Areas Authority, Sharjah
- Christopher Drew - Environmental Research & Wildlife Dev. Agency, Abu Dhabi
- Hilal Al-Nabhani - Ministry of Regional Municipalities and the Environment, Oman
- Paul Vercammen - BCEAW, Environment & Protected Areas Authority, Sharjah
- Dr. Ayoub Rajab Al-Balushi - Director of Vet. Services, DRC, Oman
- Ronald Anthony Loughland - CER, Emirates Heritage Club, Abu Dhabi
- Dr. Salim Abdullah Bahwan - Veterinary Officer, DRC, Oman
- Abullaziz al Midfa - DG, EPAA, Sharjah

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

ARABIAN TAHR

Executive Summary

The Arabian Tahr (Wa'al) is a medium sized ungulate which is endemic to the Hajar Mountains of the Sultanate of Oman and the United Arab Emirates. The species is listed by the IUCN as vulnerable and is currently under extreme threat as a result of intense grazing competition from livestock, illegal hunting and habitat degradation.

To prevent further decline in population numbers and decrease in habitat quality, the following objectives have been recommended by the Arabian Tahr Working Group (established at CAMP 2001):

- Obtain a clear picture of the impact of domestic and feral livestock herds on Arabian Tahr habitat.
- Develop a coordinated Oman/UAE survey and monitoring programme for the Arabian Tahr.
- Increase the awareness of local law enforcement agencies of the presence of Arabian Tahr, legislation on hunting, and penalties enforced for hunting.
- Increase public awareness of the importance and uniqueness of the Arabian Tahr.

To achieve the above-mentioned goals, the following plans of action have been proposed:

- Determine the scale of goat infestation in Arabian Tahr area and known Arabian Tahr habitats, by using vaccination records from local vet services, surveys and questionnaires.
- Surveys of Arabian Tahr range using camera trapping, observations, transect surveys and communication with locals to determine the number and distribution of Arabian Tahr populations.
- Create informative posters (information on Arabian Tahr, legislation, and associated penalties), and distribute these to all law enforcement offices within or near Arabian Tahr ranges.
- Create educational posters on Tahr and distribute these to schools, villages, tour operators, and shops.

Regional collaborators for the United Arab Emirates and the Sultanate of Oman have been identified, and specific tasks of the action plan allocated to them. Several deadlines for completion of these taska have been set, with the aim of compiling a final report of the findings at CAMP 2002.

Based on the results of the survey and monitoring programme, the Tahr Working Group will recommend an appropriate conservation plan for the Arabian Tahr in the Sultanate of Oman and the United Arab Emirates. The Tahr Working Group was created to facilitate cooperation between regions and countries where the Arabian Tahr occurs, and it is our hope that the above-mentioned objectives will contribute towards greater cooperation in conserving the Arabian Tahr.

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

ARABIAN TAHR

Final Report

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1. COMMENTS AND ISSUES OF DISCUSSION

1.1. Distribution of the taxon

Available information indicates that Arabian Tahr are restricted to mountainous areas, supported by unpublished data on red blood cell counts that show high altitude adaptation. There are however reports of Tahr at location near to sea level.

Regional distribution augmented with sightings from two main locations: Wadi Wurreyah (summer 2000), Jebel Hafit (summer 2000 and winter 2001):

– Wadi Wurreyah: photographic evidence of 9 females at the most (7/2000)

– Jebel Hafit: female and kid photographed (07/2000); (15/02/2001) sighting of male near parking lot

Furthermore, there was a report of a Tahr caught in a goat trap in Mahdah (Oman).

No new data on migration of Tahr, but reports of Tahr kids following goat herds; reports of local herdsman (Oman) giving kids to local authorities, indicating some forms of cooperation between locals and conservation authorities. Small numbers of males in Wadi Wurreyah photographs source of concern. Indications are that hunters prefer to obtain males.

1.2. Number of Locations or Subpopulations

Number of locations of Tahr distribution still the same, but with addition of Wadi Wurreyah and Jebel Hafit locations.

1.3. Habitat status

The overall opinion is that habitat status has deteriorated since the last assessment, but is complicated by factors like movement of domestic goat herds away from wadis and reports that even feral goats are hunted in the wadis; this would seem to suggest an increase in Tahr habitat. Although the previous CAMP (2000) for the Arabian Tahr reported increase in Tahr habitat, Insall (1999) does highlight the fact that this may have been overestimated. The construction of roads and the associated development is probably the main cause of habitat change, resulting in habitat disturbance and fragmentation of Tahr populations. A significant cause of habitat fragmentation is the Khor Kalba – Hatta road which divides the UAE/Oman Tahr populations. Depending on the location, habitat quality has either increased or decreased; overgrazing in areas has caused decrease while construction of dams, or mining, may change water resources for Tahr. However, even with local increases in habitat quality, the overall quality may actually decrease due to disturbance factors associated with large construction. However, the above-mentioned predictions are based largely on assumptions and caution must be exercised when assessing habitat quality with scant data.

1.4. Threats

Human interference:

Hunting of Tahr was identified as major threat, with the associated marketing of meat and other body parts like throat glands (unconfirmed report). Indications are that Tahr meat can possibly create good income for traders; however, the market is not open and probably

restricted to limited numbers of customers, possibly also well-off customers. Some exotic plant species have been identified as increasing in distribution into Tahr habitat, but does not seem to pose an immediate threat to vegetation utilised by Tahr.

Natural/Man induced threats:

Vaccination of domestic goats against diseases. There are no indications that farmers consider Tahr a disease threat to their livestock. Inbreeding depression in small populations is likely; supported by reports of testicular abnormalities in captive male Tahr. Competition with domestic and wild goats an important threat to Tahr populations, but may be decreasing with possible movement of goat herds away from Tahr habitat. Possible solution to wipe out wild goat populations, but they seem resilient to such measures and increase in numbers very quickly. Predation of Tahr by feral dogs not considered possible.

Catastrophes:

Drought was still considered to be the most important natural climatic factor, but from previous Vortex simulations, Tahr appear to be resilient in the face of drought.

1.5. Trade

Main forms of trade include meat and whole animal. Throat glands identified as possible parts that have trade value, but these unconfirmed reports require further investigation.

1.6. Population numbers

Previous population number estimates were based on previously predicted habitat size. As a result of new habitat status predictions, population estimates have to be re-calculated. Due to the lack of survey data, accurate numbers can not be calculated, and current estimates simply reflect the minimum number of individuals.

1.7. Population trends

It was assumed that decrease in overgrazing by goat herds indirectly resulted in increase in Tahr numbers, but all indications are that population numbers may be decreasing (based on reports of fewer Tahr sightings in certain areas). This may not hold for both the Sultanate of Oman and the United Arab Emirates, since there are fewer reports from the latter. More surveys are needed in both areas to ascertain population numbers. Indications are that there is an increase in poaching activities, especially in the Sultanate of Oman. Employment of local people to patrol Tahr areas is a viable solution to the hunting/poaching problem.

Time frame for predicted decline in population numbers based on at least one generation time of Tahr.

1.8. Data quality

Population number estimates are based only on a few baseline survey studies, and reports from sightings. Surveys should increase the reliability of population number estimates.

1.9. Conservation Status

Despite insufficient data on Tahr population numbers, and trends in population numbers, the IUCN Red List Category Vulnerable was assigned to the Arabian Tahr, based on C2(a) E. The Arabian Tahr situation may be worse than predicted here, and therefore intensive surveys of Tahr areas are essential.

General hunting bans do exist in both the Sultanate of Oman and the United Arab Emirates, but there are differences with regard to the level of enforcement. A general Biological Diversity Agreement also exists between the countries of the GCC.

In addition to the Wadi Sarin Wildlife Reserve, Jebel Qahwan in Oman was proclaimed a protected area. An area at the base of Jebel Hafit in the United Arab Emirates has been proclaimed a protected spot and a potential Tahr release site.

1.10. Supporting Research

Proposal for a joint project on the home range movements of the Arabian Tahr, between the Office of the Advisor for Conservation of the Environment, College of Agriculture, Sultan Qaboos University and Department of Evolutionary Biology, University of Siena (Italy), in Wadi Sarin (Sultanate of Oman). The sourcing of information from locals is seen as important. A baseline study on Jebel Hafit was also proposed. There are also proposals to establish well managed (constant patrolling) food/water supplementation stations in Tahr areas during drought; this recommendation will be put through to the Ministry of Municipalities, Sultanate of Oman.

1.11. Management recommendations

To prevent catastrophic results of drought and grazing pressure from goats, habitat management is important to sustain extant Tahr populations, which includes careful management of water sources (limiting factor management). General management practices proposed include patrolling of Tahr areas by locally employed rangers. A conservation plan for the Arabian Tahr is pending, depending on the outcome of proposed surveys.

1.12. Captive Breeding

There must be concrete reasons for captive breeding of Tahr, not just for the sake of breeding them. A more intensive captive breeding programme is proposed for breeding centres in both the Sultanate of Oman and the United Arab Emirates.

1.13. Captive stocks

Registers/records of captive Tahr do exist; collaboration between breeding centres required for Tahr exchange and development of Tahr studbook. Possibly one Tahr to be exchanged between Omani Mammal Breeding Centre and Breeding Centre for Endangered Arabian Wildlife (BCEAW). Results of the exchange of some Tahr between Sir Bani Yas (Abu Dhabi) and BCEAW still pending, but these Tahr may be translocated to the protected area at the base of Jebel Hafit.

1.14. Other comments

Need for coordinated surveys of Tahr habitat and extant populations, especially in the UAE, due to lack of data on sightings. Techniques to locate Tahr need to be formulated and standardized throughout the region.

2. Problems, Goals And Action Plan For Arabian Tahr

Several main conservation problems for the Arabian Tahr were identified, and ranked according to priority. Goals were then set for each of these problems, and action plans developed to address these.

2.1. Presence of domestic livestock leads to competition and decline in habitat quality

It is thought that the high numbers of domestic and feral goats in Tahr habitat may have led largely to a major decline in habitat quality, due to overgrazing and competition from the livestock. Furthermore, periodic water and food fluctuations as a result of droughts may also affect habitat quality.

The eventual goal of this conservation assessment is to reduce the numbers of feral and domestic livestock in Tahr habitat, formulate legislation with regard to farming with livestock and implementing a watering/feeding supplementation system in Tahr areas during drought.

Although it is assumed that the presence of domestic and feral goats is detrimental to Tahr habitat, there are no figures on the extent of the goat problem. Therefore, one of the initial actions necessary for understanding the effect of livestock on Tahr habitat, is to undertake intensive surveys of the scale of goat intrusion into Tahr habitat. This will include surveys and collecting goat vaccination records.

The following institutions will undertake this:

- Oman: Director of Veterinary. Services, Diwan of Royal Court
- UAE: ERWDA, Abu Dhabi; Commission for Environmental Research, Abu Dhabi; EPAA, Sharjah

- Timeframe: finish surveys before end of April 2001.
- Outcome: figures of foraging availability; carrying capacity for goats/Tahr.
- Collaborators: municipalities; Agric. Depts; community leaders; farmers; environmental agencies
- Resources: Oman: minimal; Abu Dhabi: 8 week survey (4 staff); Sharjah: 8 weeks (6 staff).
- Consequences: expect to be able to recommend management of goat numbers in Tahr habitat.
- Obstacles: vegetation cover not known; information accuracy.

2.2. Lack of law enforcement leads to illegal hunting and poaching

Although general hunting laws do exist in both the Sultanate of Oman and the United Arab Emirates, these laws are not strictly enforced, and hunting/poaching of Tahr continues. Therefore, there is a need to inform local law enforcement agencies and the general public of

the laws that exist, to improve law enforcement. Furthermore, with the cooperation of locals, it is hoped to improve ranger strength and effectiveness.

Informative posters, that outline the laws pertaining to hunting of Tahr, and the penalties associated, will be produced and distributed to as many law enforcement offices near or within Tahr areas.

The following institutions will be involved:

- Ministry of Municipalities, Oman (recommendations to be carried forth)
- EPAA to coordinate making of posters

- Timeframe: deadline for posters out: 31 March 2001
- Outcome: posters out in Tahr areas; each Wali office, police station and military outpost in Tahr range

- Collaborators: Ministry of Interior, UAE; CER to follow; military
- Resources: poster resources provided by EPAA
- Consequences: increased number of enquiries to agencies involved
- Obstacles: difficult to assess success

2.3. Lack of environmental education leads to ignorance of the importance of conservation

There is a general lack of conservation awareness amongst the public in the Sultanate of Oman and the United Arab Emirates. This leads to uncontrolled pollution and social use of Tahr habitat. This is probably largely due to the scarcity of information available. Therefore, the main goal here is to increase public awareness of the Arabian Tahr.

As with the second goal, educational posters will be made for distribution at educational institutions. At this stage EPAA (Sharjah, UAE) is also responsible for the production of posters.

- Timeframe: deadline for posters out: 31 March 2001
- Outcome: > 2000 posters distributed to educational institutes throughout Tahr range
- Collaborators: Ministry of Interior UAE; CER to follow; military; Ministry of Education, tour operators
- Resources: poster resources provided by EPAA
- Consequences: increases public awareness and knowledge
- Obstacles: difficult to measure success

2.4. Insufficient cooperation/effort to achieve coordinated survey projects throughout Tahr range

One of the most important shortcomings of this CAMP for Arabian Tahr is the lack of reliable data on Tahr population numbers and distribution. These data are essential for making informed estimates of numbers and priority conservation areas. Only from this can

conservation authorities expect to set up proper conservation management plans and make recommendations to government authorities.

The major aim to overcome this problem is obvious. A coordinated Oman/UAE survey and monitoring programme will be developed for Arabian Tahr. Through the use of standard surveying techniques (camera trapping, observation, information from locals, transect surveys), the status of Tahr populations and their distribution will become better known.

Responsibility for various Tahr areas will be divided accordingly:

- Northern UAE: EPAA, Sharjah
- Southern UAE (including Jebel Hafit): ERWDA, CER
- Oman: Wadi Sarin: proposed project: Univ. of Sienna, Italy, SQU; Ministry of Municipalities (Hilal) to collate ranger surveys

- Timeframe: deadline 31 December 2001 (data compiled and presentable by 31 January 2002)
- Outcome: Data on numbers and locations; recommendations for prioritizing areas
- Collaborators: United Arab Emirates: EPAA, ERWDA, CER; Sultanate of Oman: OACE, SQU; Italy: Univ. of Sienna
- Resources: EPAA: 2 research staff, 4 rangers, film: sponsors; ERWDA/CER: 4 research staff
- Consequences: data to allow formulation of Tahr conservation management plan
- Obstacles: manpower limitations

The second action was to establish an Arabian Tahr Work Group, whose duty is to coordinate all conservation efforts related to the Arabian Tahr in the sub-region. The members represent the various regions and countries, and will coordinate Tahr work in that region. Several meetings are to be held to discuss recent findings and collate data. A chairman and secretary were elected at this CAMP 2001:

- Richard John Wood - Manager of Omani Mammal BC, DRC, Oman (CHAIRMAN)
- Lanral Ruddock - BCEAW, Environment & Protected Areas Authority, Sharjah (SECRETARY)
- Christopher Drew - Environmental Research & Wildlife Dev. Agency, Abu Dhabi
- Hilal Al-Nabhani - Ministry of Regional Municipalities and the Environment, Oman

- Paul Vercammen - BCEAW, Environment & Protected Areas Authority, Sharjah
- Dr. Ayoub Rajab Al-Balushi - Director of Vet. Services, DRC, Oman
- Ronald Anthony Loughland - CER, Emirates Heritage Club, Abu Dhabi
- Dr. Salim Abdullah Bahwan - Veterinary Officer, DRC, Oman
- Abullaziz al Midfa - DG, EPAA, Sharjah

2.5. Limited range and habitat fragmentation/disturbance leads to higher probability of inbreeding and disease

A major concern of CAMP 2001 for the Arabian Tahr was the decline in Tahr habitat, mainly due to increased disturbance from human activities, mining and dam construction and habitat fragmentation as a result of road construction. This leads to isolated population with an associated increase in risk of inbreeding and disease spreading.

It is not possible to decrease the level of habitat fragmentation, but the prevention of further fragmentation is achievable as a long-term goal. Habitat restoration to create corridors between major Tahr areas is also a goal.

Unfortunately such conservation measures can only be implemented with a knowledge of Tahr population numbers and distribution. Therefore, these aims are pending the results of the Tahr and goat surveys.

Conservation Assessment and Management Plan (CAMP)
For The
Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the
Arabian Leopard, Tahr, and Arabian Oryx

SECTION 4

Arabian Oryx: Action Plan and Reports

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
Arabian Oryx

Executive Summary

The global population of the Arabian oryx (both wild and captive) contains at least 4591animals. There are currently approximately 710 Arabian oryx living in the wild, in three different populations, each the result of reintroductions:

- The Arabian Oryx Sanctuary in the Sultanate of Oman: a population of about 160 animals, of which approximately 80% are males (a further 50 animals are in a fenced area at the sanctuary)
- Uruq Bany Ma'arid in the Kingdom of Saudi Arabia: a population of 250 individuals
- Mahasat as-Sayd in the Kingdom of Saudi Arabia: a 2500 km² fenced area containing about 300 individuals

There are a further approximately 3462 semi-wild and captive oryx in at least 21 institutions and private collections in the Arabian peninsula. This number is only an estimate, based to some extent on census and monitoring, and the knowledge of the participants of the workshop, plus a significant dose of "hear say".
At least 419 Arabian oryx live in registered zoos in Europe, North America, Africa and Asia (European studbook, 2000; International Studbook 1995).

Using the 2000 IUCN Red List Criteria, the Arabian Oryx was considered by the CAMP participants to be no longer "Endangered" but "Vulnerable" (VU-D1).

The current top four problems for the Arabian oryx were considered to be:

(1) Poaching was, and potentially still could be, a major factor affecting the population growth of the Arabian oryx. Other human impact factors such as livestock competition, off-road driving, oil/gas exploitation, etc. are certainly factors to take into account, but are of comparatively less importance.

(2) There is insufficient law enforcement in the regions where oryx occur in the wild.

(3) Some countries (like the Kingdom of Saudi Arabia, possibly the Sultanate of Oman) do have a national action plan. However, there is no action plan for the conservation of the Arabian oryx, involving all range countries and all *in situ* and *ex situ* activities/contributions.

(4) Most oryx alive in the world today live in captivity in the Arabian peninsula. The majority of these captive populations are not, or poorly, managed, resulting in a lack of information on numbers of animals, their origins, relationships etc. Consequently, some of these populations severely suffer from inbreeding.

The following recommendations were made to help remedy these problems:

- For the Kingdom of Saudi Arabia, it is recommended that the current rangers be placed directly under the Ministry of the Interior so they can officially carry arms.

- For the Arabian Oryx Sanctuary (Sultanate of Oman), where rangers not only have a policing function but also a monitoring/wildlife managing function, it is recommended:
  - 1) that rangers are supported by giving them more possibilities to act by providing them with modern anti-poaching equipment such as better cars and communication equipment,
  - 2) to balance the existing White Oryx Project rangers force by recruiting more rangers, including those from other tribes,
  - 3) to provide training on how to deal with professional poachers,
  - 4) to increase cooperation with the Royal Oman Police and Wali Offices by increasing awareness of the importance of the police task in the protection of the Arabian oryx.

- For all range countries, it is suggested to investigate the possibility of new legislation to 1) register all institutions (private and non-private) holding Arabian oryx (and possibly other non-domestic species), 2) register all individuals in these institutions and 3) update this on a regular basis.

- For Sultanate of Oman (Arabian Oryx Sanctuary) it is recommended to: 1) assign, but more importantly maintain, designated tracks to be used by the inhabiting tribes and by the rangers and researchers in order to decrease the amount of off road driving and, 2) investigate the possibility of establishing/controlling an official point of entry and exit (e.g. education centre, visitor centre …).

- It is recommended to better inform the people on existing legislation for the Arabian oryx and its reserves, by using sign boards (not only text signs but also pictorial signs (for illiterate people)) at the main entry points of the reserves, around the main roads, around the settlements, and other obvious places.

- It is recommended that the recently established Committee for the Coordination of Conservation of the Arabian Oryx (Secretariat in Abu Dhabi), meets as soon as possible in order to: 1) start the implementation of the goals and actions outlined in the document "General Recommendations of the Constituting Meeting of the Coordinating Body for the Conservation of the Arabian oryx", 2) consider the recommendations made by the current CAMP working group, 3) come to on overall action plan for the conservation of the Arabian oryx, involving all range countries and all *in situ* and *ex situ* activities/contributions.

- Considering that there are still only about 710 Arabian oryx in the wild, distributed over three populations, the captive population has a critical role to play as a pool of animals for further reintroductions, as a back up population for the wild populations and as an educational tool in zoos.

- It is therefore recommended that:

  All institutions holding Arabian oryx in the Arabian peninsula (including private collections), introduce for themselves a basic form of management in their herd(s) to make maximum use of the available genetic material (as is already the case in Taïf, Sharjah, H.H. Sheikh Butti Maktoem etc.). This includes: a) develop a form of register including all available information on animals in your collection (e.g. origin of founder stock, family relationships and/or broad genetic lines, number of births, number of deaths, death causes etc.), b) to provide individual identification of animals by means of ear tags, or ear notches, or microchips, or tattoos, etc., c) terminate breeding with animals that look phenotypically substantially different from wild oryx.

  In order to avoid successive inbreeding and to secure long term survival of this species in the Arabian peninsula, it is strongly recommended that national and/or regional register(s) are established in which member institutions agree to work together to exchange animals and information (on the animals and on husbandry). There is enough expertise already in the Arabian peninsula to start this type of cooperation. It is suggested that this activity be started immediately in the form of a regional register containing data from those institutions already willing to participate in such a program. Arabia's Wildlife Center, Sharjah would be willing to perform this role and will communicate with the Secretariat of the Committee for the Coordination of Conservation of the Arabian Oryx (Abu Dhabi).

Implementation of the recommended actions is not only the responsibility of the range states. Financial and technical support may also need to be found outside the Arabian peninsula.

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN
Arabian Oryx

ORYX WORKING GROUP PARTICIPANTS

Moh. Al-Shuaili – Dir. Nature Conservation Planning - Oman
Abdulaziz Khalidi - King Kalid WRC - KSA
Abdulrab al Hemeri – TERC-ERWDA - Abu Dhabi
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Kristin Leus – Conservation Biologist, Royal Zoological Society of Antwerp
Graeme Pienaar - AMC mammals BCEAW – Sharjah
Rabah J. Al-Harbi –National Commission for Wildlife Conservation and Development - KSA
Stephane Ostrowski – National Wildlife Research Centre – KSA

CAMP TAXON DATA SHEET

Comments and points of general discussion

Current distribution

It is difficult to distinguish between what is a truly wild population and what is a captive population. For example, what to do with large fenced areas in which oryx run wild and/or just receive supplementary feeding.

Assuming "current distribution" concerns wild populations only, it is important to come up with a definition for a wild population. For this workshop, with "wild" we mean "without a fence and breeding not managed" as well as fenced but the area is so large that it could almost be considered as not fenced (2000 km+);. Employing these criteria, wild populations only occur in Oman (Arabian Oryx Sanctuary), and in Saudi Arabia (Uruq Bani Ma'arid and Mahazat Alsaid).

Approximate extent of occurrence

In Oman alone, the Arabian Oryx Sanctuary release area suitable for oryx is 24,700 km². Uruq bani Ma'arid has a surface area of about 12,500 km². Mahazat Alsaid is a fenced area of 2,500 km² in which the oryx run wild. Although it was difficult to come up with an absolute number for the total extent of occurrence, it is certainly larger than 21,001 km².

Area of occupancy

During the successful years of the Oman - Arabian Oryx Sanctuary reintroduced population, the latter used on average 16,000 km² of grazing area per year. As grazing and exploration of areas away from the release site is dependant on unpredictable rain (both in time and place), the area of occupancy shifts within a larger area of occurrence. Although it was difficult to come up with an absolute number for the total area of occupancy, it is very likely to be larger than 2,001 km².

Number of locations or subpopulations:

If only speaking about the wild population, there are three locations with one population each:

Oman: Arabian Oryx Sanctuary
KSA: Uruq Bani Ma'arid and Mahazat as-Sayd

Each population in itself is not fragmented but the three populations are isolated from one another

Trade

In recent years, the most important trade is in live animals. Occasional trade in horns, skin and taxidermy models (heads) are probably a by-trade of this (products from caught animals that died).

9. Global Population:

In order to estimate the total global population of Arabian oryx, all subpopulations must first be identified. Again it is sometimes difficult to draw a line between what is a really wild population and what is a captive population. We employed three categories of management of oryx:

(1) "wild" meaning without a fence and breeding not managed; or fenced but the area is so large that it could almost be considered as not fenced (>2000 km²);
(2) " Fenced" meaning a fenced area smaller than 2000 km² with no management of the breeding;
(3) "captive" meaning in a fenced area with intensive management of the breeding.

The code is put in bold in front of each collection. Collections are ordered by country.

UAE:

Abu Dhabi

(2) Collection of H.H. Sheikh Zayed : a total of about 1300 individuals in at least eight groups of which the largest on the island of Sir Bani Yas (420), two of the other collections known are H.H. Sheikh Sultan –Ajban Farm: (25+); H.H. Sheikh Khalifa – Abu Al Abyaad Island (10+).

In 1997 an unknown number of animals was released in Umm al Zumool in the southeast of Abu Dhabi. No further data on this group is available at the time.

(2) Al Ain Zoo: three groups with a total of about 250 individuals.

It is known that there are many more private collections with an unknown, but thought to be significant, number of individuals; more information needed.

Dubai

(3) Collection of H.H. Sheikh Butti: 8 individuals
(2) Wadi Safa: 50 individuals
(2) Al Maha: about 70 individuals in fenced area with supplementary feeding
(2) H.H. Sheikh Mohammed: about 50 individuals (recently imported from the US)
There is also unknown number of animals in other private collections.

Sharjah

(3) Arabia's Wildlife Center: 21 individuals

Qatar

(2) Government collection with about 250 individual
(2) Three other populations containing in total about 50 individuals. One of these is
One of these four collections is the Oryx and Gazelle Conservation Centre, Doha

Oman:

(1) Arabian Oryx Sanctuary: Reintroduced population running wild counts about 160 animals, of which approximately 80% are males. A further 50 animals are in a fenced area at the Arabian Oryx Sanctuary;

(2) One private collection with about 50 individuals

KSA:

(2) Mahasat as-Sayd: 2500km² fenced area containing about 300 individuals
(2) King Kalid Wildlife Research Center: Captive population in a protected area; about 8 individuals
(1) Uruq Bany Ma'arid: wild population of 250 individuals
(2) Taif: 30km² intensively managed; 246 individuals
(2) Reem farm (21),
(2) Al-Jamaz farm (120),
(2) Sheikh Muhamed Al-Athel farm (20)
(2) Wady Laban farm (20)

(2) Riyadh Zoo (10)
There may be another 50 or so individuals in other collections.

Jordan:
(2) Shaumari: 22km² fenced area with maximum 200 individuals
[(2) Dhana: not sure if there still is a population there, but if it is, it's captive and small]

Syria
(2) Tadmur 25 individuals in one protected (fenced) area

Bahrain:
(2) Al Areen one fenced population of about 140 individuals

Israel:
(2) Hai Bar: unknown number of individuals

TOTAL: > 4119

COLLECTIONS OUTSIDE THE ARABIAN PENINSULA

Europe:
(3) 126 individuals in 21 zoos (from 2000 European studbook data)

Africa:
(3) About 30 individuals in 4 institutions (from 1995 International studbook)

N. America:
(3) About 250 individuals in 29 registered zoos + x in non-registered institutions (from 1995 International studbook)

Asia
(3) About 13 individuals in 3 institutions (from 1995 International studbook)

TOTAL in collections outside the Arabian peninsula: > 419

9. Number of mature individuals

The exact number of mature individuals is not known but since we have 4000+ animals and oryx can start to breed between 12 –18 months, it would be safe to assume there are more than 2,500 mature individuals.

11. Population estimates

Population estimates of the Arabian institutions are to some extent based on censusing and monitoring plus a significant dose of "hear say". For the wild populations field studies provide the numbers. European population numbers are censussed (2000 European studbook data). The American, African and Asian populations are derived from the literature (1995 international studbook).

IUCN Red Data Book Status

Own reasoning while working through the IUCN Red List Criteria:

The IUCN criteria only apply to the wild populations (category (1) above), in this case these are three populations: Arabian Oryx Sanctuary, The Uruq Bani Ma'arid and Mahazat as-Sayd.

The Arabian oryx is not critically endangered:
The taxon meets not of the criteria set for this IUCN red list category (IUCN Red List Categories, 2000).

The Arabian oryx is not endangered:

The taxon meets not of the criteria set for this IUCN red list category (IUCN Red List Categories, 2000).
The Arabian oryx wild population size is less than 2500 mature individuals (criteria C) but there is no "estimated continuing decline of at least 20% within five years or two generations" or "a continuing decline, observed, projected, or inferred, in numbers of mature individuals AND factors under a and b (IUCN Red List Categories, 2000). The Uruq Bani Ma'arid and Mahazat as-Sayd populations have increased in numbers. The Arabian Oryx Sanctuary population decreased because of the recent poaching. However, the total wild population (the three populations together) did not decrease at least 20% within five years.

The Arabian oryx is vulnerable:
D1 Applies: "Population very small or restricted in the form of population size estimated to number less than 1000 mature individuals".

17D
A Species Management Program is strongly recommended for all those countries in the former range of the species that plan reintroductions.

18
In those countries that could potentially reintroduce oryx (UAE, KSA, Oman, Yemen – and possibly Syria if combined with Jordan and KSA to create a northern population) the ongoing, sometimes huge and/or poorly managed captive programs, should be decreased and new nucleus populations of carefully chosen animals that are closely followed up and managed should be created.

Action planning exercise

Key problems affecting survival of the Arabian Oryx in random order

- Need for cross border oryx habitats
- Drought
- Poaching (hunting and trade – if there is no market there would be no trade)
- Need more research on life history, demography etc.
- Human activities (oil/gas exploration; agriculture, road construction)
- Lack of awareness about the environment and impact people have on it, and about the status of the oryx
- Local communities are not sufficiently involved in oryx conservation projects.
- There is also a need for equal opportunities for involvement for all tribes in the region.
- Released populations need long term monitoring and long term commitments
- Need for increase of cooperation between different states (exchange information, knowledge and animals)
- Lack of qualified local manpower
- Law enforcement
- Too much uncontrolled off-road driving
- Not enough information on many of the different oryx populations (numbers, origin, …)
- Absence of strategy and action plan for conservation and evaluation

Putting the clumps into sentences + prioritising:

Priorities are marked in front of the different problems in bold.

(1) Poaching is a major factor affecting the population growth of the Arabian oryx.. Other human impact factors such as livestock competition off- road driving, oil/gas exploitation, are certainly factors to take this into account but are of comparatively less importance.

(2) There is insufficient law enforcement in the regions where oryx occur in the wild.

(3) Some countries (like Saudi Arabia, possibly Oman) do have an national action plan. However, there is no action plan for the conservation of the Arabian oryx, involving all range countries and all in situ and ex situ activities/contributions.

(4) Most oryx alive in the world today live in captivity in the Arabian peninsula. The majority of these captive populations are not or poorly managed resulting in a lack of information on numbers of animals, their origins, relationships etc. Some of these populations severely suffer from inbreeding.

(5) There is a lack of awareness among all layers of society about the importance and status of the natural heritage (wildlife and ecosystems) of the Arabian peninsula.

(5) Local communities are not sufficiently involved in the planning, implementation and evaluation processes of the field conservation projects for the Arabian oryx. They should be trained for conservation management to ensure the continuity of the project.

(7) Although there are still about 160 animals in Oman, the sex ratio is highly skewed towards males, due to poaching between 1996 and 1999. As there are only 3 wild oryx populations, a male biased sex ratio in one of them can be influence to the whole species.

(7) There is a large increase in the numbers of livestock (camels, sheep and goats) cause overgrazing and compete for food and land with the oryx. Livestock also carry diseases that can be transmitted to the oryx populations.

(9) Only employing members of the local tribes as rangers leads to favouritism regarding the enforcement of reserve rules on fellow tribe members.

(10) The oryx is a fragile species for ecotourism, and easily disturbed..

GOALS

1. To stop chronic poaching within 1 year in Saudi Arabia,(Uruq Bani Ma'arid) and as soon as possible in the Arabian Oryx Sanctuary in Oman.

2. To enforce the law in protected areas with Arabian oryx reintroduced populations. This includes poaching , grazing control, overgrazing recovery plans, off-road driving by tourists.

3. To activate the existing Committee for the Coordination of Conservation of Arabian oryx reintroduction, as formed in January 2000.

4. To decrease the uncontrolled and unmanaged captive breeding; to support the creation of carefully managed captive Arabian gene pools..

5. ;To improve general public awareness towards Arabian oryx conservation in the Arabian peninsula.

6. To increase the involvement of local communities in ex situ and in situ stages Arabian oryx conservation projects .

7. To implement the Arabian Oryx Sanctuary management guidelines of the Sultanate of Oman..

8. To rebalance the sex ratio of the Oman reintroduced Arabian oryx populations.

9; Evaluation of interspecific competition between livestock and Arabian oryx; evaluate risk of disease transmission between livestock and Arabian oryx populations

10. To investigate in the literature previous experiences of impact concerning the use of Hippotraginae in ecotourism.

11. To draw the standards and guidelines for the sustainable use of Arabian oryx in ecotourism.

Actions

Responsibilities:

Many of the decision makers that will be involved with implementation of conservation actions for the Arabian Oryx were not present at the meeting, consequently responsibilities of the participants of the workshop to ensure implementation of the suggested actions must be limited to making sure that the recommendations reach the right institutions and people.

In general, unless otherwise stated:

- Abdulrab al Hemeri (Abu Dhabi) will make sure that the recommended action points are brought to the attention of the CCCAO (Committee for the Coordination of Conservation of the Arabian Oryx), the secretariat and chairmanship of which is presently located in Abu Dhabi.
- Moh. Al-Shuaili (Sultanate of Oman), will provide a list of names and addresses for the institution mentioned below that carry authority for implementation of conservation actions for the Arabian Oryx in Oman. These include: The White Oryx Project, Ministry of Regional Municipalities and Environment, Royal Oman Police and the Ministry of the Interior. These should receive a copy of the report and be requested to take the recommended actions into account.
- Abdulaziz Khalidi (Kingdom of Saudi Arabia) will make sure the recommendations reach the responsible people in KSA (Dr Hany Tatwany and colleagues).

Implementation of the recommended actions is not only the responsibility of the range states. Financial and technical support may also need to be found outside the Arabian peninsula.

FOR THIS REASON WE RECOMMEND THAT THE REPORT OF THE ORYX GROUP OF THIS CAMP MEETING BE BOUND SEPARATELY, SO IT CAN BE HANDED OVER DIRECTLY TO THE RESPONSIBLE POLICY MAKERS FOR THIS SPECIES.

GOAL 1. Prevent reoccurrence of chronic poaching within 1 year in Saudi Arabia, (Uruq Bani Ma'arid) and as soon as possible in the Arabian Oryx Sanctuary in Oman.

Saudi Arabia

At this moment, rangers go to the Coast Guard Training Center for training in anti-poaching techniques.
However, they are officially still civilians falling under the NCWD (National Commission for Wildlife Conservation and Development) and can not carry heavy arms. Rangers are not involved in scientific field work.

→ The current rangers should be placed directly under the Ministry of the Interior so they can officially carry arms.

Oman

In Oman, rangers have both a "policing" task and a scientific monitoring task. Giving them official police authority would mean that they would fall under one ministry for one part of their task (policing) and another ministry for another part of their task (wildlife management and monitoring in the reserve). This is practically not feasible. Therefore a different approach is needed in Oman than in KSA.

Reaction to the current poaching threat:
It is recommended that rangers are supported by giving them more possibilities to act by providing them with modern anti-poaching equipment: better cars and communication equipment (as soon as possible – within 5 years)

It is also recommended to balance the existing White Oryx project rangers force by recruiting more rangers, including those from other tribes (as soon as possible - within 5 years)

It is recommended to provide training on how to deal with professional poachers – long term (continuous)

To increase cooperation with the Royal Oman police and Wali Offices by increasing awareness of the importance of the police task in the protection of the Arabian oryx – long term

Prevention (reduce the motivation for poaching):

Poachers can not poach without the help of local guides in order to find their way and to find the animals.

We recommend that this may be counteracted by increasing the efforts to convince local people of the importance of conserving the Arabian oryx. This could be achieved if local people experience economical benefits of living in the same habitat as the Arabian oryx. Important in this regard is to educate local people, including school children, on the importance of wildlife conservation and desert ecology.

GOAL 2. To implement law enforcement in protected areas with Arabian oryx reintroduced populations. This includes poaching , grazing control, overgrazing recovery plans, off-road driving by tourists.

FOR ALL RANGE COUNTRIES:

Once oryx have been poached it is extremely difficult to discover where they have gone. Additionally there is no or little exchange of information on oryxes kept in collections. This makes law enforcement very difficult.

It is suggested to investigate the possibility of new legislation to register all institutions (private and non-private) holding Arabian oryx (and possibly other non-domestic species), to register all individuals in these institutions and to update this on a regular basis.
(This action is also a stepping stone towards goal no.4)

OMAN

Off road driving:
In the Arabian Oryx Sanctuary there are no regularly maintained roads/tracks. In consequence a lot damage is caused by four wheel drive vehicles.
There are settlements within the protected area (Arabian Oryx Sanctuary). Camels are used less and less and are replaced by four wheel drive vehicles
Entry and exit to the Arabian Oryx Sanctuary along the main access roads is not controlled.

It is recommended to:

- ***assign but more importantly maintain designated tracks to be used by the inhabiting tribes and by the rangers and researchers (whenever they can) – within 5 year; starting immediately***
- ***investigating the possibility of establishing and controlling an official point of entry and exit (education centre, visitor centre …) – long term***

General:
Better inform the people on existing legislation affecting the Arabian Oryx and the Arabian Oryx Sanctuary, by using sign boards (not only text signs but also pictorial signs (for illiterate people) at the main entry points of the sanctuary, around the main roads, around the settlements, and other obvious places.. (within 5 years)

GOAL 3. To activate the existing Committee for the Coordination of Conservation of Arabian Oryx reintroduction, as formed in January 2000.

Most, if not all, steps necessary to come to an overall action plan for the Arabian Oryx, involving all range countries and all *in situ* and *ex situ* activities/contributions, are outlined in the goals of the Committee for the Coordination of Conservation of the Arabian Oryx, formed in Muscat, 29-31 January 2000.

It is recommended that the newly formed CCCAO meets as soon as possible in order to:

1) ***start the implementation of the goals and actions outlined in the document "General Recommendations of the Constituting Meeting of the Coordinating Body for the Conservation of the Arabian Oryx" (Sultanate of Oman, Ministry of Regional Municipalities and Environment- Jan 2000)***
2) ***consider the recommendations made by the current camp working group.***
3) ***come to on overall action plan for the conservation of the Arabian Oryx, involving all range countries and all in situ and ex situ activities/contributions.***

GOAL 4. To decrease the uncontrolled and unmanaged captive breeding; to support the creation of carefully managed captive Arabian gene pools.

Considering that there are still only about 710 Arabian oryx in the wild, distributed over three populations, the captive population has a critical role to play as a pool of animals for further reintroductions, and as back up population for the wild population. It therefore is essential that all captive animals, in the Arabian peninsula and in the rest of the world, are properly managed.

It is recommended that all institutions holding Arabian Oryx in the Arabian peninsula (including private collections), introduce for themselves a basic form of management in their herd(s) to make maximum use of the available genetic variation (as is already the case in Taïf, Sharjah, H.H. Sheikh Butti Maktoem etc.).

This includes:

- develop a form of register including all available information on animals in your collection (e.g. origin of founder stock, family relationships and/or broad genetic lines, number of births, number of deaths, death causes)
- to provide individual identification of animals by means of ear tags, or ear notches, or microchips, or tattoos, or… etc.
- terminating breeding with animals that look phenotypically substantially different from wild oryx

In order to avoid successive inbreeding and to secure long term survival of this species in the Arabian peninsula, it is strongly recommend that national and/or regional register(s) are established in which member institutions agree to work together to exchange animals and information (on the animals and on husbandry). There is enough expertise already in the Arabian peninsula to immediately start this type of cooperation among institutions that are already willing to participate in this.

Action:

It is recommended that this activity be started immediately in the form of a regional register containing data from those institutions already willing to participate. Arabia's Wildlife Centre, Sharjah, would be willing to perform this role and will communicate with the Secretariat of the Committee for the Coordination of Conservation of the Arabian Oryx

Conservation Assessment and Management Plan (CAMP)
For The
Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the
Arabian Leopard, Tahr, and Arabian Oryx

SECTION 5

Arabian Leopard: Action Plan and Reports
(Panthera pardus nimr)

Arabian Leopard Executive Summary

The captive management group of the Arabian leopard met prior to the CAMP and produced a number of recommendations. The group wants to evolve into a valuable tool for the management of the Arabian leopard in captivity, and it is ready to take on further responsibilities as needed.

The first task of the CAMP group work was to fill in the Taxon Data Sheet. This led to a lot of discussions on various aspects with a wealth of details from all countries, but also a clear demonstration of lack of information. One of the open questions concerned population estimations. For each region a minimum and a maximum was given and it added up to a total population of 82 to 290 animals. This was more than given at last year's CAMP workshop. Nevertheless, everybody agreed that the leopard population is decreasing. The discrepancy was explained by the fact that more information was available this year.

The group then identified 6 groups of threats and ranked them as follows: (1) habitat loss, (2) human persecution, (3) shortage of wild prey, (4) lack of legislation, (5) lack of baseline information and (6) public awareness. In each of these 6 categories, factors causing the threat were listed.

In the next step, goals were defined to reduce or eliminate these threats. Some of the prominent ones were (1) develop the appropriate legislation where needed, (2) improve the law enforcement, (3) limit the increase of livestock (which is responsible at the first place for the habitat deterioration), (4) develop community assistance for leopard presence, and (5) define the target groups for public awareness programs.

Finally, specific actions were listed that can be performed in the short term (12-18 months). The first one was to establish a leopard working group in each country within the leopard's range, draft a status report for each country involved, prepare training material for field workers, produce a poster for police stations and the general public, and organize the following meetings: (1) Leopard working group meetings in each country by June 2001, (2) a first meeting of the advisory group in fall 2001 in Sharjah, and (3) a workshop on field techniques and monitoring in Yemen probably in early 2002.

ARABIAN LEOPARD *PANTHERA PARDUS NIMR*
COMMENTS AND POINTS OF GENERAL DISCUSSION

GROUP MEMBERS

Sean McKeown (facilitator)
Ahmed Boug (KSA)
Patrick Paillat (KSA)
Abdulrachman Khoja (KSA)
Robert Llewellyn Smith (RAK)
Ali Salem Bait Saeed (Oman)
Hormoz Asadi (Iran)
Khalid Al-Asbahi (Yemen)
Gary Fuelner (Dubai)
Kevin Budd (AMC)
Beth Fairclough (AMC)

Distribution & Habitat

The Arabian Leopard is an opportunist capable of surviving in a variety of habitats from sparsely vegetated mountainous areas to gravel plains and Juniper forests anywhere between sea-level and 3'000 m provided there is an adequate prey base (Nubian Ibex, Arabian Tahr, Rock Hyrax, Gazelle and feral Goats) and permanent water.

It seems that the Arabian leopard avoids areas of human inhabitation, possibly as a result of hunting over a very long time period. Historically there have been very few reports of attacks on people.

Despite this, the leopard's current distribution appears to be restricted to a few isolated regions in each of the range states, effectively confining the leopard to between 5 – 9 subpopulations. Numbers in the Musandum (Oman) and the mountain ranges (Hajar & Shimyyaliyah) along the east coast of the Northern Emirates appear to be low, with nothing having been reported where the Hajar range extends into northeastern Oman. However there is a significant increase in numbers further south, especially in the region of Jebel Samhan in Oman and Al Wadah in Yemen. In Saudi Arabia, there are probably two populations in the Asir and Hijaz ranges.

With such a fragmented population dispersal routes and corridors connecting them need to be identified to enable effective population management.

Despite the probably highly fragmented distribution, the total area of occurrence is larger than 20'000 km^2. The area of occupancy is estimated to be larger than 2000 km^2.

The suitable habitat is estimated to have decreased by 20% over the last 20 years. The cause of decrease is located in expanding settlements and increase in livestock. Human interference and climatic change have led also in a decline in the quality of the habitat.

Threats & Trade

With the decrease of both habitat quantity and quality during the past 20 years, which has lead to an increase in conflicts with the expanding human population, the persecution of the leopard has increased.

Increased stock farming in Jebel Qara, Dhofar region, Oman has resulted in increased hunting of leopards.

Trade

Besides the conflict around livestock losses, the persecution for trade is a considerable threat to the leopards. Trade is both happening domestic and international. Live animals as well as parts are traded (Fat, bones, skins). Yemen seems to be the source of many animals appearing in the trade.

Situation in the countries:
Oman: no trade; Yemen: trade is happening; Saudi Arabia: some trade is happening. The trade occurs within the Arabian peninsula. It is not clear whether all animals appearing on the market are Arabian leopards. Hair samples have been collected and given to Dr. Nader of the King Khalid Wildlife RC. The discussion about the status of sub-species comes up again. There is some confusion what has been analyzed at the lab of S. J. O'Brien so far.

Animals are most often not specifically killed for the bones and fat, but if there is a dead animal, these are used and sold for medicinal purposes. The animals are mostly killed to get rid of the problems with livestock.

Since the last CAMP (Feb 2000) there have been two(1.1) cases of animals having been brought into Saudi Arabia from Yemen.

There is a report of 1 students having trapped and then shot a leopard on the UAE side in the Musandum between the 3 – 8 February 2001. Nothing more is known, what is to become or has become of the carcass is not known.

Population numbers and trend
All known subpopulations were listed and a minimum and maximum number was estimated. The global population comes out as 82 to 290 individuals. 2 of the 9 possible subpopulations may have as many as 100 individuals, the others probably less than 20. The number of mature animals in all populations is certainly less than 250.

Country	Area	Low	High
UAE	Musandan	5	15
Oman	Hajar range	unk	unk
	Dohfar region Jabal Sanham Jabal al Qama	 17 10	 50 30

	Jabla al Qamar	6	15
Yemen	Al Wadah Al Mahra Al Hawf	20 10 unk	100 20 unk
Saudi Arabia	Asir Mountains Hijaz Mts	4 10	20 40
TOTAL		82	290

Although the estimated numbers are higher than last year, the population is stated as declining. This discrepancy is attributed to the increasing interest in the species (more observations reported) and to the fact that people this year came better prepared and brought numbers along. However, the number are mainly based on indirect information and literature. Only very few field study are underway that can produce population numbers. In Oman, they have run a photo trap project 1997-2000 in a protected area, where they could identify as many as 9 different individuals. There is limited fieldwork going on in Saudi Arabia, the UAE and Yemen.

There have been no reports of leopards in northern Oman for the past 15 to 20 years although there appears to be a healthy population of Tahr. The same situation exists in the Hawf region of Yemen, there is a stable population in the Dhofar region of Oman and it is not inconceivable that this population extends into Yemen.

The rate of decline is estimated 51-80% over the last 30 years. There are reports from a Oman Special forces commander based in the Musandum of dozens of Leopards having been shot between 1970 to 1986.

Legal Status and Protected Areas

The species is listed as critically endangered in international red data books. On national levels, there are only general laws, there is nothing specific for the leopard. The species is listed in Oman's National Red Data book. So far, there is one protected area established for the leopard: Jabal Samhan in Oman.

Supporting research

As there is a lack of baseline data on the ecology of the Arabian leopard, research on various aspects is needed for an effective management.

Arabian Leopard Working Group

Goals and Actions

GROUP MEMBERS

Sean McKeown (facilitator)
Ahmed Boug (KSA)
Patrick Paillat (KSA)
Abdulrachman Khoja (KSA)
Robert Llewellyn Smith (RAK)
Ali Salem Bait Saeed (Oman)
Hormoz Asadi (Iran)
Khalid Al-Asbahi (Yemen)
Gary Fuelner (Dubai)
Kevin Budd (AMC)
Beth Fairclough (AMC)
Urs Breitenmoser (IUCN/SSC Cat SG)
Christine Breitenmoser-Würsten (IUCN/SSC Cat SG)

Goals

A) LEOPARD WORKING GROUP (LWG)

Establish a leopard working group in each country within the Arabian leopard range. The members will be trained to do the field work (monitoring, information, interviews, reporting).

Some of the countries have already started this process. In Yemen, they have a public awareness section established in the Council of Environment. In Oman, a group of rangers is already working in the field (in Dhufar and in Musandum).

The main tasks of these groups will be:

- Survey and monitoring
- Rise public awareness (bring the leopard to the people, improve the image)
- Dealing with depredation and problem animals (identify prey killed by leopards, analyze killed leopards, identify problem animals)
- Identify conflicts and needs of the local communities

The present Captive Breeding Management Group of the Arabian leopard will be expanded to include field experts and should be known as the Arabian Leopard Advisory Group in the future. The main function will be to coordinate the efforts of the four leopard working groups.

Arabian Leopard Advisory Group
EEPA will coordinate the activities
and chair the group

LWG Yemen	LWG Saudia Arabia	LWG Oman	LWG UAE

B) Goals for the defined threats

Threat "Habitat Loss"

a) Limit the increase of livestock to the carrying capacity of the habitat in the 5 core areas of leopards in order to prevent over grazing.
b) Stop subsidies for livestock in the five core areas.

"Human development"
Limit infrastructure development in the five core areas.

"Tree cutting"
No tree cutting in the five core areas or only in the traditional way of tree cutting (e.g. in Yemen) that guarantees the survival of the trees.

Threat "Human persecution"

a) Develop legal protection.
b) Establish community assistance for the presence of predators
c) Handle problem animals (leopards that repeatedly kills livestock):
    a. Radio-collar and track the animal to gain information on predator-livestock interaction and the possibility to develop preventive measures (protect livestock from attacks of predators).
    b. Add the animal to the captive breeding program.
    c. Translocate it to another area.

Threat "Prey enhancement"

a) Stop hunting of leopard prey (a.o. hyrax, gazelle, thar, ibex, porcupine); This requires a law in UAE, Yemen and Saudi Arabia.
b) Research on leopard diet in order to be able to target more important prey species for management.
c) Establish livestock management.

Threat "Legislation"

a) Laws that are specific on stopping hunting and trapping of leopards must be implemented. Clear penalties have to be defined in UAE, Saudi Arabia and Yemen.
b) Improve the law enforcement through training and information of police, wardens, rangers, army, border people about the existing wildlife laws.

c) Establish more protected areas where wild leopards exist (in the core area of the 5 sub-populations; core area: area where reproduction occurs).
d) Improve or establish the enforcement of CITES at borders and within countries.

Threat "Lack of information"

a) Carry out surveys in Saudi Arabia, Yemen, and UAE. Extend the survey area in Oman

Recommendations should be made where and how official surveys should be performed.
A two-level survey would be appropriate: an intensive survey with trained people in the field, and a data base with information from the whole potential leopard range.

Recommendation concerning the areas:
Saudi Arabia: Al Baha
Yemen: Howaf, Mahara, Wadah
Oman: Musundum in the north and Jabel Qamar should be included into the survey. In Jabel Qamar efforts are undertaken to establish a new reserve. This is heavily recommended by the CAMP workshop.

Methods: develop common survey methods
Yemen offers to host a workshop on survey methods, where people from Saudi Arabia, Oman and UAE would attend. It needs assistance and support for this. Yemen would like to use the opportunity of this technical workshop for a public awareness campaign and the decision maker.

b) Dispersal routes
   - Project start 2001 in Oman to radio track leopards with Satellite telemetry. The collars will work for 1 year and then the data can be retrieved.
   - Initiate a project to radio track leopards in Yemen with animals that are caught in traps by local people.

c) Life history
   - Compile data on life history. These data will come together from the survey and the two radio-collar projects in an initial phase.

d) Population size
   - Data will come together from the survey and the two radio-collar projects.

Threat "Public awareness"

a) Target groups for a public awareness campaign:
   i. Local communities in the leopard area
   ii. Decision makers (political ministries, police, customs)
   iii. School children
   iv. General public
b) Carry out human dimension research: Find out about the reasons of the attitude of the local communities.

c) Define the main message for each of this groups and produce material to bring this message to the people (exhibition, poster, etc.)

Status of public awareness work:
Yemen has started a) and b). Oman has a Directorate of Public Awareness in the Ministry that works with eight sub-regions in the country. Basic facilities are available, but the system needs expansion.

Actions – Leopard group

1. Establish *leopard working group* groups in the respective countries.
Each countries leopard working group should include decision makers and experts in ecology and public awareness. This has to happen within the next 6 months. Two to three people in each country are responsible for getting started:

Saudi Arabia: Patrick Paillat, Abdulrachman Khoja
Yemen: Naji Thowabeh, Hussein Guneid
Oman: Ali Salem Bait Saeed, Ali Amar Al Kaumy, Andrew Spalton
UAE: Kevin Budd (EEPA), Chris Drew (TERC)

A minimum of three representatives (one decision maker, one expert of field research, one expert of captive breeding) of each country will be in the international advisory group. Abdulaziz offered to coordinate the first phase. If the *leopard working group* in the countries are established, they report the members of the group to Abdulaziz al Midfa.
Each *leopard working group* should meet before June for a first time to elect the representatives. The international group will meet for a first time in October.

What is the relationship between the Arabian leopard Advisory Group (ALAG) and the Captive Breeding Management Group? The people involved in captive management will be members of the *leopard working group* and be involved in the ALAG. The structures have to be as simple as possible

Next steps:

	MEETING
- DO IN BETWEEN	**PLACE/DATE**
- Set up leopard working group	April
- Provide checklist for status report (Cat SG)	March
- Produce poster	
National leopard working group meetings	June
- Draft status report	
- Identify field workers	

1st Arabian Leopard Advisory Groups	Sharjah, October
- Produce training material	
Workshop on field materials	Yemen, time to be defined

---

2) Initiate co-operation between Sharjah, Fujayrah and Ras Al Khaiman and the Omani government regarding a leopard survey in the north of the leopard range.

Conservation Assessment and Management Plan (CAMP)
For The
Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the
Arabian Leopard, Tahr, and Arabian Oryx

SECTION 6

IUCN 2000 Red List Categories and Criteria (Ver. 3.1); Taxon Data Sheet; and CBSG Workshop Processes

.

Conservation Assessment Management Plan
Taxon Data Sheet for _____

Working Group: **Date:**

PART ONE

1. Scientific Name (With authority and date):

_____
_____

1A. Synonyms: _____
_____

1B. Scientific nomenclature:

$1B_1$. Family: _____
$1B_2$. Order: _____
$1B_3$. Class: _____

1C. Common name(s) with language:

_____
_____

1D. Taxonomic level of assessment: ☐ Species ☐ Sub species ☐ Variety ☐ Form

1E. Country:

2. Distribution of the taxon

2A. Habit or life form (only plants):

_____

2B. Habitat of the taxon (ecosystem level):

_____
_____

2C. Habitat specificity (niche, elevation, etc.):

_____
_____

2D. Historical distribution (Global -- in past 100 years described by country):

_____
_____

2E. Current distribution (listed by country):

_____
_____

2F. Current geographic extent of taxon's distribution being assessed in this workshop (i.e. county, province, state, country, etc.):

_____
_____

2G. Concentrated migration sites (using political units):

_____

3. Approximate **EXTENT OF OCCURRENCE** of the taxon in and around the area of study/ sighting/ collection (Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary encompassing all known, inferred or projected sites of present occurrence of the taxon): (tick appropriate box)

☐ < 100 km^2 ☐ 101 - 5,000 km^2 ☐ 5,001 - 20,000 km^2 ☐ > 20,001 km^2

4. Approximate **AREA OF OCCUPANCY** of the taxon in and around the area of study/ sighting/ collection (Area of occupancy is defined as the area occupied by the taxon within the 'extent of occurrence'): (tick appropriate box)

☐ < 10 km^2 ☐ 11 - 500 km^2 ☐ 501 - 2,000 km^2 ☐ > 2,001 km^2

5. Number of Populations and Subpopulations in which the taxon is distributed: _____

6. Habitat status:

Are the subpopulations: ☐ Contiguous ☐ Fragmented ☐Not known

6A. Is there any change in the habitat where the taxon occurs: ☐ Yes ☐ No If yes, Is it a:

☐ Decrease in area ☐ Increase in area ☐ Stable in area ☐ Unknown

6B. If Decreasing, what has been the decrease in habitat (approximately, in percent) over ? years?:

☐ < 20% ☐ > 20% ☐ > 50% ☐ > 80% in the last _____ years

6C. If Stable or Unknown, do you predict a decline in habitat (approximately) over ? years?:

☐ < 20% ☐ > 20% ☐ > 50% ☐ > 80% in the next _____ years

6D. State primary cause of change: _____

6E Is there any change in the quality of habitat where the taxon occurs: ☐ Yes ☐ No If yes,

☐ Decrease in quality ☐ Increase in quality ☐ Stable in quality ☐ Unknown

6F. State primary cause of change: _____

7. Threats:

7A. What are the threats to the taxon? (Circle **present [P]** or **future (predicted) [F]** threats below):

Human interference
Aircraft [P] [F]
Artificial lighting [P] [F]
Damming [P] [F]
Destructive fishing [P] [F]
Fishing [P] [F]
Grazing [P] [F]
Harvest/ Hunting [P] [F]
Harvest for medicine [P] [F]
Harvest for food [P] [F]
Harvest for timber [P] [F]
Loss of habitat [P] [F]
Habitat fragmentation [P] [F]
Habitat loss due to exotic animals [P] [F]
Habitat loss due to exotic plants [P][F]
Overexploitation [P] [F]
Pesticides [P] [F]
Poisoning [P] [F]

Pollution [P] [F]
Powerlines [P] [F]
Road kills [P] [F]
Trade for market or medicine [P] [F]
Trade of parts [P] [F]
Trampling [P] [F]
War [P] [F]

Natural/ Man induced threats
Climate [P] [F]
Disease [P] [F]
Decline in prey species [P] [F]
Drowning [P] [F]
Edaphic changes [P] [F]
Genetic problems [P] [F]
Hybridization [P] [F]
Interspecific competition [P] [F]
Interspecific competition from exotics [P] [F]

Interspecific competition -livestock [P] [F]
Nutritional disorders [P] [F]
Predation [P] [F]
Predation by exotics [P] [F]
Siltation [P] [F]

Catastrophes
Drought [P] [F]
El Nino [P] [F]
Fire [P] [F]
Hurricane [P] [F]
Landslide [P] [F]
Tsunami [P] [F]
Volcano [P] [F]

Other threats (please specify): _____

7B. Are these threats resulting in (perceived or inferred) or may result in (predicted) population decline?:
☐ Yes ☐ No; If yes, indicate which threats are resulting or may result in population decline:
_____

8. Trade:

8A. Is the taxon in trade?: ☐ Yes ☐ No If yes, is it

☐ Local ☐ Domestic ☐ Commercial ☐ International

8B. Parts in trade:

	☐ Skin	☐ Bones	☐ Fur
☐ Hair	☐ Horn	☐ Organs	☐ Glands
☐ Meat	☐ Taxidermy models	☐ Live animal	☐ Products
☐ Whole plants	☐ Flowers	☐ Seeds	☐ Roots

☐ Others, please specify
_____

8C. Which form of trade (specified form) is resulting in a perceived or inferred population decline?:
_____
_____

9. Population numbers:

9A. Global population: _____

9B. Populations and Subpopulations (No. of individuals in each):
_____

9C. Number of **Mature Individuals** (in all populations): ☐ < 50 ☐ < 250 ☐ < 2,500 ☐ > 2,500

9D. Average age of parents in population:_____

10. Population trends:

10A. Is the population size/ numbers of the taxon:
☐ Declining ☐ Increasing ☐ Stable ☐ Unknown

10B. If Declining, what has been the rate of population decline perceived or inferred:
☐ < 20% ☐ > 20% ☐ > 50% ☐ > 80% in the last _____ years/ generations

10C. If Stable or Unknown, do you predict a future decline in the population. ☐ Yes ☐ No
If yes, please specify rate and factors e.g. habitat loss, threats, trade, etc._____

☐ < 20% ☐ > 20% ☐ > 50% ☐ > 80% in the next _____ years/ generations

11. Data Quality:

11A. Are the above estimates based on:
☐ Census or monitoring ☐ General field study ☐ Informal field sighting ☐ Literature
☐ Indirect information such as from trade, etc. ☐ Museum/herbarium studies/records
☐ Hearsay/ popular belief

12. Recent field studies (in the last 10 years). Indicate year of study not year of publication.

Researcher names	Location	Dates	Topics

PART TWO

13. Conservation Status:
Current Status

13A. Current IUCN Red List Category: Global _____ National _____

13B. CITES: _____

13C. National Wildlife Legislation: _____

13D. National Red Data Book: _____

13E. International Red Data Book: _____

13F. Other legislation (please specify): _____

13G. Known presence in protected areas (please list): _____

13H. National or regionally endorsed protection plan: _____

Assigned Status

13I. Assigned IUCN Red List Category: _____

13J. IUCN Criteria based on: _____

PART THREE

14. Supporting Research recommended for the taxon: ☐ Yes ☐ No If yes, is it

☐ Survey studies ☐ Genetic research ☐ Taxonomic research ☐ Life history
☐ Limiting factor research ☐ Epidemiology ☐ Trade
☐ Others (taxon specific)_____

14A. Is Population and Habitat Viability Assessment recommended: ☐ Yes ☐ No ☐ Pending

15. Management recommendations for the taxon:

☐ Habitat management ☐ Wild population management ☐ Monitoring ☐ Translocation
☐ Sustainable utilization ☐ Public education ☐ Genome Resource Banking
☐ Limiting factor management ☐ Captive breeding ☐ Work in local communities
☐ Others_____

16. If **Captive Breeding/Cultivation** is recommended, is it for:
☐ Species recovery ☐ Education ☐ Reintroduction ☐ Benign introduction
☐ Research ☐ Husbandry ☐ Preservation of live genome

17. Do **Captive stocks** already exist: ☐ Yes ☐ No If yes,

17A. Names of facilities:_____
_____

17B. Number in captivity: Male _____ Female _____ Unsexed _____ Total _____ Not known ☐

17C. Does a coordinated **Species Management Program** exist for this species : ☐ Yes ☐ No
If yes, which countries (if country, which institutions):_____
_____

17D. Is a coordinated **Species Management Program** recommended for the range country(ies) ?
☐ Yes ☐ No (please specify countries) _____

18. Level of captive breeding/cultivation recommended:

☐ A. Ongoing captive program intensified or increased ☐ B. Ongoing captive program decreased
☐ C. Initiate captive program within 3 years ☐ D. Initiate captive program in 3 years
☐ E. Pending recommendation from a PHVA workshop ☐ F. No captive program recommended

19. Are techniques established to propagate the taxon:

☐ Techniques known for this taxon or similar taxon ☐ Some techniques known for taxon or similar taxa
☐ Techniques not known at all ☐ Information not available with this group of compilers

20. Other comments: _____

_____

_____

_____

_____

PART FOUR

21. Sources (complete citation):

_____

_____

_____

_____

_____

_____

22. Compilers: _____

_____

_____

23. Reviewers: _____

_____

TAXON DATA SHEET: ORGANIZATION AND DEFINITIONS

The Conservation Assessment and Management Plan (CAMP) **Taxon Data Sheet** is a working document for recording information that can be used to assess and categorize the degree of threat to a taxon using the IUCN Red List Criteria and recommend conservation action. This sheet has four parts.

- Part one (numbers 1 -12) summarizes taxonomic and biological information on the taxon and asks for information on population, distribution, demography, habitat, threats.

- Part two (number 13) provides space for the current conservation status categorizations according to IUCN, regional, national, and legal criteria, as well as the IUCN Red List category as derived during the CAMP workshop from information in items 1 – 12.

- Part three (numbers 14 -19) requests suggesting suitable steps for management of the taxon, both in the wild and in captivity.

- Part four (numbers 20 -23) are for information sources, both published and unpublished, the names of the compilers or contributors to the completed Taxon Data Sheet and the names of the reviewers.

The completed Taxon Data Sheets for different groups of organisms will differ slightly. A major advantage of the revised IUCN Red List Categories is that they are applicable across all taxon groups. The IUCN Red List Categories are described in Appendix III of this document.

The CAMP Taxon Data Sheet is keyed to the IUCN Red List Criteria. The Taxon Data Sheet has been made more "user-friendly" so that participants can tick boxes instead writing in much of the sheet. It is also more "data friendly" to accommodate the computerized data entry program. This sheet asks for information from which the conservation status of the taxon in the wild can be derived. The information can also be used for making research and management recommendations.

DEFINITIONS OF TERMS USED IN THE TAXON DATA SHEET

This section of the CAMP Reference Manual defines precisely what data are included in each Part of the Taxon Data Sheet and also links the Taxon Data Sheet directly with the IUCN Guidelines to the Red List categories (see Appendix III). If complete information is not available for any species, details can be added to the sheets after the workshop when the Draft Report is circulated for review. Participants should make a note of incomplete taxa so information can be added later.

PART ONE

1. Scientific name (with authority and date): Scientific names of extant taxa -- genus and species (or subspecies where appropriate). The name should be followed by the authority (author's) name and date of description.

1A. Synonyms: List scientific synonyms and ambiguities with authority.

1B. Scientific nomenclature: List the Family ($1B_1$), Order ($1B_2$) and Class ($1B_3$) to which the Taxon belongs.

1C. Common name(s) with language: List known common names in English, and vernacular names followed by the language in parenthesis.

1D. Taxonomic level: This indicates the taxonomic level of assessment (e.g., species or subspecies). Taxonomic uncertainties may be discussed in this section. Subspecies not considered separately should be listed here along with their distribution.

1E. Country: List the country(ies) where the taxon is found. If the taxon is located in more than one country but is primarily found in one, please note which is the 'primary' country.

2. Distribution of the taxon

2A. Habit or Life form: List habit or life form of the taxon (plants only).

2B. Habitat (ecosystem level): Indicate the habitat in which the taxon reside using standard national classifications of ecosystems. Standard national classification of vegetation types may be used as guidelines.

2C. Habitat specificity: Indicate the specific niche or microhabitat of the taxon. Elevation or altitude range should be mentioned.

2D. Historical distribution: Record the historical global distribution of the taxon in the past 100 years (by country).

2E. Current distribution: Note the current geographic extent, including breeding and wintering locations of the taxon.

2F. Current geographic extent of taxon's distribution being assessed in this workshop: Record the geographic distribution of the taxon <u>in the region being covered in the current exercise</u> using political units/divisions (i.e. county, province, state, country, etc.).

2G. Concentrated migration sites (using political units): If applicable, specify origin and destination of the migration route (specify locale/country along migration route where the taxon may face some degree of threat).

3. Extent of occurrence: If possible, list the actual size of the area in which the taxon occurs. Also list the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy (see Figure 1 below). This measure does not take account of discontinuities or disjunction in the spatial distribution of taxa. Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

The Extent of Occurrence is one criterion under which a taxon can qualify for one of the IUCN Red List categories of Threat. If the Extent of Occurrence is:

- less than 100 km^2 see **"criteria B" for CR**
- less than 5,000 km^2 see **"criteria B" for EN**
- less than 20,000 km^2 see **"criteria B" for VU**
- more than 20,000 km^2 see **Area of Occupancy** described below :

4. Area of occupancy: List the area within the 'extent of occurrence' which is actually occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of a taxon (e.g., colonial nesting sites, feeding sites for migratory taxa). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon. The criteria include values in km^2, and thus to avoid errors in classification the area of occupancy should be measured on grid squares or equivalents which are sufficiently small (see Fig. 1).

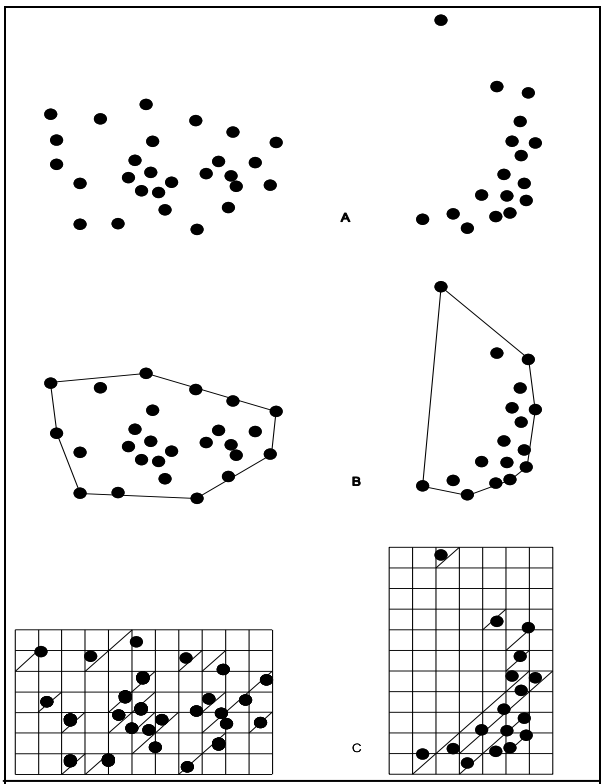

Figure 1: Two examples of the distinction between extent of occurrence and area of occupancy. (a) is the spatial distribution of known, inferred or projected sites of occurrence. (b) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (c) shows one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

The Area of Occupancy is one criterion under which a taxon can qualify for one of the IUCN Red List categories of Threat. If the Area of Occupancy is

- less than 10 km^2, see **"Criteria B" for CR**
- less than 500 km^2, see **"Criteria B" for EN**
- less than 2,000 km^2, see **"Criteria B" for VU**

If Extent of Occurrence and Area of Occupancy are not limited to less than 20,000 km^2 and 2,000 km^2 respectively, the criteria for threat due to restricted distribution does not apply.

5. Number of populations and subpopulations: Note the number of populations (and, if appropriate, subpopulations) of the taxon. The term 'Subpopulations' refers to a set of individuals sites not likely to allow exchange by natural means.

6. Habitat status:

6A. Indicate whether or not the habitat in which the taxon occurs is fragmented (fragments are sites within a subpopulation where some degree of natural exchange can occur).

6B. If there is a change in habitat, indicate change as percent over the last number of years.

6C. If the status has not changed, indicate a percent of change if your predict so in the future.

6D. State the primary cause of change either in the past or in the future.

6E. Indicate the status of the **quality of habitat** in which the taxon is distributed.

6F. If there is a change in the status of quality of habitat, indicate primary cause for the change.

7. Threats: Identify present or predicted future events that are threats to the taxon. Circle the choice in 7A and indicate in 7B if there is any population decline due to any or all of these threats.

7A.

Human interference

Aircraft
Artificial lighting
Damming
Destructive fishing
Fishing
Grazing
Harvest/Hunting
Harvest for medicine
Harvest for food
Harvest for timber
Loss of habitat
Habitat fragmentation
Habitat loss due to exotic animals
Pollution
Powerlines
Road kills
Trade for market or medicine
Trade of parts
Trampling
War

Natural/Man induced threats

Climate
Disease
Decline in prey
Drowning

Interspecific competition – livestock
Nutritional disorders
Predation
Predation by exotics
Siltation

Catastrophes
Drought
El Nino
Fire
Hurricane
Landslide
Tsunami
Edaphic factors (due to fertilizers, pesticides, fire)

Others (please specify)

8. Trade: Is the taxon in trade? If so, indicate the level of trade in 8A, parts in trade in 8B and its effect on the population in 8C.

9. Population numbers:

9A. Global population: List the estimated numbers of individuals in the wild. If specific numbers are unavailable, estimate the general range of the population size.

9B. Population and Subpopulations: List the estimated number of individuals in any particular population or subpopulation for which there are data, followed by the location.

9C. Number of mature individuals: Indicate the number of mature individuals in the entire population.

9D. Average age of parents: Indicate the number of years in a generation. A generation is defined as the average age of parents in the population.

10. Population trends - % change in years or in generations: If possible, list the trend of the population (stable, declining, or increasing) in 10A, 10B and 10C.

11. Data Quality: List the actual age of the data used to provide 'population estimate'. Also list the type of data from which the estimates are provided.

Reliable census or population monitoring
General field study
Informal field sightings
Indirect information (trade numbers, habitat availability).
Museum/ herbarium studies/ records
Literature
Hearsay/popular belief

Record a combination if there is inconsistent data quality in different parts of range.

12. Recent field studies: List any current or recent field studies (in the last 10 years), the name of the researcher and the location of the study. Quote only study dates. Do not quote publication dates (publications form these studies can be listed in the 'Sources' section of the Taxon Data Sheet).

PART TWO

13. Conservation status

13. A-H. Current Status: Record here all current conservation status categorizations for the taxon according to global and national IUCN Red Lists, and any other regional, national, and legal criteria.

13. I and J. Assigned Status: With the information derived during the CAMP workshop (items 1 – 12 of this Taxon Data Sheet), and using the criteria and guidelines in Section III, derive a status according to the IUCN Red List categories. Also indicate the criteria that the treat category is based on. This is explained in full in Appendix III.

EX	=	Extinct	
EW	=	Extinct in the wild	
CR	**=**	**Critically Endangered**	**Threatened categories**
EN	**=**	**Endangered**	
VU	**=**	**Vulnerable**	
LR	=	Lower Risk	
cd	=	Conservation Dependent	
nt	=	Near Threatened	
lc	=	Least Concern	
DD	=	Data Deficient	
NE	=	Not Evaluated	

Conservation status based on: Indicate which of the IUCN Red List criteria in the IUCN Red List Categories document, Appendix III) were used to assign a category of threat. Be sure to list every specific criterion that applies (for example, A1b, B3c, E):

PR	=	Population reduction (A1a, or A2b, etc.)
RD	=	Restricted distribution (B1, or B2a, B3c, etc.)
PE	=	Population estimates (C1, or C2a, etc.)
NM	=	Number of mature individuals (D)
PX	=	Probability of extinction (E)

CITES and other legislation: List CITES Appendix on which the species is listed, if appropriate.

List the status of the taxon if included in any other national or international legislation or Red Data Book

Other: List whether the species has been assigned threatened status in other venues, e.g., nationally or in other conservation assessments.

Known presence in protected areas: Please list all the protected areas in which the taxon is found.

Nationally or regionally endorsed protection plans: Indicate if the taxon is under any kind of protection either nationally or locally.

PART THREE

14. Research recommendations: Based on the threats to the taxa and lacunae areas of study, research recommendations form a part of species recovery program. Indicate the areas of research needed to understand the taxon. The categories within this section are:

Survey
Genetic research/studies
Taxonomic research/studies
Limiting factor research
Life history studies
Epidemiological studies
Husbandry research
Trade
Other (record in detail on Taxon Data Sheet)

14A. Note whether a **Population and Habitat Viability Assessment** is recommended for the taxon.

15. Management recommendations: It should be noted that there is (or should be) a clear relationship between threats and subsequent outlined research management actions. The "Management recommendations" column provides an integrated view of actions to be taken, based on the listed threats. Adaptive management recommendations can be defined as a management program which includes a strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the species to that activity. The categories within the column are as follows:

Habitat management
Translocations
Monitoring
Wild population management
Limiting factor management
Public awareness/education
Sustainable utilization
Genome research banking

Captive breeding/cultivation
Work with local communities
Other (record in detail on Taxon Data Sheet)

16. Captive breeding/cultivation recommendation: If captive breeding/cultivation is recommended in section 15, indicate whether this program is required for any particular reason such as:

Species recovery
Education
Reintroduction/translocation
Benign introduction
Research
Husbandry
Preservation of live genome
Others (record in detail on Taxon Data Sheet)

17. Captive/cultivated stocks: Indicate if there are any captive or cultivated stocks of the taxon. If so list the facilities in 17A, and the number in captivity in 17B. Indicate if a species management program exists (17C) or if such a program is recommended (17D).

18. Captive breeding/cultivation recommendation: If captive breeding/cultivation is recommended, indicate the action to be taken from among these:

Ongoing captive breeding/ cultivation program intensified or increased
Ongoing captive breeding/ cultivation program decreased
Initiate captive breeding/ cultivation program within three years
Initiate captive breeding/ cultivation program after three years
Pending recommendation from a PHVA workshop
No captive breeding/ cultivation required for the taxon.

19. Are techniques established for propagating the taxon in captivity/cultivation: Indicate the appropriate choice:

- Techniques available or in place for breeding/ cultivating the taxon or similar taxa *ex situ*
- Techniques partially known or in place for breeding/ cultivating the taxon or similar taxa *ex situ*
- Techniques not known for breeding/ cultivating taxon or similar taxa *ex situ*
- Information not available about breeding/ cultivating techniques for the taxon among the group of compilers

20. Other Comments: Note any additional information that is important with respect to the conservation of the taxon.

21. Sources: List complete sources used for information for the above data. (Author name, year, title of article or book, journal, issue, and page numbers).

22. Compilers: List the names of the people who contributed information for this Taxon Data Sheet (including people who sent Biological Information Sheets, if they were used.).

23. Reviewers: List the names and affiliations of Taxon Data Sheet Reviewers.

IUCN RED LIST CATEGORIES

Prepared by the

IUCN Species Survival Commission

As approved by the
??th Meeting of the IUCN Council
Gland, Switzerland

? February 2000

IUCN RED LIST CATEGORIES

I. INTRODUCTION

1. The IUCN Red List Categories have been developed as an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. However, while the Red List may focus attention on those taxa at the highest risk it is not the sole means of setting priorities for conservation measures for their protection.

Extensive consultation and testing in the development of the system strongly suggests that it is robust across most organisms. However, it should be noted that although the system places species into the threatened categories with a high degree of consistency, the criteria cannot take into account the life histories of every species. Hence, in certain individual cases, the risk of extinction may be under- or over-estimated.

2. Before 1994 the more subjective threatened species categories used in Red Data Books and Red Lists had been in place, with some modification, for almost 30 years. Although the need to revise the categories had long been recognised (Fitter & Fitter 1987), the current phase of development only began in 1989 following a request from the IUCN Species Survival Commission (SSC) Steering Committee to develop a more objective approach. IUCN Council adopted the new Red List system in 1994.

The new IUCN Red List Categories and Criteria have several specific aims:

- to provide a system that can be applied consistently by different people;
- to improve objectivity by providing users with clear guidance on how to evaluate different factors which affect risk of extinction;
- to provide a system which will facilitate comparisons across widely different taxa;
- to give people using threatened species lists a better understanding of how individual species were classified.

3. Since their adoption by IUCN Council in 1994, the IUCN Red List Categories have become widely recognised internationally and they are now used in a whole range of publications and listings produced by IUCN as well as by numerous governmental and non-governmental organisations. Such broad and extensive use revealed the need for a number of improvements and SSC was mandated by the 1996 World Conservation Congress (WCC Res. 1.4) to conduct a review of the system. This document presents the revisions recommended by the SSC Criteria Review Working Group.

The proposals presented in this document result from a continuing process of drafting, consultation and validation. It was clear that the production of a large number of draft proposals led to some confusion, especially as each draft has been used for classifying some set of species for conservation purposes. To clarify matters, and to open the way for modifications as and when they became necessary, a system for version numbering is as follows:

Version 1.0: Mace & Lande (1991)
The first paper discussing a new basis for the categories, and presenting numerical criteria especially relevant for large vertebrates.

Version 2.0: Mace *et al*. (1992)

A major revision of Version 1.0, including numerical criteria appropriate to all organisms and introducing the non-threatened categories.

Version 2.1: IUCN (1993)
Following an extensive consultation process within SSC, a number of changes were made to the details of the criteria, and fuller explanation of basic principles was included. A more explicit structure clarified the significance of the non-threatened categories.

Version 2.2: Mace & Stuart (1994)
Following further comments received and additional validation exercises, some minor changes to the criteria were made. In addition, the Susceptible category present in Versions 2.0 and 2.1 was subsumed into the Vulnerable category. A precautionary application of the system was emphasised.

Version 2.3: IUCN (1994)
IUCN Council adopted this version, which incorporates changes as a result of comments from IUCN members, in December 1994. The initial version of this document was published without the necessary bibliographic details such as date of publication and ISBN number, but these were included in the subsequent reprints in 1998 and 1999. This version was used for the *1996 IUCN Red List of Threatened Animals* (Baillie and Groombridge 1996) and *The World List of Threatened Trees* (Oldfield *et al* 1998)**.**

Version 3.0: IUCN/SSC Criteria Review Working Group (1999)
Following comments received, a series of workshops were convened to look at the Red List Criteria following which, changes were proposed.

Version 3.1:
The IUCN Council adopted this latest document, which incorporates changes as a result of comments from the IUCN and SSC memberships and from a final meeting of the Criteria Review Working Group, in February 2000.

All new assessments should use the latest adopted version and cite the version number.

4. In the rest of this document the proposed system is outlined in several sections. Section II, the Preamble, presents basic information about the context and structure of the system, and the procedures that are to be followed in applying the criteria to species. Section III provides definitions of key terms used. In Section IV, the categories are presented, while Section V presents the quantitative criteria used for classification within the threatened categories. Section VI is the bibliography. Annex I provides guidance on how to deal with uncertainty, Annex II suggests a standard format for citing the Red List Categories and Criteria, and Annex III outlines the documentation requirements for taxa to be included on IUCN's global Red Lists. It is important for the effective functioning of the system that all sections are read and understood to ensure that the definitions and rules are followed (Note: Annexes I, II and III are not part of the approved rules and will be updated on a regular basis).

II. PREAMBLE

The following information presents important information on the use and interpretation of the categories (= Critically Endangered, Endangered, etc.), criteria (= A to E), and sub-criteria (= 1, 2, etc.; a, b, etc.; i, ii, etc.):

1. Taxonomic level and scope of the categorisation process

The criteria can be applied to any taxonomic unit at or below the species level. The term 'taxon' in the following information, definitions and criteria is used for convenience, and may represent species or lower taxonomic levels, including forms that are not yet formally described. There is sufficient range among the different criteria to enable the appropriate listing of taxa from the complete taxonomic spectrum, with the exception of micro-organisms. The criteria may also be applied within any specified geographical or political area although in such cases special notice should be taken of point 14 below. In presenting the results of applying the criteria, the taxonomic unit and area under consideration should be made explicit in accordance with the documentation guidelines. The categorisation process should only be applied to wild populations inside their natural range, and to populations resulting from benign introductions (defined in the IUCN Guidelines for Re-introductions (IUCN 1998) as "...an attempt to establish a species, for the purpose of conservation, outside its recorded distribution, but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range").

2. Nature of the categories

Extinction is a chance process. Thus, a listing in a higher extinction risk category implies a higher expectation of extinction, and over the time-frames specified, more taxa listed in a higher category are expected to go extinct than in a lower one (without effective conservation action). However, the persistence of some taxa in high-risk categories does not necessarily mean their initial assessment was inaccurate.

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as 'threatened'. The threatened categories form a part of the overall scheme. It will be possible to place all taxa into one of the categories (see Figure 1).

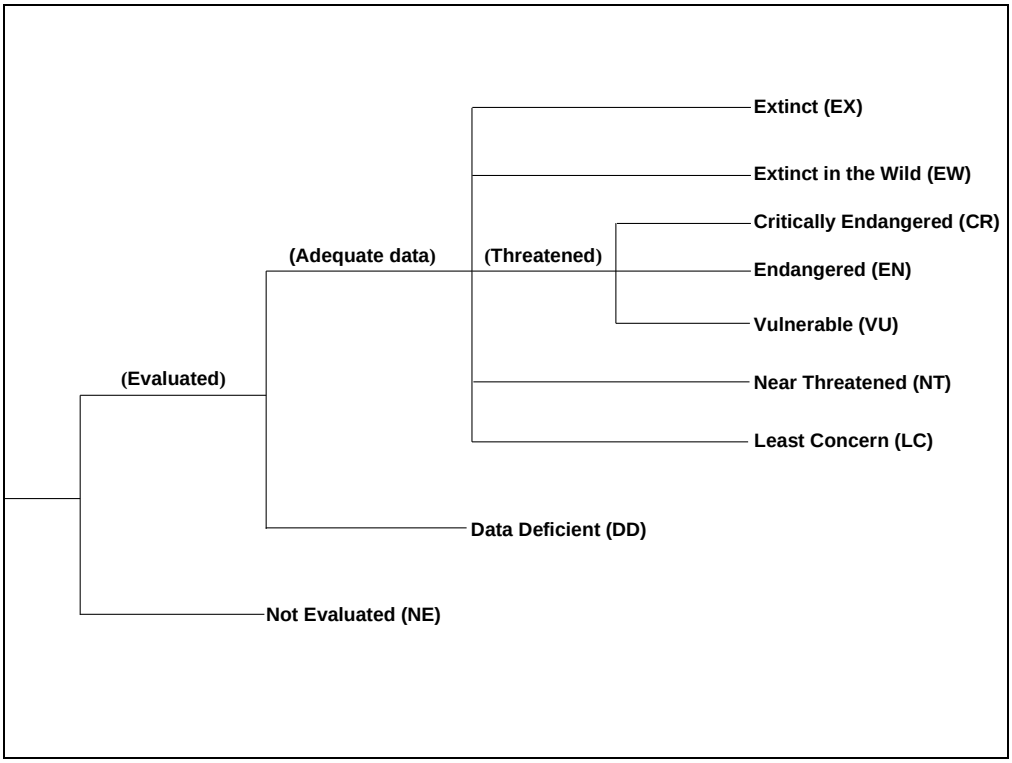

Figure 1. Structure of the categories.

3. Role of the different criteria

For listing as Critically Endangered, Endangered or Vulnerable there is a range of quantitative criteria; meeting any one of these criteria qualifies a taxon for listing at that level of threat. Each taxon should be evaluated against all the criteria. Even though some criteria will be inappropriate for certain taxa (some taxa will never qualify under these however close to extinction they come), there should be criteria appropriate for assessing threat levels for any taxon. The relevant factor is whether any one criterion is met, not whether all are appropriate or all are met. Because it will never be clear which criteria are appropriate for a particular taxon in advance, each taxon should be evaluated against all the criteria, and any criterion met should be listed.

4. Derivation of quantitative criteria

The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. The quantitative values presented in the various criteria associated with threatened categories were developed through wide consultation and they are set at what are generally judged to be appropriate levels, even if no formal justification for these values exists. The levels for different criteria within categories were set independently but against a common standard. Some broad consistency between them was sought.

5. Conservation actions in the listing process

The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action affecting it. It is important to emphasise here that a taxon may require conservation action even if it is not listed as threatened. Conservation actions which may benefit the taxon are included as part of the documentation requirements (see Annex 3).

6. Data quality and the importance of inference and projection

The criteria are clearly quantitative in nature. However, the absence of high quality data should not deter attempts at applying the criteria, as methods involving estimation, inference and projection are

emphasised to be acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonably be supported. Suspected or inferred patterns in either the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified as part of the documentation.

Taxa at risk from threats posed by future events of low probability but with severe consequences (catastrophes) should be identified by the criteria (e.g. small distributions, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible, or nearly so (pathogens, invasive organisms, hybridisation).

7. Problems of scale

Classification based on the sizes of geographic ranges or the patterns of habitat occupancy is complicated by problems of spatial scale. The finer the scale at which the distributions or habitats of taxa are mapped, the smaller the area will be that they are found to occupy, and the less likely it will be that range estimates exceed the thresholds specified in the criteria. Mapping at finer scales reveals more areas in which the taxon is unrecorded. Conversely, coarse-scale mapping reveals less of the unoccupied area causing larger range estimates that are more likely to exceed the thresholds for threatened categories. The choice of scale at which range is estimated may thus, itself, influence the outcome of Red List assessments and could be a source of inconsistency and bias. It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxa in question, and the origin and comprehensiveness of the distribution data.

8. Uncertainty

The data used to evaluate taxa against the criteria are often estimated with considerable uncertainty. Such uncertainty can arise from any one or all of natural variation, vagueness in the terms and definitions used, and measurement error. The way in which this uncertainty is handled can have a strong influence on the results from an evaluation. Details of methods recommended for handling uncertainty are included in Annex 1 and assessors are encouraged to read and follow these principles.

In general, when this uncertainty leads to wide variation in the results of assessments the range of possible outcomes should be made explicit. A single category must be chosen and the basis for the decision should be documented, and should be both precautionary and credible.

When data are very uncertain, the category of 'Data Deficient' may be assigned. However, in this case it is important to document that this category indicates that this category has been assigned because data are inadequate to determine a threat category, rather than the taxon is poorly known. In cases where there are evident threats to a taxon, through, for example, deterioration of its only known habitat it is important to attempt threatened listing, even though there may be little direct information on the biological status of the taxon itself.

9. Implications of listing

Listing in the categories of Not Evaluated and Data Deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time as an assessment is made, taxa listed in these categories should not be treated as if they were non-threatened. It may be appropriate (especially for Data Deficient forms) to give them the same degree of protection as threatened taxa, at least until their status can be assessed.

10. Documentation

All assessments should be documented. Threatened classifications should state the criteria and sub-criteria that were met. No listing can be accepted as valid unless at least one criterion is given. If more than one criterion or sub-criterion was met, then each should be listed. Therefore, if a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic down listing. Instead, the taxon should be re-evaluated with respect to all criteria to indicate its status. The factors

responsible for triggering the criteria, especially where inference and projection are used, should be documented (see Annexes 2 and 3). The documentation requirements for other categories are also specified in Annex 3.

11. Threats and priorities

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and even perhaps the taxonomic distinctiveness of the subject.

12. Re-evaluation

Evaluation of taxa against the criteria should be carried out at appropriate intervals. This is especially important for taxa listed under Near Threatened, Data Deficient and for threatened taxa whose status is known or suspected to be deteriorating.

13. Transfer between categories

There are rules to govern the movement of taxa between categories which are as follows: (A) A taxon may be moved from a category of higher threat to a category of lower threat if none of the criteria of the higher category has been met for five years or more. (B) If the original classification is found to have been erroneous, the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay (but see Section 9). (C) Transfer from categories of lower to higher risk should be made without delay.

14. Use at regional level

The IUCN Red List Categories and Criteria were designed for global taxon assessments. However, many people are interested in applying them to subsets of global data, especially at regional, national or local levels. To do this, refer to guidelines prepared by the IUCN/SSC Regional Applications Working Group (Gärdenfors *et al*. 1999). When applied at national or regional levels it must be recognised that a global category may not be the same as a national or regional category for a particular taxon. For example, taxa classified as Least Concern globally might be Critically Endangered within a particular region where numbers are very small or declining, perhaps only because they are at the margins of their global range. Conversely, taxa classified as Vulnerable on the basis of their global declines in numbers or range might be Least Concern within a particular region where their populations are stable.

III. DEFINITIONS

1. Population and Population Size (Criteria A, C and D)

The term population is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used.

2. Subpopulations (Criteria B and C)

Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

3. Mature individuals (Criteria A, B, C and D)

The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity the following points should be borne in mind:

- Mature individuals that will never produce new recruits should not be counted (e.g. densities are too low for fertilisation).
- In the case of populations with biased adult or breeding sex ratios it is appropriate to use lower estimates for the number of mature individuals which take this into account (e.g. the estimated effective population size).
- Where the population size fluctuates use a lower estimate. In most cases this will be much less than the mean.
- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals).
- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.
- Re-introduced individuals must have produced viable offspring before they are counted as mature individuals.

4. Generation (Criteria A, C and E)

Generation length is the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, the more natural, i.e. pre-disturbance, generation length should be used.

5. Reduction (Criterion A)

A reduction is a decline in the number of mature individuals of at least the amount (%) stated over the time period (years) specified, although the decline need not still be continuing. A reduction should not be interpreted as part of a fluctuation unless there is good evidence for this. The downward part of a fluctuation will not normally count as a reduction.

6. Continuing decline (Criteria B and C)

A continuing decline is a recent, current or projected future decline (which may be smooth, irregular or sporadic) which is liable to continue unless remedial measures are taken. Fluctuations will not normally

count as continuing declines, but an observed decline should not be considered as a fluctuation unless there is evidence for this.

7. Extreme fluctuations (Criteria B and C)

Extreme fluctuations occur in a number of taxa where population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e., a tenfold increase or decrease).

8. Severely fragmented (Criterion B)

Severely fragmented refers to the situation where increased extinction risks to the taxon result from the fact that most individuals within a taxon are found in small and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonisation.

9. Extent of occurrence (Criteria A and B)

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy (see Figure 2). This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

10. Area of occupancy (Criteria A, B and D)

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. colonial nesting sites, feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data (see '6. Problems of scale' in the Preamble). To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardise estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardisation should be done because different types of taxa have different scale-area relationships.

11. Location (Criteria B and D)

Location defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.

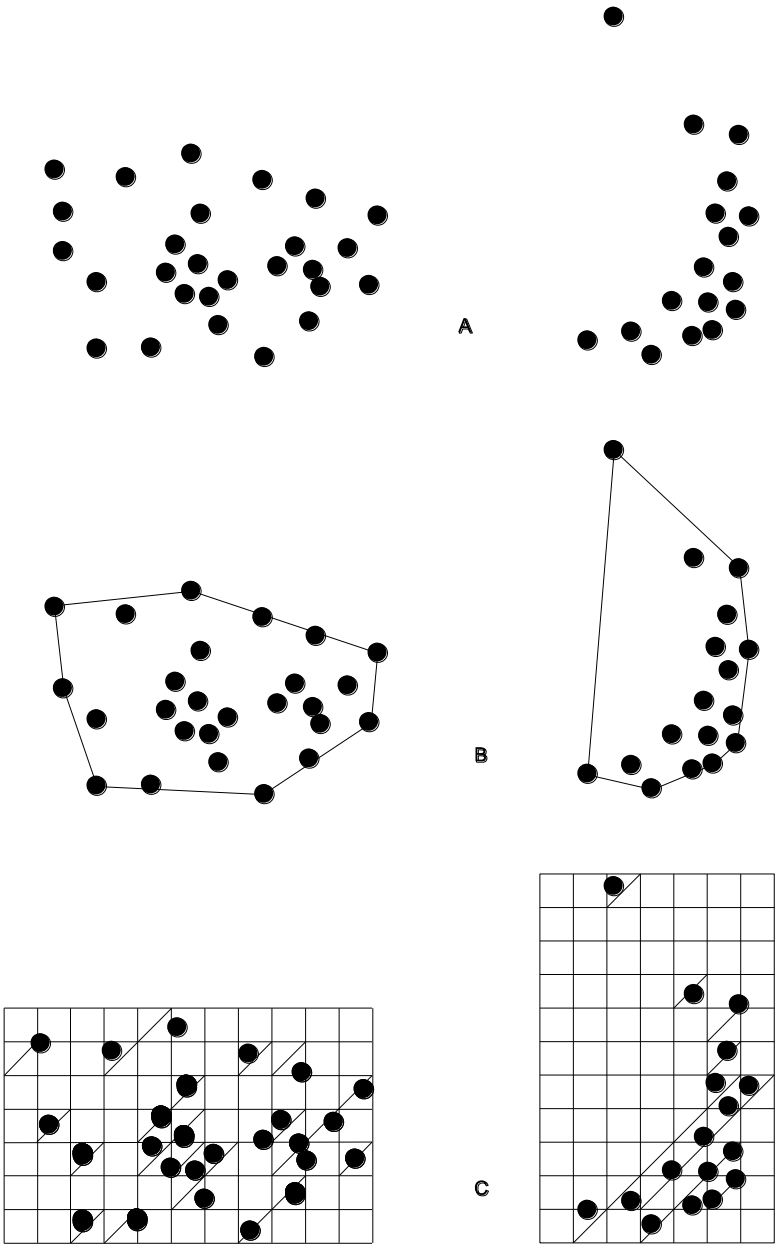

Figure 2. Two examples of the distinction between extent of occurrence and area of occupancy. (a) is the spatial distribution of known, inferred or projected sites of occurrence. (b) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (c) shows one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

12. Quantitative analysis (Criterion E)

A quantitative analysis is defined here as any form of analysis which estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analyses should make full use of all relevant available data. In a situation in which there is limited information, such data as are available can be used to provide an estimate of extinction risk (for instance, estimating the impact of stochastic events on habitat). In presenting the results of quantitative analyses, the assumptions (which must be appropriate and defensible), the data used and uncertainty in the data or quantitative model must be documented.

IV. THE CATEGORIES [1]

A representation of the relationships between the categories is shown in Figure 1.

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the Criteria A to E on pages 98 to 99, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the Criteria A to E on pages 100 to 101, and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the Criteria A to E on pages 102 to 103, and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified**.**

NOT EVALUATED (NE)

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[1] *Note: As in previous IUCN categories, the abbreviation of each category (in parenthesis) follows the English denominations when translated into other languages (see Annex II).*

A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

V. THE CRITERIA FOR CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥90% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

   (a) direct observation
   (b) an index of abundance appropriate for the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥80% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR be understood OR be reversible**,** based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥80%, projected or suspected to be met within the next ten years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years), where the time period includes both the past and the future, and where the reduction or its causes have not ceased, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at only a single location.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

2. Area of occupancy estimated to be less than 10 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at only a single location.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

C. Population size estimated to number less than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

   (a) Population structure in the form of one of the following:
   (i) no subpopulation estimated to contain more than 50 mature individuals, OR
   (ii) at least 90% of mature individuals are in one subpopulation.

   (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

ENDANGERED (EN)
A taxon is Endangered when best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

   (a) direct observation
   (b) an index of abundance appropriate for the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR be understood OR be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥50%, projected or suspected to be met within the next ten years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years), where the time period includes both the past and the future, AND where the reduction or its causes may not have ceased, based on (and specifying) any of the (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than five locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations

(iv) number of mature individuals.

2. Area of occupancy estimated to be less than 500 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than five locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

C. Population size estimated to number less than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

   (a) Population structure in the form of one of the following:
   (i) no subpopulation estimated to contain more than 250 mature individuals, OR
   (ii) at least 95% of mature individuals are in one subpopulation.

   (b) Extreme fluctuations in number of mature individuals.

D. Population size estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

VULNERABLE (VU)
A taxon is Vulnerable when best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are: clearly reversible AND understood AND ceased, based on (and specifying) any of the following:

   (a) direct observation
   (b) an index of abundance appropriate for the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥30% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR be understood OR be reversible**,** based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥30%, projected or suspected to be met within the next ten years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥30% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years), where the time period includes both the past and the future, AND where the reduction or its causes may not have ceased, based on (and specifying) any of the (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than ten locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 2000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than ten locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:

      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

C. Population size estimated to number less than 10,000 mature individuals and either:

   1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, OR

   2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

      (a) Population structure in the form of one of the following:

         (i) no subpopulation estimated to contain more than 1000 mature individuals, OR
         (ii) all mature individuals are in one subpopulation.

      (b) Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

   1. Population size estimated to number less than 1000 mature individuals.

   2. Population with a very restricted area of occupancy (typically less than 20km^2) or number of locations (typically 5 or less) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

VI. Bibliography

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ANNEX 1: UNCERTAINTY

The Red List Criteria should be applied to a taxon based on the available evidence concerning its numbers, trend and distribution. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, a threatened listing may be justified, even though there may be little direct information on the biological status of the taxon itself. In all these instances there are uncertainties associated with the available information and how it was obtained. These uncertainties may be categorised as natural variability, semantic uncertainty and measurement error (Akçakaya *et al*. 2000). This section provides guidance on how to recognise and deal with these uncertainties when using the criteria.

Natural variability results from the fact that species' life histories and the environments in which they live are changing over time. The effect of this variation on the criteria is limited, because each parameter refers to a specific time or spatial scale. Semantic uncertainty arises from vagueness in the definition of terms or a lack of consistency in different assessors' usage of them. Despite attempts to make the definitions of the terms used in the criteria exact, in some cases this is not possible without the loss of generality. Measurement error is often the largest source of uncertainty; it arises from the lack of precise information about the parameters used in the criteria. This may be due to inaccuracies in estimating the values or a lack of knowledge. Measurement error may be reduced or eliminated by acquiring additional data. For further details, see Akçakaya *et al*. (2000) and Burgman *et al*. (1999).

One of the simplest ways to represent uncertainty is to specify a best estimate and a range of plausible values. The best estimate itself might be a range, but in any case the best estimate should always be included in the range of plausible values. When data are very uncertain, the range for the best estimate might be the range of plausible values. There are various methods that can be used to establish the plausible range. It may be based on confidence intervals, the opinion of a single expert, or the consensus opinion of a group of experts. Whichever method is used should be justified in the documentation.

When interpreting and using uncertain data, preferences and attitudes toward risk and uncertainty may play an important role. Attitudes have two components. First, assessors need to consider whether they will include the full range of plausible values in assessments, or whether they will exclude extreme values from consideration (known as dispute tolerance). An assessor with a low dispute tolerance would include all values, thereby increasing the uncertainty, whereas an assessor with a high dispute tolerance would exclude extremes, reducing the uncertainty. Second, assessors need to consider whether they have a precautionary or evidentiary attitude to risk (known as risk tolerance). A precautionary attitude will classify a taxon as threatened unless we are certain that it is not threatened, whereas an evidentiary attitude will classify a taxon as threatened only when there is strong evidence to support a threatened classification. Assessors should resist an evidentiary attitude and adopt a precautionary but realistic attitude to uncertainty when applying the criteria, for example, by using plausible lower bounds, rather than best estimates, in determining population size, especially if it is fluctuating. All preferences and attitudes should be explicitly documented.

The assessment using a point estimate will lead to a single Red List Category. However, when a plausible range for each parameter is used to evaluate the criteria, a range of categories may be obtained reflecting the uncertainties in the data. A single category, based on a specific attitude to uncertainty, should always be listed along with the criteria met while the range of plausible categories should be indicated in the documentation (see Annex 3).

Where data are so uncertain that any category is plausible, the category of 'Data Deficient' should be assigned. However, it is important to recognise that this category indicates that the data are inadequate to determine the degree of threat faced by a taxon, not necessarily that the taxon is poorly known. Although Data Deficient is not a threatened category, it indicates a need to obtain more information on a taxon to determine the appropriate listing; moreover it requires documentation with whatever available information there is.

References:

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Annex 2: Citation of the IUCN Red List Categories and Criteria

In order to promote the use of a standard format for citing the Red List Categories and Criteria the following forms of citation are recommended:

1). The Red List Category may be written out in full or abbreviated as follows (when translated into other languages, the abbreviations should follow the English denominations):

Extinct or EX
Extinct in the Wild or EW
Critically Endangered or CR
Endangered or EN
Vulnerable or VU
Near Threatened or NT
Least Concern or LC
Data Deficient or DD
Not Evaluated or NE

2). Under Section V on the criteria for Critically Endangered, Endangered and Vulnerable there is a hierarchical alpha-numeric numbering system of criteria and sub-criteria. These criteria and sub-criteria (all four levels) form an integral part of the Red List assessment and all those that result in the assignment of a threatened category must be specified after the Category. The first level in the hierarchy consists of the five Criteria (A-E). Where more than one criterion is met, they should be separated by semi-colons. The second level of the hierarchy is indicated by the use of numbers (1-4) and if more than one is met they are separated by means of the '+' symbol. The third level is indicated by the use of the lower case alphabet characters (a-e). These are listed without any punctuation. The fourth level of the hierarchy under Criteria B and C involves the use of lower case roman numerals (i-v). These are placed in parentheses (with no space between the preceeding alphabet character and start of the parenthesis) and separated by the use of commas if more than one is listed. The following are examples of such usage:

EX
CR A1cd
VU A2c+3c
EN B1ac(i, ii, iii)
EN A2c; D
VU D1+2
CR A2c+3c; B1ab(iii)
CR D
VU D2
EN B2ab(i, ii, iii)
VU C2a(ii)
EN A1c; B1ab(iii); C2a(i)
EN B2b(iii)c(ii)
EN B1ab(i, ii, v)c(iii, iv); B2b(i)c(ii, v)
VU B1ab(iii)+2ab(iii)
EN A2abc+3bc+4abc; B1b(iii, iv, v)c(ii, iii, iv)+2b(iii, iv, v)c(ii, iii, iv)

ANNEX 3: DOCUMENTATION REQUIREMENTS FOR TAXA INCLUDED ON THE IUCN RED LIST

A major weakness of the *1996 IUCN Red List of Threatened Animals* and to a lesser extent *The World List of Threatened Trees* published in 1998, is that they are poorly documented and as a result, the listings in them are unsubstantiated. To rectify this weakness, a new system of minimum documentation requirements is being developed. It is important to note that the requirements outlined here are NOT part of the approved 'rule-set' for assigning a Red List status to any taxon and the requirements will be updated on a regular basis. All taxa added to the IUCN Red List, or any listings that are changed must be documented following the requirements outlined below. Taxa already on the Red List will also be documented in due course with help from the appointed Red List Authorities (see below). These documentation requirements are drafted as guides and deviations from them are acceptable provided they are fully substantiated. The documentation will bring greater credibility and transparency to listings on the Red List and will facilitate better analysis of the findings. It will also provide a basis on which listings can be contested.

Each listing should be documented as follows:

1. Name of taxon, authority, date of publication, and higher level taxonomic classification (phylum, class and order). IUCN/SSC has adopted a number of global taxonomic standards and these should be followed wherever possible. These standards are not listed here as they are constantly being updated (see http://www.iucn.org/themes/ssc/siteindx for details).
2. Red List Category and Criteria (including sub-criteria) met following the rules in this booklet; and see point 3 of 'notes' for exceptions.
3. Common name/s in English if available or in other languages if widely used.
4. An overview of range, including ALL range states (current and historical since AD 1600). For all non-marine taxa, the range states should be indicated using the standard names or two letter codes under the United Nations standard ISO 3166-1 (ISO 1997). A standard system of country subdivision codes (ISO 3166-2) is being developed (ISO 1998), until such time that this is ready, Red List Authorities are encouraged to use the geographical recording system devised by the Taxonomic Databases Working Group (TDWG) (see Hollis & Brummitt 1992). Old range state names should be updated following ISO 3166-3 (ISO 1999). For marine taxa occurring in coastal regions, the range state systems outlined above should be used provided the occurrence is within the countries defined economic exclusion zone or territorial waters. However, it may be more ecologically useful if the marine ecosystems e.g. Sherman (1994) or the WWF's marine ecoregions, (see http://www.worldwildlife.org/ for further details), are recorded. For deep-sea taxa, there is no single widely accepted system for recording geographic range, possibilities include the FAO Fisheries areas or the WCPA Marine Regions (Kehler *et al*. 1995), and although neither of these is entirely satisfactory the latter should be used. In the absence of any suitable system it is suggested that assessors be as informative as possible when describing the ranges of deep-sea taxa, so that this information can easily be translated to any system which may be adopted as a standard in the future. Against each range state or geographic region additional information may, if so desired, be included as codes to indicate: national status (only if obtained by following the *Guidelines on Regional Application*), breeding (B), non-breeding (N), passage (P), Regionally Extinct (RE), re-introduced (IN) taxa and uncertainty about occurrence in the particular area (?). The complete range must be specified for global assessments to be valid.
5. A brief rationale for the listing of the taxon, referring to the relevant factors from the narrative under point 6. Any assumptions and inferences concerning the information used to match particular criteria must be recorded. Similarly, details on how projections were done must be provided.
6. A short narrative specifying (if available):
   - Generation length;
   - If a plant, its usual growth form (see point 1 under 'notes');
   - Population trends (past, present, future, and fluctuations);
   - Extent of occurrence and/or area of occupancy (past, present and future);
   - Degree of fragmentation;

- Information on main habitats (see point 2 under 'notes') including altitudinal range where known;
- Population size and density;
- Number and size of subpopulations;
- Nature, extent and severity of threats (see point 3 under 'notes');
- Number of locations;
- Any conservation measures taken which benefit the taxon, including protected areas that support particularly important populations;
- What future actions are required (e.g. field surveys, specific research or conservation actions);
- If a quantitative analysis is used (Criterion E) the assumptions, structural equations and data used should be documented; and
- For Extinct or Extinct in the Wild taxa, extra documentation is required indicating the effective date of extinction, causes of extinction and the details of surveys which have been conducted to search for the taxon.
- For taxa listed as Near Threatened, the documentation should include a discussion of the criteria that are nearly met.
- The documentation for taxa listed as Data Deficient should be a summary of the information available for each taxon.

7. A summary of current population trends should be indicated using the following notation:
   ↑ = improving, ↓ = deteriorating, → = stable and **?** = uncertain or don't know
8. All changes in status must be recorded in the documentation.
9. The key sources of data used must be cited in full, including any personal communications.
10. A general description of the consultation and peer review process followed (see details below). This should include:
    - The name/s and contact details of the assessor/s and date of assessment.
    - The names and contact details of at least two evaluators and date of evaluation.
    - In cases where the mandates of taxonomic, regional or thematic Red List Authorities overlap, the names of the other Red List Authorities consulted should be given.
    - Any disputes or petitions about a listing should also be recorded in the documentation, including how the dispute was resolved. The outcome of petitions referred to the Red List Standards Working Group will be documented by the IUCN/SSC Red List Programme Officer.

The improved objectivity of the 1994 IUCN Red List Categories and Criteria revealed that the *ad hoc* process of listing a taxon needed to be improved. To rectify this, a system of appointed **Red List Authorities** (RLAs) has been established. These RLAs are responsible for the assessment and evaluation of all taxa included on the IUCN Red List. In most cases, the Red List Authority is the SSC Specialist Group responsible for a species, group of species or specific geographic area, but in the case of birds, BirdLife International is designated as the RLA for birds. In cases where the SSC and its partner networks do not cover a particular taxonomic group or geographic region, the Red List Programme Subcommittee will recommend the appointment of other appropriate organisations or networks to act as RLAs for these. Under this new system, global Red List assessments may still be done by anyone (the assessors). However, for a new global assessment to be included on the IUCN Red List the listing (including documentation) must be evaluated and accepted by at least two members of the relevant Red List Authority and/or by the Red List Standards Working Group (the evaluators). There will be some overlap in the jurisdictions of RLAs, especially where regional groups consider taxa under the ambit of a taxon group and vice versa. In such cases, no RLA has precedence over another and both need to collaborate in assessing or evaluating the status of the taxon concerned.

Notes:

1). Growth Forms
The growth form (or habit) of each plant taxon should be described using the following terms:

annual
perennial herb
shrub (small if < 0.5 m, medium if > 0.5 m and large if > 1 m)

tree (small is > 2 m and large if > 5 m)
succulent (leaf and/or stem) [used in conjunction with the terms annual, shrub or tree]
geophyte (any bulbous taxon)
graminoid (grass or sedge-like plants) [can be used in conjunction with annual]
hydrophyte
epiphyte or lithophyte
parasite (can be used in conjunction with herb or shrub)
liane (vines, creepers and climbers)

Some taxa may fit one or more of these categories and the most usual one should be indicated and the others may be included if so desired.

2). Habitat Types
There is no globally accepted standard for describing habitat types. However, in order to facilitate analysis of the data, assessors are urged to use the following general descriptive terms based on the World Land Cover Types, rather than any country or region-specific habitat classification system:

Urban
Coniferous Forest
Temperate Broadleaf Forest
Temperate Mixed Forest (coniferous and broadleaf)
Lowland Tropical Rainforest
Montane Tropical Rainforest
Tropical Degraded Forest
Tropical Monsoon and Dry Forest
Temperate Forest and Fields Mosaics
Bamboo
Eucalyptus
Grassland
Grasses and Shrubs Mosaics
Tropical Savanna Woodland (with understorey dominated by grass
Shrublands
Mediterranean Scrub
Succulent and Thorn Scrub
Heath Scrub (cool)
Desert
Semi-Desert
Polar and Alpine Bare Soils
Tundra
Wooded Tundra
Rocks
Glacier Ice
Salt Pans and Playas
Beaches and Dunes
Coastal Rocky Cliffs and Slopes
Compound Coastlines (beaches and rocky cliffs mixed)
Coastline lagoons and estuaries
Mangroves
Crops and Urban
Crop and Water Mixtures (including irrigated cropland)
Arable Agriculture, excluding Cereals
Arable Agriculture - Cereals
Crop, Grass and Shrub Mixture
Freshwater Lakes, Ponds and Dams
Saline Lakes, Ponds and Dams
Rivers and Streams

Swamps, Marshes and Bogs
Deep Sea, Oceanic
Seagrass Beds
Coral Reefs
Continental Shelf Waters

Terms like 'lowland', 'montane' and 'alpine' may need to be combined with some of the above. In many cases one or more habitat may have too be given, especially in cases like anadromous and diadromous species which spend part of their life-time in freshwater rivers and lakes, and the other part in marine environments. Similarly, migratory and highly mobile species will occur in many different habitats. In all instances the major habitats upon which the species is dependent for its survival should be listed.

3). Threats
The nature of threats varies considerably, but where possible assessors are asked to use the following major categories of threat (more than one can be indicated), with additional notes if necessary:

Human-Induced Habitat Loss
Habitat replaced by waste-ground
Habitat replaced by arable agriculture
Habitat replaced by livestock farming
Habitat replaced by human settlements, industry, roads, etc.
Habitat replaced by forestry plantations
Mining activities
Groundwater extraction
Dams
Other
Unknown

Decline in Habitat Quality
Grazing
Commercial logging (selective removal of wood)

Firewood collection (selective removal of wood)

Other types of selective removal of wood, including for charcoal production

Loss of prey base/pollinators, etc
Shifting agriculture
Groundwater extraction
Selective removal of non-woody vegetation
Fire
Erosion
Habitat changes caused by invasives
Fragmentation
Other
Unknown

Pollution
Agricultural pollution/pesticides
Industrial pollution
Oil slicks
Other
Unknown

Use of Taxon in Question
Legal commercial use
Illegal commercial use

Recreational use
Subsistence/traditional use
Other
Unknown

Invasives
Predators
Competitors
Hybridisers
Pathogens
Other
Unknown

Intrinsic Factors
Poor dispersal/pollination
Poor regeneration/recruitment/reproduction
High juvenile mortality
Restricted range
Other
Unknown

Other
Increased predation
Disturbance
Disease
Intentional poisoning
Persecution
Accidental mortality
Bycatch
Tourism
Climate change
Drought
Storms
Volcanoes
Floods
Other

Not known

4). RAMAS® Red List Software

RAMAS® Red List is a software package (Akçakaya & Ferson 1999) developed by Applied Biomathematics (a New York based software company) to assign taxa to Red List Categories according to the rules of the IUCN Red List Criteria. A particular advantage of this package is that it includes an algorithm for dealing with uncertain data. Before using the software it must be stressed that all users must have a thorough knowledge of the IUCN Red List Categories and Criteria, especially the definitions. The software has been modified to produce all of the information required to meet the documentation standards above, but in certain instances the information will be reported differently, because of the way the software operates. The following points should be noted in addition to the documentation standards outline above:

- If RAMAS® Red List is used to obtain a listing, this should be stated.
- Uncertain values should be entered as a best estimate and a plausible range, or as an interval. See the section on specifying uncertain data in the RAMAS Red List manual or the program help file.

- The settings for attitude towards risk and uncertainty (i.e. dispute tolerance, risk tolerance and burden of proof) are all pre-set at a mid-point. If any of these settings are changed this should be documented and fully justified, especially if a less precautionary position is adopted.
- Depending on the uncertainties, the resulting classification can be a single category and/or a range of plausible categories. In such instances the following approach should be adopted (the program will usually indicate this automatically in the Results window):
  - If the range of plausible categories extends from Critically Endangered to Least Concern and no preferred category is indicated a listing of 'Data Deficient' should be used.
  - If the range of plausible categories extends across two or more of the threatened categories (e.g. Critically Endangered to Vulnerable) and no preferred category is indicated the precautionary approach is to take the highest category met i.e. CR in the above example. In such cases, the range of plausible categories met should be documented and the fact that a precautionary approach was followed must be indicated to distinguish it from the next case. The following notation has been suggested e.g. CR (CR-VU)*.
  - If a range of plausible categories is given and a preferred category is indicated, the documentation should indicate the range of plausible categories met e.g. EN (CR-VU).
- The program gives the criteria that contributed to the listing (see Status window). However, when data are uncertain, the listing criteria are approximate, and in some cases may not be determined at all. In such cases, the assessors or evaluators should use the results to determine or verify the criteria and sub-criteria met. Listing criteria derived in this way must be clearly indicated in the 'Comments' field.
- If the preferred category is indicated as Least Concern, but the plausible range extends into the threatened categories, a listing of 'Near Threatened' (NT) should be used. The criteria, which triggered the extension into the threatened range, should be documented.
- Any assessments done using RAMAS® Red List may be submitted as text files (preferably MS-WORD) to the IUCN/SSC Red List Programme Officer. But these assessments must be submitted together with the RAMAS Red List input files (i.e. as *.RED files).

References:

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Sherman, K. 1994. Sustainability, biomass yields, and health of coastal ecosystems: an ecological perspective. *Marine Ecology in Progress Series* 112: 277-301. (See http://www.edc.uri/lme/default.htm for an updated version of the map and http://www.edc.uri/lme/brochure/page1.htm for further information).

CBSG Workshop and Training Processes

Information on Capabilities of Conservation Breeding Specialist Group (CBSG/SSC/IUCN)

Introduction

There is a lack of generally accepted tools to evaluate and integrate the interaction of biological, physical, and social factors on the population dynamics of the broad range of threatened species. There is a need for tools and processes to characterize the risk of species and habitat extinction, on the possible effects of future events, on the effects of management interventions, and on how to develop and sustain learning-based cross-institutional management programs.

The Conservation Breeding Specialist Group (CBSG) of IUCN's Species Survival Commission (SSC) has 10 years of experience in developing, testing and applying a series of scientifically based tools and processes to assist risk characterization and species management decision making. These tools, based on small population and conservation biology (biological and physical factors), human demography, and the dynamics of social learning are used in intensive, problem-solving workshops to produce realistic and achievable recommendations for both *in situ* and *ex situ* population management.

Our Workshop processes provide an objective environment, expert knowledge, and a neutral facilitation process that supports sharing of available information across institutions and stakeholder groups, reaching agreement on the issues and available information, and then making useful and practical management recommendations for the taxon and habitat system under consideration. The process has been remarkably successful in unearthing and integrating previously unpublished information for the decision making process. Their proven heuristic value and constant refinement and expansion have made the CBSG CAMP and PHVA processes two of the most imaginative and productive organizing forces for species conservation today (Conway, 1995).

Integration of Science, Management, and Stakeholders

The CBSG Population and Habitat Viability Assessment (PHVA) Workshop process is based upon biological and sociological science. Effective conservation action is best built upon a synthesis of available biological information, but is dependent on actions of humans living within the range of the threatened species as well as established national and international interests. There are characteristic patterns of human behavior that are cross-disciplinary and cross-cultural which affect the processes of communication, problem-solving, and collaboration: 1) in the acquisition, sharing, and analysis of information; 2) in the perception and characterization of risk; 3) in the development of trust among individuals; and, 4) in 'territoriality' (personal, institutional, local, national). Each of these has strong emotional components that shape our interactions. Recognition of these patterns has been essential in the development of processes to assist people in working groups to reach agreement on needed conservation actions, collaboration needed, and to establish new working relationships.

Frequently, local management agencies, external consultants, and local experts have identified management actions. However, an isolated narrow professional approach which focuses primarily on the perceived biological problems seems to have little effect on the needed political and social changes (social learning) for collaboration, effective management and conservation of habitat fragments or protected areas and their species components. CBSG workshops are organized to bring together the full range of groups with a strong interest in conserving and managing the species in its habitat or the consequences of such management. One goal in all workshops is to reach a common understanding of the state of scientific knowledge available and its possible application to the decision-making process and to needed management actions. We have found the decision-making driven workshop process with risk characterization tools, stochastic simulation modelling, scenario testing, and deliberation amng stakeholders are powerful tools for extracting, assembling, and exploring information. This process encourages developing a shared understanding across wide boundaries of training and expertise. These tools also support building of working agreements and instill local ownership of the problems, the decisions required, and their management during the workshop process. As participants appreciate the complexity of the problems as a group, they take more ownership of the process as well as the ultimate recommendations made to achieve workable solutions. This is essential if the management recommendations generated by the workshops are to succeed.

CBSG participants have learned a host of lessons in more than 100 workshop experiences in 40 countries. Traditional approaches to endangered species problems have tended to emphasize our lack of information and the need for additional research. This has been coupled with a hesitancy to make explicit risk assessments of species status and a reluctance to make immediate or non-traditional management recommendations. The result has been long delays in preparing action plans, loss of momentum, dependency on crisis-driven actions or broad recommendations that do not provide useful guidance to the managers.

CBSG's interactive and participatory workshop approach produces positive effects on management decision-making and in generating political and social support for conservation actions by local people. Modelling is an important tool as part of the process and provides a continuing test of assumptions, data consistency, and of scenarios. CBSG participants recognize that the present science is imperfect and that management policies and actions need to be designed as part of a biological and social learning process. The Workshop process essentially provides a means for designing management decisions and programs on the basis of sound science while allowing new information and unexpected events to be used for learning and to adjust management practices.

Workshop Processes and Multiple Stakeholders

Experience: The Chairman and three Program Officers of CBSG have conducted and facilitated more than 100 species and ecosystem Workshops in 40 countries including the USA during the past 6 years. *Reports from these workshops are available from the CBSG Office*. We have worked on a continuing basis with agencies on some taxa (e.g., Florida panther, Sumatran tiger) and have assisted in the development of national conservation strategies for other taxa (e.g., Sumatran elephant, Sumatran tiger, Indonesia). Our *Population Biology Program Officer (Dr. P. Miller)* received his doctoral training with Dr. P. Hedrick and has experience with the genetic and demographic aspects of a range of vertebrate species. He has worked extensively with VORTEX and other population models.

Facilitator's Training and Manual: A manual has been prepared to assist CBSG workshop conveners, collaborators, and facilitators in the process of organizing, conducting, and completing a CBSG workshop. It was developed with the assistance of two management science professionals and 30 people from 11 countries with experience in CBSG workshops. These facilitator's training workshops have proven very popular with 2 per year planned for 1996 and 1997 in several countries including the USA. *Copies of the Facilitator's Manual are available from the CBSG Office.*

Scientific Studies of Workshop Process: The effectiveness of these workshops as tools for eliciting information, assisting the development of sustained networking among stakeholders, impact on attitudes of participants, and in achieving consensus on needed management actions and research has been extensively debated. We initiated a scientific study of the process and its long term aftermath three years ago in collaboration with an independent team of researchers (Vredenburg and Westley, 1995). A survey questionnaire is administered at the beginning and end of each workshop. They have also conducted extensive interviews with participants in workshops held in five countries. *Three manuscripts on CBSG Workshop processes and their effects are available from the team and the CBSG office.* The study also is undertaking follow up at one and two years after each workshop to assess longer-term effects. To the best of our knowledge there is no comparable systematic scientific study of conservation and management processes. *We will apply the same scientific study tools to the workshops in this program and provide an analysis of the results after each workshop.*

CBSG Workshop Toolkit

Our basic set of tools for workshops include small group dynamic skills, explicit use in small groups of problem restatement, divergent thinking sessions, identification of the history and chronology of the problem, causal flow diagramming (elementary systems analysis), matrix methods for qualitative data and expert judgements, paired and weighted ranking for making comparisons between sites, criteria, and options, utility analysis, stochastic simulation modeling for single populations and metapopulation and deterministic and stochastic modeling of local human populations. Several computer packages are used to assist collection and analysis of information with these tools. We provide training in several of these tools in each workshop as well as intensive special training workshops for people wishing to organize their own workshops.

Stochastic Simulation Modelling

Integration of Biological, Physical and Social Factors: The Workshop process, as developed by CBSG, generates population and habitat viability assessments based upon in-depth analysis of information on the life history, population dynamics, ecology, and history of the populations. Information on demography, genetics, and environmental factors pertinent to assessing population status and risk of extinction under current management scenarios and perceived threats are assembled in preparation for and during the workshops. Modeling and simulations provide a neutral externalization focus for assembly of information, identifying assumptions, projecting possible outcomes (risks), and examining for internal consistency. Timely reports from the workshop are necessary to have impact on stakeholders and decision makers. Draft reports are distributed within 3 weeks of the workshop and final reports within 60 days.

Human Dimension: We have collaborated with human demographers in 4 CBSG workshops on endangered species and habitats. They have utilized computer models incorporating human population characteristics and events at the local level in order to provide projections of the likely course of population growth and the utilization of local resources. This information was then incorporated into projections of the likely viability of the habitat of the threatened species and used as part of the population projections and risk assessments. We have prepared a draft manual on the human dimension of population and habitat viability assessment. It is our intention to further develop these tools and to utilize them as part of the scenario assessment process.

Risk Assessment and Scenario Evaluation: A stochastic population simulation model is a kind of model that attempts to incorporate the uncertainty, randomness or unpredictability of life history and environmental events into the modeling process. Events whose occurrence is uncertain, unpredictable, and random are called stochastic. Most events in an animal's life have some level of uncertainty. Similarly, environmental factors, and their effect on the population process, are stochastic - they are not completely random, but their effects are predictable within certain limits. Simulation solutions are usually needed for complex models including several stochastic parameters.

There are a host of reasons why simulation modeling is valuable for the workshop process and development of management tools. The primary advantage, of course, is to simulate scenarios and the impact of numerous variables on the population dynamics and potential for population extinction. Interestingly, not all advantages are related to generating useful management recommendations. The side-benefits are substantial.

- Population modeling supports consensus and instills ownership and pride during the workshop process. As groups begin to appreciate the complexity of the problems, they have a tendency to take more ownership of the process and the ultimate recommendations to achieve workable solutions.
- Population modeling forces discussion on biological and physical aspects and specification of assumptions, data, and goals. The lack of sufficient data of useable quality rapidly becomes apparent and identifies critical factors for further study (driving research and decision making), management, and monitoring. This not only influences assumptions, but also the group's goals.
- Population modeling generates credibility by using technology that non-biologically oriented groups can use to relate to population biology and the "real" problems. The acceptance of the computer as a tool for performing repetitive tasks has led to a common ground for persons of diverse backgrounds.
- Population modeling explicitly incorporates what we know about dynamics by allowing the simultaneous examination of multiple factors and interactions - more than can be considered in analytical models. The ability to alter these parameters in a systematic fashion allows testing a multitude of scenarios that can guide adaptive management strategies.
- Population modeling can be a neutral computer "game" that focuses attention while providing persons of diverse agendas the opportunity to reach consensus on difficult issues.
- Population modeling results can be of political value for people in governmental agencies by providing support for perceived population trends and the need for action. It helps managers to justify resource allocation for a program to their superiors and budgetary agencies as well as identify areas for intensifying program efforts.

Modeling Tools: At the present time, our preferred model for use in the population simulation modeling process is called VORTEX. This model, developed by Lacy et al., is designed specifically for use in the stochastic simulation of the small population/extinction process. It has been developed in collaboration and cooperation with the CBSG PHVA process. The model simulates deterministic forces as well as demographic, environmental, and

genetic events in relation to their probabilities. It includes modules for catastrophes, density dependence, metapopulation dynamics, and inbreeding effects. The VORTEX model analyzes a population in a stochastic and probabilistic fashion. It also makes predictions that are testable in a scientific manner, lending more credibility to the process of using population-modeling tools.

There are other commercial models, but presently they have some limitations such as failing to measure genetic effects, being difficult to use, or failing to model individuals. VORTEX has been successfully used in more than 90 PHVA workshops in guiding management decisions. VORTEX is general enough for use when dealing with a broad range of species, but specific enough to incorporate most of the important processes. It is continually evolving in conjunction with the PHVA process. VORTEX has, as do all models, its limitations, which may restrict its utility. The VORTEX model analyzes a population in a stochastic and probabilistic fashion. It is now at Version 7.3 through the cooperative contributions of dozens of biologists. It has been the subject of a series of both published and in-press validation studies and comparisons with other modeling tools. More than 2000 copies of VORTEX are in circulation and it is being used as a teaching tool in university courses.

We use this model and the experience we have with it as a central tool for the population dynamic aspects of this project. Additional modules, building on other simulation modeling tools for human population dynamics (which we have used in 3 countries) with potential impacts on water usage, harvesting effects, and physical factors such as hydrology and water diversion will be developed to provide input into the population and habitat models which can then be used to evaluate possible effects of different management scenarios. No such composite models are available.

CBSG Resources as Unique Asset

Expertise and Costs: The problems and threats to endangered species everywhere are complex and interactive with a need for information from diverse specialists. No agency or country encompasses all of the useful expert knowledge. Thus, there is a need to include a wide range of people as resources and analysts. It is important that the invited experts have reputations for expertise, objectivity, initial lack of local stake, and for active transfer of wanted skills. CBSG has a volunteer network of more than 700 experts with about 250 in the USA. More than 3,000 people from 400 organizations have assisted CBSG on projects and participated in workshops on a volunteer basis contributing tens of thousands of hours of time. We will call upon individual experts to assist in all phases of this project.

Indirect cost contributions to support: Use of CBSG resources and the contribution of participating experts provide a matching contribution more than equaling the proposed budget request for projects.

Manuals and Reports: We have manuals available that provide guidance on the goals, objectives, and preparations needed for CBSG workshops. These help to reduce startup time and costs and allow us to begin work on organizing the project immediately with proposed participants and stockholders. We have a process manual for use by local organizers, which goes into detail on all aspects of organizing, conducting, and preparing reports from the workshops. Draft reports are prepared during the workshop so that there is agreement by participants on its content and recommendations. Reports are also prepared on the mini-workshops (working groups) that will be conducted in information gathering exercises with small groups of experts and stakeholders. We can print reports within 24-48 hours of preparation of final copy. We also have CD-ROM preparation facilities, software and experience.

Conservation Assessment and Management Plan (CAMP)
For The
Arabian Ungulates and Leopard

&

Population and Habitat Viability Assessment (PHVA)
For the
Arabian Leopard, Tahr, and Arabian Oryx

SECTION 7

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