



Strategy for the Conservation of the Leopard in the Arabian Peninsula







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Al nimr al-arabi, the Arabian leopard, is a uniquely small, genetically distinctive, desert-adapted form of the leopard that is endemic to the Arabian Peninsula. It once occurred around the mountainous rim of the Arabian Peninsula, where it preyed on Arabian tahr, Nubian ibex, hyrax and other species that share its habitat. Although widespread, the leopard lived at the top of the ecological food chain in an extreme environment, with low primary productivity. As a result, it must have always existed at low densities and is never likely to have been abundant.

Leopard numbers have fallen much further following their elimination from many areas of former range. It is many years since the leopard was seen in Sharjah Emirate. Now only disused stone leopard traps (margaba) in sites such as Wadi Hilo attest to its earlier presence here. Sadly, the latest evidence indicates that leopards also disappeared from the rest of the United Arab Emirates during the last few years. Small populations now survive only in southern Oman and a few parts of Yemen and Saudi Arabia and the leopard has become one of the scarcest and most highly-threatened species of the fauna of Arabia. The decline of this charismatic animal represents a major loss both for regional biodiversity and for our natural heritage.

The plight of the Arabian leopard was a major topic at the first annual Sharjah Conservation Workshop held in the year 2000 and at several subsequent workshops. These discussions culminated in the production of a range-wide status report sponsored by Sharjah Environment and Protected Areas Authority and published by the IUCN/SSC Cat Specialist Group in 2006.

The Breeding Centre for Endangered Arabian Wildlife successfully pioneered the breeding of Arabian leopards and leads the regional captive breeding programme in cooperation with facilities in Oman, Saudi Arabia, UAE and Yemen. The success of the breeding programme at least guarantees the survival of the leopard in captivity.

The leopard is well-known for its ability to survive in many different types of environment, and one should not underestimate its resilience or discount the possibility of undetected remnant populations persisting for some time in remote areas. Nevertheless, the overall situation is undoubtedly grave; without intervention there is a real chance that the leopard could follow the lion and the cheetah into extinction in the wild in the Arabian Peninsula.

We must now ensure that the status of the Arabian leopard does not deteriorate further, by safeguarding the remaining leopard populations, taking steps to expand them, and ultimately restoring it to its rightful place in the mountains and wadis of Arabia wherever possible. Such an ambitious goal will require coordinated action by all concerned.

This conservation strategy, developed in cooperation with the IUCN Cat Specialist Group and the participation of experts from across the region and beyond, provides the appropriate framework for such action. We are pleased to have contributed to its development; we commend its conclusions and recommendations and urge their adoption and implementation by all current and former range states.

H.H Dr Sheikh Sultan al Qassimi
Ruler of Sharjah

Arabian Leopard



Executive Summary

The Arabian leopard is critically endangered and has been listed as such on the IUCN Red List of Threatened Species since 1996. One of the criteria for this classification is that there are less than 250 animals remaining in the wild, a figure that is widely agreed upon by experts from the region. Annual conservation workshops held at the Breeding Centre for Endangered Arabian Wildlife (BCEAW) in Sharjah since 2000 have repeatedly focused on assessing the plight of the leopard in Arabia. Recommendations from the 2003 workshop culminated in the publication of a range-wide status report (Cat News Special Issue No. 1) in 2006 which brought regional knowledge together into a single document and provided the baseline information from which to take the first steps in conservation planning.

The reports indicated that the range of the Arabian leopard is extremely fragmented with only a few remaining population nuclei along the mountains in the south and west. Of the three confirmed nuclei still remaining, even the largest population in south west Oman cannot be considered viable in the long term (Breitenmoser et. al. 2006). Although data quality did not allow an accurate estimation of the population size, experts were still in agreement that the effective population size is between 100-250 individuals. The initiation of conservation efforts to preserve the Arabian leopard requires considered and careful planning to be successful. The annual workshops have until now provided an avenue for international and regional experts to jointly assess what is known, what knowledge is lacking and what steps are required to enable successful conservation of the Arabian leopard.

The next step in the conservation process is the step that allows attainment of the conservation goal by recommending “on-the-ground conservation actions” that are endorsed by national authorities. This step was achieved during an intensive three day workshop from the 27th to the 29th of January 2007. The goal of the workshop was to develop a comprehensive Conservation Strategy for the Arabian leopard, its prey and habitats, in a participative process involving experts, wildlife conservation agencies, and representatives of special interest groups. The aim of the Conservation Strategy was to define common goals and objectives, identify priority conservation activities on the range level, and provide guidance for the development and implementation of National Action Plans. The workshop was hosted by the Environment and Protected Areas Authority of Sharjah and facilitated under the banner of the IUCN/SSC Cat Specialist Group.

The workshop participants agreed on a long-term vision for the conservation of the Arabian leopard as “to have viable and sustainably managed populations of the Arabian leopard, its wild prey and natural habitats in co-existence with local communities across its range in the Arabian Peninsula”.

To achieve the vision, the mid-term goal has been defined as “to ensure the survival of all known wild populations of Arabian leopard and develop conservation programmes for the leopard, its prey and natural habitat in all range states”.

The most obvious problem facing the Arabian leopard is the alarming reduction in its distribution area, resulting in a strongly fragmented population with an unknown, but without any doubt dangerously reduced number of animals left in the wild. The lack of reliable data for most of the possible or probable distribution areas and the limited scientific work done in the past makes the analysis of threats an uncertain exercise. The workshop participants have analysed the reasons for the decline of the population (Causes), the now active Threats to the survival of the leopard, the knowledge or capacities lacking for its conservation (Gaps), and the factors hindering the implementation of conservation measures (Constraints). As a consequence of the notorious shortage of data and knowledge, the list of Gaps and Constraints is considerably longer than the list of Causes and Threats.

To achieve the mid-term goal, eleven objectives were identified each with 1-4 targets and 1-5 activities selected to direct the achievement of each objective. Targets and activities were given a 1-5 years time frame for achievement after the endorsement and implementation of the Conservation Strategy for the Arabian leopard.

The Conservation Strategy for the Arabian leopard is located on the regional level to have a significant impact for the survival of the species in the region. But it must be followed by the development of national action plans as only on country level actions can be implemented.



1. Introduction

The Arabian leopard (*Panthera pardus nimr*) is listed as Critically Endangered in the IUCN Red List of Threatened Species™ (Box 1). Since 2000, the leopard has been a priority species at the annual workshops held at the Breeding Centre for Endangered Arabian Wildlife, Sharjah, UAE. The leopard working group at the workshops compiled over the years the information available on the situation of the Arabian leopard. All data were updated in 2006 and published as country-based status reports for Jordan (Qarqaz & Baker 2006), Saudi Arabia (Judas et al. 2006), Yemen (Al Jumaily et al. 2006), Oman (Spalton et al. 2006), and United Arab Emirates (Edmonds et al. 2006), to provide baseline information for the design of a conservation programme. From 27–29 January 2007, The Sharjah Environment and Protected Areas Authority (EPAA) organised a workshop and conference for the development of a range-wide conservation strategy for the Arabian leopard. The Arabian Leopard Conservation Strategy is the result of this meeting and subsequent revision by the workshop participants and review by the relevant range country authorities.

The Strategy assesses the problems and makes recommendations at the range level, hence for the entire area of the Arabian Peninsula, which is considered to be the original distribution range of the Arabian leopard (Spalton & al Hikmani 2006; Fig. 1). Some of the problems identified and the solutions recommended should take place or at least be co-ordinated at the range level, such as the captive breeding programme. Others – like international trade or management of protected areas across international borders – will have to be addressed or synchronised between neighbouring countries. Many of the objectives, targets and activities listed in the range wide Conservation Strategy (Chapter 4) will however need to be implemented at the national level. To do this, we recommend that each range country should develop a National Action Plan, following the principles and recommendations in this Strategy.

The Arabian leopard is an umbrella and a flagship species for the wildlife of the Arabian Peninsula and its wild habitats. The establishment of a captive breeding programme was a first important step in preventing the complete extinction of the Arabian leopard, even though not all leopards held in captivity on the Arabian Peninsula have yet been integrated into the breeding programme (Edmonds et al. 2006). In the meantime, most remnant populations probably continue to decline. The lack of reliable surveys and monitoring data makes a sound assessment of the decline in range and numbers impossible; we do not know how much time we have left to save the Arabian leopard from extinction in the wild. The publication of the Conservation Strategy is an important step in the ongoing struggle for the survival of this superb animal. However, the release of the Strategy alone will not save the Arabian leopard – only on-the-ground action will! It is therefore of outstanding importance that the recommendations of this Strategy are implemented by the range countries without further delay. The Strategy provides guidance for this, and the experts and national institutions, which were involved in the development of the Strategy, can build a strong partnership for the conservation of the Arabian leopard.

Box 1 – The Arabian leopard in the IUCN Red List

The Arabian leopard (*Panthera pardus nimr*) is listed as Critically Endangered in the IUCN Red List of Threatened Species™ with the following assessment information:

Assessment: CR C2a(i) (version 3.1, 2001)
Year assessed: 1996
Assessor: Cat Specialist Group
Evaluators: Nowell, K., Breitenmoser, U., Breitenmoser, Ch. & Jackson, P.
Justification: The Leopard population of the Arabian peninsula is estimated to number approximately 100 mature individuals, with a declining trend, and no subpopulation estimated to contain more than 50 mature individuals.
History: 1994 – Endangered (Groombridge 1994)

The category is Critically Endangered (CR), the criteria indicate that the total population size is estimated to number fewer than 250 mature individuals (C) and a continuing decline observed, projected or inferred in numbers of mature individuals (2), and population structure (a) no subpopulation estimated to contain more than 50 mature individuals (i). For further information see www.redlist.org.

2. Distribution and Status of the Arabian Leopard

The information available on the Arabian leopard is so sparse and vague that it is impossible to reconstruct the historical distribution and status in any detail. The map (Figure 1) that has been compiled from evidence in the range state reports (Al Jumaily et al. 2006; Edmonds et al. 2006; Judas et al. 2006; Qarqaz & Baker, 2006; Spalton et al. 2006) shows the presumed former range in the mountains of the Arabian Peninsula, together with possible, probable and confirmed areas of current distribution. This map clearly illustrates the magnitude of the decline in the range of Arabian leopards that has taken place, most of it concentrated in the last 50 years.

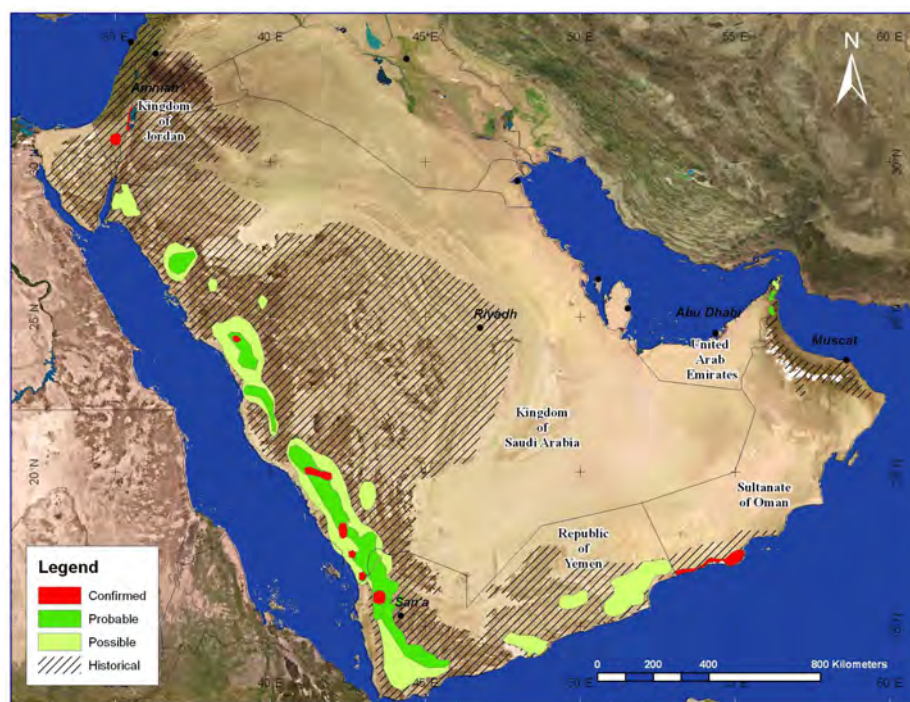


Fig. 1. Former and current (since 1990) distribution information for the leopard on the Arabian Peninsula (Spalton & Hikmani 2006). Confirmed records: Confident evidence or hard facts, such as dead specimens (with body, skin, etc. available), photo-trap pictures, and genetic analyses (e.g. from scats). Probable records: All records confirmed by any evidence or by a trained person. Possible or unconfirmed records: All not confirmed or not confirmable reports. This includes especially hear-sayings and direct observations.

The last confirmed specimen from the Hajar Mountains in the southeast of the Arabian Peninsula dates from 1976 and leopards are now considered extinct there, except in the very northern tip, in the Musandam Peninsula of Oman and adjoining mountains of the UAE. A trickle of reports from these areas persisted through the 1990s and into the early 2000s; field signs in UAE in May 2006 and leopard tracks seen in Musandam in early 2007 provide evidence of continuing presence, though numbers in the area are believed to be very low (Reinl 2007).

The largest area of known occurrence of the Arabian leopard is located in Dhofar, southern Oman, in the near-contiguous ranges of Jebel Samhan, Jebel Qara and Jebel Qamar. This is also the best-known population and the only one in Arabia for which ecological data can be considered adequate, as a result of a long-term research and monitoring programme, involving camera trapping, satellite collaring, and dietary analysis.

The wooded mountain habitat here continues westwards into Yemen, and though possible evidence of leopards has been found in Hauf Forest protected area, close to the border, their occurrence has not been confirmed. However, a robust border fence in this area would potentially restrict movements of leopards, ibex and other prey between the two countries. The one currently known population in Yemen is located in the mountains around Wada'a, in Amran Governorate, north of Sana'a. Local people have traditionally used stone traps to catch leopards in this area and se-

veral individuals in the captive breeding population originate from here. Regular removal of leopards from the wild population must have depleted numbers to some extent, and local reports refer to leopards being more common 20 years ago. Nonetheless, continued presence was reported as recently as January 2007. There are anecdotal reports of leopard occurrence at other sites in Yemen, along the huge western escarpment and in the rugged and mountainous south of the country, but field surveys are needed to confirm them.

In Saudi Arabia, investigations by two research teams have concluded that leopard presence is now confined to clusters of sites in two western localities: the Hejaz mountains, north-west of Medina, and the mountains south of Taif to the Yemen border, notably the Biljurashi escarpment. Evidence of continued leopard presence in the latter area was provided by photographs in February 2007 of two leopards poisoned in the vicinity of An Nahar (Edmonds 2007).

In the north of the Arabian Peninsula, the last confirmed record of a leopard in Jordan dates from 1987. Occasional anecdotal reports since then have not so far been confirmed by field investigations. Suitable habitat exists, for example in Dana Reserve, so the possibility that leopards from the small population across the border could re-occupy the area should not be excluded.

Therefore, only four sites in 2006-2007 had confirmed presence of Arabian leopards, plus one just outside the area covered by this strategy. Although in reality the situation is probably not so dire, it is unknown just how many leopard subpopulations survive. Furthermore, except for Dhofar, even basic data on status are lacking, including such parameters as extent of area occupied, estimates of numbers, status of prey, and extent of depredation on livestock. Without this baseline information, it is impossible to forecast how viable, or how likely to persist in the long-term, these surviving nuclei are. The only firm conclusion to be drawn is that remnant populations are small, isolated, fragmented and under threat. A comprehensive series of field surveys is urgently required to establish leopard presence in all potential areas and to assess the status of all subpopulations.

No accurate estimate of the total number of Arabian leopards still surviving in the wild can be attempted at the moment, but the total must be lower than the figure of 250 reproducing individuals which represents the threshold for Critically Endangered status on the IUCN Red List.

Preliminary results of molecular genetic research carried out by Dr Carlos Fernandes at the University of Cardiff, UK, indicate that the Arabian leopard is a very distinct form, clearly separate from both African and Asian leopards, a finding that emphasises the urgency of implementing all the measures outlined in this strategy.



3. Problem Analysis

The most obvious problem facing the Arabian leopard is the alarming reduction in its distribution area (Fig. 1), resulting in a strongly fragmented population with an unknown, but without any doubt dangerously reduced number of animals left in the wild (Spalton and Al Hikmani 2006). The lack of reliable data for most of the possible or probable distribution areas (Fig. 1) and the limited scientific work done in the past makes the analysis of threats an uncertain exercise. The workshop participants have analysed the reasons for the decline of the population (Causes), the now active Threats to the survival of the leopard, the knowledge or capacities lacking for its conservation (Gaps), and the factors hindering the implementation of conservation measures (Constraints). As a consequence of the notorious shortage of data and knowledge, the list of Gaps and Constraints is considerably longer than the list of Causes and Threats.



Arabian leopard poisoned in an Namas/Al Nams in the Kingdom of Saudi Arabia in spring 2007 (Photo khasram.net)

Causes – reasons that led (in the past) to the decline of the populations:

1. Unrestricted killing of leopards;
2. Loss of prey through hunting, habitat degradation and competition with livestock;
3. Destruction or degradation of habitat as a consequence of woodland destruction and overgrazing;
4. Lack of effective law enforcement after leopard was granted legal protection;
5. Public attitude towards wildlife in general and leopard in particular.

Threats – reasons that are now threatening the survival of the leopard:

1. Insufficient or non-existing law enforcement;
2. Hunting, killing and capturing of leopards;
3. Leopard habitat degradation and fragmentation as a consequence of unsustainable human exploitation (destruction of woodland, overgrazing, roads, facilities, mining);
4. Unsustainable hunting of leopard prey.
5. Genetic depletion of the small isolated populations

Gaps – lack of knowledge, information or competence limiting our ability to conserve the leopard:

1. Inadequate information on socio-economical influence (cultural value of leopard, human-predator/wildlife conflict);

2. Inadequate information on the impact of different threats on leopard populations;
3. Lack of knowledge and capacity needed to collect the adequate scientific information (resources, experts, field researchers, etc.);
4. Lack or inadequate knowledge of basic data on leopard biology and ecology:
 - a. Breeding biology and demography (reproduction, male-female ratio, etc.);
 - b. Population status (present distribution and past and ongoing changes in distribution area, density and abundance, population trends, etc.);
 - c. Habitat use and availability, land-tenure system, home range size;
 - d. Feeding ecology (staple prey and prey spectrum, prey availability);
5. Inadequate knowledge of diseases;
6. Inadequate knowledge on the genetic status of remnant population and on subpopulation differences;
7. Insufficient sharing of information and knowledge between range states and institutions involved in wildlife conservation and management;
8. Lack of appropriate capacity building programmes.

Constraints – hindering the conservation/recovery of the leopard or the implementation of conservation measures:

1. Lack of awareness on the critical situation of the leopard and clear commitment for its conservation by key decision makers;
2. Lack of awareness of the “value” of the Arabian leopard by all levels of society;
3. Poor environmental consciousness;
4. Failure to identify “benefits” of leopard conservation;
5. Weak legislation (in some countries) or weak law enforcement;
6. Lack of field science and field data;
7. Failure to tackle leopard/livestock conflict;
8. Lack of enough suitable habitat and prey species populations;
9. Poor co-ordination between government agencies;
10. Shortage of funds.

The problem analysis clarifies the reasons for the decline of the Arabian leopard in the past and the difficulties to be overcome for its effective conservation today. The identification of Threats, Gaps and Constraints helps formulation of realistic Objectives to encounter these problems and to work towards our common Vision and Goal (Chapter 4).

4. Conservation Strategy

The procedure used to develop the Arabian Leopard Conservation Strategy was a facilitated logical framework approach (LogFrame; Box 2, Breitenmoser et al. 2006). The participants first formulated a long-term vision and a mid-term goal, setting the landmark at the horizon. The problem analysis (Chapter 3) revealed the obstacles on the way to our destination. Then, we identified a number of objectives that should allow us to overcome the difficulties and to reach the goal. These objectives were subsequently broken down into more concrete targets and activities. The Strategy provides guidance for the conservation of the Arabian leopard on the range level. Hence, the objectives, targets and activities listed hereafter refer to tasks, which have to be addressed on a regional level or require international co-operation (such as the captive breeding programme). In most cases, however, action will have to be taken by a range country and should therefore be organised in detail through the National Action Plans. Most of the targets and activities listed hereafter lack a timeframe and specification of a responsible actor, as the participants of the workshop in Sharjah did not feel entitled to attribute assignments to institutions not represented at the Sharjah meeting. Nevertheless, the workshop participants prioritised threats, targets and activities by country (Chapter 5.1) and identified the national agencies responsible for the endorsement and involved in the implementation of the Strategy or the National Action Plans, respectively. The range country matrices should help to concretise the targets and activities listed in the Strategy when developing the National Action Plans.

BOX 2 – Logical Framework

The logistic framework (LogFrame) is a widely used methodology in participative workshops improving the performance of interventions. A LogFrame approach allows working together in defining visions and goals, analysing the problems, and developing solutions in form of objectives, targets and activities. The LogFrame used for the development of the Arabian Leopard Conservation Strategy can be visualised in form of a pyramid:



Vision: A guiding vision – describing the world and its biodiversity we are seeking to preserve for the next ~25 years.

Goal: The particular goal we want to reach within 10–20 years according to our vision.

Objective: 2–5 objectives to fulfil the goal reflecting our expertise and strength (timeframe about 5 years).

Target: Specific targets describing the partners' contribution to the objective within the next 3–5 years.

Activity: Activities for the next 1–3 years required for achieving a target.

Part of the LogFrame is the problem analysis to identify threats, gaps and constraints to the survival or conservation of the leopard. The definition of a vision and a goal and the identification of the threats allow then to specify objectives, targets and activities to counteract the threats and to meet the goal.

Vision and Goal

Our long-term Vision for the conservation of the Arabian leopard is:

To have viable and sustainably managed populations of the Arabian leopard, its wild prey and natural habitats in coexistence with local communities across its range in the Arabian Peninsula.

This vision should be aimed for by means of the following mid-term (about 10 years after the implementation of the Strategy) Goal:

To ensure the survival of all known wild populations of Arabian leopard and develop conservation programmes for the leopard, its prey and natural habitat in all range states.

Objectives, Targets and Activities

After the problem analysis (Chapter 3), three working groups formulated specific Objectives allowing to counteract the threats and to meet the Vision and Goal. The groups addressed the following themes:

1. Save what we have: Halt the further decline of the remnant populations in the wild;
2. Save a backup: Conserve a maximum possible genetic diversity of the Arabian leopard through the captive breeding programme;
3. Regain lost ground: Prepare the habitats, prey supply and local people in areas, where leopards once roamed, for their return.

Many of the more general objectives, such as raising awareness and building capacity, were proposed by more than one group and then merged in the plenary discussion. Finally, the workshop participants retained the following 11 objectives, 22 targets and 54 activities:

- Objective 1. Survey and Monitoring:** To assess known and possible existing Arabian leopard populations and potential recovery sites
- Target 1.1. Presence/absence surveys and reports completed by 2010
 - Activity 1.1.1. Carry out Rapid Assessment Surveys (RAS; Box 3) in all areas with possible but not confirmed leopard presence
 - Target 1.2. Key sites defined and identified
 - Activity 1.2.1. Conduct interviews, surveys, and data collection in the areas with probable leopard presence (Target 1.1)
 - Activity 1.2.2. Conduct field surveys using camera trapping and other techniques in the areas with identified leopard presence (Target 1.1)
- Objective 2. Protected Areas:** To establish an effectively managed network of Protected Areas, focusing on known and potential leopard sites and corridors
- Target 2.1. Existing protected area network (PAN) for the Arabian leopard reviewed
 - Activity 2.1.1. Gap analyses for Hawf (Yemen) and Jabal Samhan (Oman) and other known sites
 - Activity 2.1.2. Formulate and implement recommendations based on this review and gap analysis
 - Target 2.2. Potential PA and corridors identified
 - Activity 2.2.1. Review results of camera trapping (collected in Activity 1.2.2)
 - Activity 2.2.2. Conduct surveys of habitat quality, prey availability and local people's attitudes
 - Target 2.3. At least one new protected area declared within the potential/historic leopard habitat in the range countries
 - Activity 2.3.1. Legally designate a new protected area
 - Activity 2.3.2. Develop minimum management requirements for the new protected area
 - Target 2.4. Effective management of protected area's and potential new PA's implemented
 - Activity 2.4.1. Develop management plans for established and new protected areas
 - Activity 2.4.2. Review and modify where appropriate current management system of protected areas
- Objective 3. Community Involvement:** To ensure support from local communities and stakeholders for leopard conservation programmes
- Target 3.1. Comprehensive outreach programmes prepared and implemented
 - Activity 3.1.1. Identify local communities and stakeholders
 - Activity 3.1.2. Establish a long-term education and awareness programme
 - Target 3.2. Socio-economic programmes prepared and implemented
 - Activity 3.2.1. Conduct social studies and identify economic opportunities
 - Activity 3.2.2. Investigate and mitigate human-predator conflict
 - Target 3.3. Local communities integrated into the conservation of the Arabian leopard (see also Target 11.1)
 - Activity 3.3.1. Consult with local communities regarding conservation activities (e.g. surveys, establishment of protected areas, etc.) in their district
 - Activity 3.3.2. Select and train local people to act as a link between local communities and the wildlife authorities (community council, select interested people to communicate with and involve them in projects)
- Objective 4. Resource and Capacity Building:** To secure the competences and means needed to implement the Strategy and the National Action Plans for the conservation of the Arabian leopard
- Target 4.1. Comprehensive capacity building programme developed and operational
 - Activity 4.1.1. Carry out gap analysis: Evaluate and assess current resources and capacities
 - Activity 4.1.2. Develop an action plan to build the capacities and competencies needed
 - Target 4.2. Sustainable financial mechanisms for the implementation of the Strategy developed and maintained
 - Activity 4.2.1. Prepare a broad fund-raising strategy to identify and secure the financial resources needed at range-wide and national level

- Objective 5. Law Enforcement:** To adopt and to effectively enforce adequate legislation for protection of the Arabian leopard, its prey and habitats
- Target 5.1. Legislation and regulations on nature protection and wildlife management adequate for the conservation of leopards, their prey and habitat in place
 - Activity 5.1.1. Review and complement or update existing wildlife and nature conservation legislation, where appropriate
 - Target 5.2. Wildlife and nature conservation legislation and regulations are effectively enforced in the range states
 - Activity 5.2.1. Train personnel in the relevant authorities regarding wildlife legislation and enforcement
 - Activity 5.2.2. Coordinate law enforcement between relevant authorities on the local level
 - Activity 5.2.3. Raise awareness of laws and penalties among local communities
 - Activity 5.2.4. Monitor implementation of wildlife legislation
- Objective 6. Site Recovery:** To mitigate the main factors causing leopard decline in existing and potential sites
- Target 6.1. Factors causing the decline in key sites for the Arabian leopard are identified, properly managed and reduced
 - Activity 6.1.1. Initiate leopard conservation schemes in key sites/areas (see also Objective 2)
 - Activity 6.1.2. Understand and mitigate leopard-livestock conflicts: Review and restructure, wherever needed, livestock husbandry techniques together with local people
 - Activity 6.1.3. Regulate livestock grazing activities within the key sites
 - Activity 6.1.4. Enhance the population of natural prey species in key sites
- Objective 7. Population Recovery:** To reinforce and to re-establish populations where appropriate
- Target 7.1. Small or unviable wild populations in key sites reinforced where appropriate
 - Activity 7.1.1. Identify priority small wild populations, and appropriate mechanisms of recovery
 - Activity 7.1.2. Introduce/reinforce the selected small populations with new individuals
 - Activity 7.1.3. Ensure all projects follow IUCN Guidelines and the respective recommendations for the Arabian leopard (see Target 10.2)
 - Target 7.2. Arabian leopards reintroduced in key sites of the known historical range of the species in order to re-connect extant populations
 - Activity 7.2.1. Reintroduce a small population to a well-prepared site as a pilot project following IUCN guidelines and the respective recommendations for the Arabian leopard (see Target 10.2)
- Objective 8. International Cooperation and Partnership:** To secure effective cooperation and partnership among the range states, their relevant agencies and with international partners
- Target 8.1. Mechanisms of cooperation and partnership among the range states and with international institutions secured and enhanced
 - Activity 8.1.1. Revitalise and restructure the existing Arabian Leopard Working Group
 - Activity 8.1.2. Establish a regional information exchange and the respective mechanisms and tools
 - Activity 8.1.3. Enhance the exchange of knowledge and experiences among the range states and all partners involved (see also Activity 11.2.4)
 - Activity 8.1.4. Enhance regional (range wide) conservation initiatives
- Objective 9. Conservation breeding:** To provide a genetic and demographic buffer for the survival of the Arabian leopard
- Target 9.1. At least 95 % of genetic diversity of known wild populations within 5 years in captive population achieved using current founders
 - Activity 9.1.1. Include all current potential founders in breeding captive population within 3 years (~January 2010)
 - Activity 9.1.2. Grow captive population by 10 % annually

- Target 9.2. An Arabian leopard captive management programme (ALCMP) established
- Activity 9.2.1. Draft recommendations and protocols for the management of the captive breeding programme within 1 year (~January 2008)
 - Activity 9.2.2. Obtain agreement from all holders of Arabian leopard to follow the recommendations of ALCMP within 2 years (~January 2009)
- Target 9.3. Husbandry techniques improved and standardised
- Activity 9.3.1. Complete Arabian leopard husbandry guidelines and translate into Arabic within 1 year
 - Activity 9.3.2. Develop exchange training programmes between participating ALCMP institutes within 2 years
- Target 9.4. Current captive population of Arabian leopard expanded to 150 animals through breeding
- Activity 9.4.1. Integrate about 20 new holders into programme within 5 years
 - Activity 9.4.2. Increase growth rate of captive population by 10 % annually

Objective 10. **Integrated Conservation Approach:** To combine in situ and ex situ projects into an inclusive conservation programme

- Target 10.1. Genetic diversity of both known ex situ and in situ populations assessed
- Activity 10.1.1. Expand current genetic analysis to include all wild and captive populations of Arabian leopard, using non-invasive techniques where possible
 - Activity 10.1.2. Assist development of facilities for analysis within the region
- Target 10.2. Protocols for reintroduction and restocking developed
- Activity 10.2.1. Establish working group of ex situ and in situ experts to develop protocols for the reintroduction or restocking of Arabian leopards following relevant IUCN guidelines

Objective 11. **Public Awareness:** To raise awareness for the conservation of the Arabian leopard at all levels

- Target 11.1. The general public's awareness of leopard conservation raised
- Activity 11.1.1. Integrate leopard conservation into the school education programmes: Produce school and community exhibitions and perform educational awareness visits (e.g. portable exhibition)
 - Activity 11.1.2. Use captive breeding and display facilities to promote leopard conservation
 - Activity 11.1.3. Initiate and maintain a media campaign to promote leopard conservation
 - Activity 11.1.4. Ensure that all educational and publicity materials are shared among range countries (see also Activities 8.1.2 and 8.1.3)
- Target 11.2. Decision makers made aware of the urgency of leopard conservation
- Activity 11.2.1. Distribute the Strategy to politicians and relevant departments
 - Activity 11.2.2. Inform all decision makers of the plight of the Arabian leopard



5. Implementation of the Arabian Leopard Conservation Strategy

The aim of strategic planning in conservation in general, and hence of the Arabian Leopard Conservation Strategy, is to recommend and promote conservation activities at the range level and in all range states. The dissemination of the Strategy should help to design and implement concrete conservation programmes. This requires a number of further organisational steps and structures at the level of the entire range or the range countries, which were discussed at the Sharjah 2007 Workshop and Conference:

1. **National Action Plans:** For the implementation of the Strategy, we strongly encourage each range country to develop a National Action Plan for the Arabian leopard. These Action Plans should build upon the principles outlined in the Strategy, and could be developed using the same approach as for the Strategy (Box 2). Several of the Objectives and Targets listed in the Conservation Strategy (Chapter 4) will have to be implemented on the range level, hence in international or supra-national co-operation, but most of the Objectives and Targets should be incorporated into the National Action Plans. Depending on the status and situation of the leopard, and the research and practical conservation activities completed so far, the Objectives, Targets and Activities have different importance and urgency among the five range states. To facilitate the development of the National Action Plans, the participants of the range countries on the Sharjah 2007 workshop and conference have assessed the problems (Table 1) and the Targets (Table 2) at the country level.
2. **Arabian leopard task force:** The implementation of the Strategy on the range level and the development and implementation of the National Action Plans require designation of appropriate dedicated working groups. The organisational structures should be put in order both on regional and national level. We recommend initiating an Arabian Leopard Task Force in each range country impelling and supervising the development and implementation of the National Action Plan.
3. **Surveys:** The status reports and the problem assessment in the Strategy (Chapter 3) have demonstrated an urgent need for more thorough surveys of probable and possible leopard areas (Fig. 1) in Saudi Arabia and Yemen. We strongly recommend starting these surveys immediately using a rapid assessment approach (Box 3), as more accurate information about the leopard distribution is of critical importance for the development of the Action Plans.
4. **Research and monitoring:** To close the gaps and overcome the constraints identified, more research and an effective monitoring of the leopard populations as well as the progress of the conservation measures are needed. Research and monitoring should be done following internationally recognised standards, methods and procedures. Leopard monitoring in Oman (Spalton et al. 2006) and many other monitoring programmes for large cats can be used as models.
5. **Sharing Information:** Exchange of information and capacity building are crucial for the effective implementation of the Strategy and the Action Plans. These tasks must be addressed primarily on the level of the expert network, but regular contacts between the range country agencies are needed too. The annual meeting in Sharjah and similar meetings in other range states can provide fora for regular discussions. We furthermore recommend establishing a website for the Arabian leopard, where publications, reports, and educational material is made easily available.
6. **Funding:** Adequate funding of the Arabian leopard conservation programmes will decide the survival of the species. Range country governments and private donors should allocate the resources needed to implement the Strategy and for the development and implementation of National Action Plans.
7. **International support:** IUCN and other institutions of the international conservation community are asked to provide continued support for the implementation of the Strategy, the development of National Action Plans, capacity building and leopard conservation activities in general. The IUCN/SSC Cat Specialist Group is requested to supervise the implementation of the Strategy.
8. **Revision:** This Strategy should be reviewed and revised where needed on a regular basis. We recommend updating the Strategy not longer than five years after its endorsement.

Box 3 - Rapid Assessment Surveys

A Rapid Assessment Survey (RAS) is a relatively brief, first-order assessment to identify key geographical, ecological and social parameters of a pre-identified area to prioritise and plan future action. A RAS would typically seek to assess:

- Area: extent, terrain, access and logistics;
- Habitats: vegetation and condition;
- Leopard: field signs (tracks, scrapes, scats) local reports (time of last record, frequency of sightings, predation on domestic animals);
- Prey: sightings, field signs, local reports;
- Human population: size, number of settlements, land use, livestock numbers and extent of grazing, local attitudes to leopards.

Approaches used in a RAS are mainly structured interviews of local people/experts, complemented by field excursions. Because of the short time-scale, thorough preparation is important: collate all available data, satellite imagery and maps, prepare questionnaires, and field survey forms.



Table 1. Country matrix problem analysis: Threats, Gaps and Causes by range country. Jor = Kingdom of Jordan, KSA = Kingdom of Saudi Arabia, Yem = Republic of Yemen, Oma = Sultanate of Oman, UAE = United Arab Emirates. ○, important; ●, very important/urgent for the respective country; —, not important or not applicable. Complete description of Threats, Gaps and Causes are presented in Chapter 3.

| Item/topic | Jor | KSA | Yem | Oma | UAE |
|--|-----|-----|-----|-----|-----|
| <i>Threats: what are current threats to the survival of the leopard?</i> | | | | | |
| 1. Insufficient law enforcement (killing/capturing of leopards) | ○ | ● | ● | ○ | ○ |
| 2. Hunting, killing and capturing of leopards | ○ | ● | ● | ○ | ○ |
| 3. Leopard habitat degradation and fragmentation | ● | ● | ○ | — | ● |
| 4. Unsustainable hunting of the leopard prey | ○ | ● | ● | ○ | ● |
| <i>Gaps: What lack of knowledge/information hinders the conservation of the leopard?</i> | | | | | |
| 1. Inadequate information on socio-economical influences | ○ | ● | ● | — | — |
| 2. Inadequate information on impact of threats | ○ | ● | ● | — | — |
| 3. Lack of knowledge on capacity level to collect scientific data | ○ | ● | ● | — | — |
| 4. Lack or inadequate knowledge of | | | ● | | |
| a. Breeding biology and demography | ○ | ● | ● | ○ | — |
| b. Population states (distribution, density trends, etc.) | ● | ● | ● | — | ● |
| c. Habitats use and availability, land-tenure system | ○ | ● | ○ | — | ● |
| d. Feeding ecology (prey spectrum, prey availability) | — | ● | ● | — | ● |
| 5. Inadequate knowledge of diseases and genetic status | — | ● | ● | ○ | ○ |
| 6. Inadequate knowledge on subpopulation differences (genetics) | — | ● | ● | ● | — |
| 7. Insufficient sharing of information/knowledge (range state level) | ○ | ○ | ● | ○ | ● |
| 8. Lack of appropriate capacity building | ○ | ● | ● | — | ○ |
| <i>Constraints: What are the factors limiting conservation/recovery of the leopard?</i> | | | | | |
| 1. Lack of awareness/commitment by key decision makers | ● | ○ | ● | — | ● |
| 2. Lack of awareness of the “value” of leopards by all levels of society | ● | ● | ● | — | ● |
| 3. Poor environmental consciousness | ○ | ● | ● | — | ● |
| 4. Failure to identify “benefits” of leopard conservation | ● | — | ● | — | ● |
| 5. Weak legislation (in some countries) or enforcement | ○ | ● | ● | — | ○ |
| 6. Lack of field science and field data | ● | ● | ● | — | ● |
| 7. Failure to tackle leopard/livestock conflict | — | ● | ● | ○ | ● |
| 8. Lack of enough suitable habitat and prey species populations | ● | ● | ● | — | ● |
| 9. Destruction of habitat | ● | ● | ● | — | ● |
| 10. Poor co-ordination between government agencies | ○ | ○ | ● | — | ● |
| 11. Shortage of funds | ● | ● | ● | — | ● |

Table 2. Country matrix Objectives and Targets by range country: Jor = Kingdom of Jordan, KSA = Kingdom of Saudi Arabia, Yem = Republic of Yemen, Oma = Sultanate of Oman, UAE = United Arab Emirates. ○ = important, ● = very important/urgent for the respective country, – = not important or not applicable. Complete description of Objectives and Targets are presented in Chapter 4.

| Objective/Target | Jor | KSA | Yem | Oma | UAE |
|--|-----|-----|-----|-----|-----|
| Objective 1: Survey and Monitoring | | | | | |
| Target 1.1: Presence/absence surveys and reports completed | ● | ● | ● | ○ | ● |
| Target 1.2: Key sites defined and identified | ● | ● | ● | ● | ● |
| Objective 2: Protected Areas | | | | | |
| Target 2.1: Existing PA network for Arabian leopard reviewed | — | ○ | ● | — | — |
| Target 2.2: Potential PA and corridors identified | ● | ● | ● | — | ● |
| Target 2.3: At least one new PA declared | ● | ● | ● | ○ | ● |
| Target 2.4: Effective management of PAs implemented | ● | ● | ● | ● | ● |
| Objective 3: Community Involvement | | | | | |
| Target 3.1: Comprehensive outreach programmes implemented | ○ | ● | ● | ● | ● |
| Target 3.2: Socio-economic programmes prepared & implemented | ○ | ○ | ● | ○ | — |
| Target 3.3: Local communities integrated into leopard conservation | ● | ● | ● | ● | ● |
| Objective 4: Resource and Capacity Building | | | | | |
| Target 4.1: Comprehensive capacity building programme in place | ○ | ● | ● | ○ | ○ |
| Target 4.2: Sustainable financial mechanisms in place | ○ | ● | ● | ● | ● |
| Objective 5: Law Enforcement | | | | | |
| Target 5.1: Adequate wildlife legislation/regulation in place | ○ | ○ | ○ | — | ○ |
| Target 5.2: Wildlife legislation/regulation effectively enforced | ● | ● | ● | — | ● |
| Objective 6: Site Recovery | | | | | |
| Target 6.1: Factors causing decline in key sites managed/reduced | ○ | ● | ● | — | ● |
| Objective 7: Population Recovery | | | | | |
| Target 7.1: Small wild populations in key sites reinforced | — | ● | ○ | — | ● |
| Target 7.2: Arabian leopard re-introduced in key sites | ○ | — | ○ | — | ● |
| Objective 8: International Cooperation and Partnership | | | | | |
| Target 8.1: Enhanced mechanisms of cooperation and partnership | ○ | ● | ● | ● | ● |
| Objective 9: Conservation Breeding | | | | | |
| Target 9.1: 95% genetic diversity in captive population in 5 years | — | — | — | — | ● |
| Target 9.2: ALCP established | — | ● | — | — | ● |
| Target 9.3: Husbandry techniques improved and standardised | — | ● | — | ○ | ○ |
| Target 9.4: Captive population expanded to 150 animals | — | ● | — | — | ● |
| Objective 10: Integrated Conservation Approach | | | | | |
| Target 10.1: Genetic diversity <i>ex situ</i> and <i>in situ</i> assessed | — | ● | ○ | ● | ○ |
| Target 10.2: Protocols for reintroduction/restocking developed | — | ○ | ○ | — | ● |
| Objective 11: Public Awareness | | | | | |
| Target 11.1: General public's awareness for leopard raised | ● | ● | ● | ○ | ● |
| Target 11.2: Decision makers made aware of urgency of Arabian leopard conservation | ● | ● | ● | ○ | ● |

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Appendix I: List of participants

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