Conservation of Cats in Iran

A *Roadmap* to a comprehensive approach for the conservation of the indigenous cat species of the I. R. Iran developed at the workshop in Sari, I. R. Iran, 12–14 May 2012

Department of Environment

IUCN SPECIES SURVIVAL COMMISSION CAT SPECIALIST GROUP

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Sand cat (Photo M. R. Besmeli)

Title picture: Pallas's cat (Photo F. Esfandyari)

Content

List of acronyms and abbreviations

ALSS	Asian Leopard Specialist Society
CACP	Conservation of the Asiatic Cheetah Project
CBC	Caucasus Biodiversity Council
CBD	Convention on Biological Diversity
CBSG	Conservation Breeding Specialist Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMR	Capture-Mark-Recapture
CMS	Convention on Migratory Species
DoE	Department of Environment
EAZA	European Association of Zoos and Aquariums
ECO-IEST	Economic Cooperation Organisation - Institute of Environmental Science and Technology
ICS	Iranian Cheetah Society
IUCN	International Union for the Conservation of Nature
KM	
LFCC	Low Forest Cover Countries
NBSAP	National Biodiversity Strategy and Action Plan
NEPA	National Environmental Plan of Action
NGO	Non-governmental organization
NSESD	National Strategy for the Environment and Sustainable Development
P4L	Plan for the Land Society
PA	Protected area
SGP	Small Grant Program
SSC	Species Survival Commission
TAG	Taxon Advisory Group
TBPA	Transboundary Protected Area
UNCCD	United Nations Convention to Combat Desertification
UoE	University of Environment
WAZA	World Association of Zoos and Aquariums
WR	Wildlife reserve

Preface

Iran's high geographic, topographic and climatic diversity at the crossroad of three continents has created globally and regionally important natural landscapes and ecosystems which supports a rich biodiversity. Iran is home to, at least 197 mammalian species from 10 orders and 38 families, including 10 species of felids. However, habitat loss and habitat fragmentation, coupled with intensified illegal killing of these charismatic carnivores over the last two decades have resulted in a drastic decline of the species' range and population size. Sadly, we have irreversibility lost Iran's Persian lions and the Caspian tiger. Yet, there are vast habitats across the country supporting the remaining eight cat species. Iran is globally the last stronghold for the Critically Endangered Asiatic Cheetah, and is perceived to hold the remnant source populations of the Endangered Persian leopard in Western Asia. To more effectively conserve this remarkable cat diversity and to replace the ongoing small-scale felid management programs with a firm national conservation plan, a Roadmap for conservation of the Iranian cat species was developed. The initial phase of this attempt has been made by Iran Department of the Environment (DoE) in collaboration with IUCN/SSC Cat Specialist Group in November 2011, with a generous financial support from University of Environment (UoE), Iran. Existence of a network of 272 reserves authorizing by Iran Department of the Environment, including 28 National Parks, 43 Wildlife Refuges, 166 Protected Areas and 35 National Natural Monuments (10.4% of the country's total area), plays a significant role in wildlife conservation in Iran. Hence realizing the available knowledge within a framework for the conservation of the Iranian cat species is essential. Using these national and international capacities, I hope that the present document will aid us to formulate a comprehensive guideline to ensure long-term survival of wild felids in Iran.

Dr. Asghar Mohammadi Fazel
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Summary

A comprehensive guide for the conservation of the cats in Iran, a so called *Roadmap* has been developed in a participatory workshop held in Sari, I. R. Iran, from 12–14 May 2012. Participants of the workshop were wildlife experts and representatives of all provincial offices of the DoE, scientists from universities, and members of NGOs engaged in cat and wildlife research and conservation. The Roadmap is organised in nine chapters, each of them having conclusions at the end.

Gap analysis. The gap analysis revealed the relevance of the roadmap as lacking means and instruments identified are addressed in this document, and it also provides guidance for cooperation and the synergetic use of available means. The knowledgebase for cheetah and leopard was judged better than for the smaller species. Specific projects with cats as flagship species are helping to free conservation.

Priorities. The goal of the priority setting was to be able to close the most important gap in a reasonable approach and order. For most cat species, basic surveys to define their distribution and population status has a high priority, but also to identify threats, conflicts and people's attitudes should have a priority as they are needed for defining conservation measures. To close the identified gaps a tight cooperation between the DoE and universities and NGOs is needed.

Monitoring. Survey and monitoring are a prerequisite for all target-oriented conservation and management interventions. Monitoring methods and their application and importance for the different cat species was analysed. A common approach (protocols), a centralised database, standardised analyses and interpretation are needed to secure the long-term availability of the data generated. Among the concrete steps towards a consistent cat monitoring system in Iran were the building of a cat monitoring task force under the lead of the DoE and the development of a cat monitoring manual to educate everybody involved in cat monitoring.

Data and collections. Beyond generating data in the field and the reporting, monitoring data need to be compiled and stored using a system granting the long-term availability and usability. The workshop participants reviewed available protocols and forms and made recommendations for further cooperation in regard to data treatment.

Partnership and cooperation. Cat conservation in Iran is a lasting obligation involving many institutions with different backgrounds, namely the DoE as the leading conservation governmental organisation, several NGOs with a strong commitment to cat conservation, and universities who engage in research and education of young researchers. Such broad cooperation requires a number of agreements which all should base on the principles outlined in this *Roadmap*.

Capacity development. Initial training and continuous education in wildlife conservation and research techniques is needed for scientists, managers, and rangers. There is nowadays a scattered offer of training units, but no comprehensive overview on academic curriculums or practical courses. Wildlife research and management should become a clearly defined part of the curriculum of some biological/ecological and veterinarian faculties and higher educational institutes.

Communication. The implementation of the *Roadmap* requires generous communication and exchange of information within the organisations (internal communication), between the partners (network communication), and with the media and the public (public information). The Sari Workshop participants defined the need for communication and reviewed already existing communication means.

Implementation and revision. The *Roadmap* is a living document and needs to be adapted to new requirements and updated with new developments at regular intervals.

Introduction

Wild cats are an important element of Iran's fauna and true flagship species for most of the natural habitats of the country. Ten members of the Felidae family are indigenous to the country, of which eight are extant: Asiatic cheetah *Acinonyx jubatus venaticus*, Persian leopard *Panthrea pardus saxicolor*, Eurasian lynx *Lynx lynx*, caracal *Caracal caracal*, jungle cat *Felis chaus*, Pallas' cat *Otocolobus manul*, wildcat *Felis silvestris*, and sand cat *Felis margarita,* and two are extinct: Caspian tiger *Panthera tigris virgata* and Persian lion *Panthera leo persica*. All cat species are of conservation concern, but only a few have so far received attention, most prominently the larger species. Iran hosts the last remaining population of the Critically Endangered Asiatic cheetah and the largest populations of the Endangered Persian leopard. However, we can assume that also for some of the smaller felid species, the main source populations live in Iran, and that the country therefore has an outstanding position for the conservation of the cats in south-west Asia.

In recent years, the Department of Environment (DoE), non-governmental organisations and scientists have increasingly been interested in the free-living cats. This interest was mainly prompted by the Conservation of the Asiatic Cheetah Project (CACP), which has also helped raising the awareness among media people and the broader public in Iran. In autumn 2011, the available information on all ten indigenous cat species has been compiled and reviewed in a workshop hosted by the Karaj University. "Cats in Iran", a cooperative project between the Iranian DoE and the IUCN/SSC Cat Specialist Group, aimed assessing the conservation status of all felids of the county. The workshop revealed that all extant species should be surveyed and consistently monitored according to common protocols and feeding a shared database. After the workshop, Dr. Asghar M. Fazel, Director of Biodiversity of the DoE, suggested that an over-arching and common approach providing guidance for cat conservation in Iran should be developed, allowing working synergistically between several partner groups and according to agreed standards.

Such a comprehensive guide for the conservation of the cats in Iran – hereafter called the "*Roadmap*" – has been developed in a participatory workshop held in Sari, I. R. Iran, from 12–14 May 2012. Participants of the workshop were wildlife experts and representatives of all provincial offices of the DoE, scientists from universities, and members of NGOs engaged in cat and wildlife research and conservation.

During the workshop, the following topics were addressed (see also chapters of the *Roadmap*):

1. Significant gaps of knowledge and shortcomings in prerequisites for conserving the cats;
2. Priority species, conservation priorities per species, and research priorities (for the felids and per species);
3. Principles, guidelines and standards for cat research, conservation and management (e.g. national legislation or international standards);
4. Monitoring principles (e.g. stratified monitoring approach) and responsibilities including veterinary health and genetic screening/monitoring;
5. Data compilation, management, and sharing (e.g. cat database, collection of specimens and tissue samples);
6. Principles for cooperation (tasks, responsibilities, data sharing) between DoE (including provincial headquarters and PA offices), scientific institutions (research), and NGOs;
7. Capacity development and training of cat conservationists at all levels and in different institutions (students, DoE and NGO staff);

8. Public relation, awareness building and internal (partnership) and external (e.g. media) communication;
9. Endorsement, implementation and revision of the *Roadmap*;

The 48 participants of the workshop (Fig. 1, Appendix I) addressed these topics in working group compiling recommendations subsequently discussed and revised in plenary discussions. The themes were, wherever needed, also considered under a species-related or regional aspect. Information on the distribution and conservation status of the cat species came mainly from the Cats in Iran articles. The information was then compiled by the facilitators and reviewed by the workshop participants and by external reviewers (see acknowledgements).

The *Roadmap* defines priorities, principles, standards, and cooperation for cat conservation, management, and research in Iran. It provides a general guideline for cat conservation, but no specific recommendations for actions at the species level. The *Roadmap* uses mainly standard and terminology developed for the conservation planning by IUCN, and it bases on the knowledge compiled for the most recent conservation status reports (outcome of the project *Cats in Iran*). The *Roadmap* is meant to be a living document to be updated every few years, as new information and more experience become available.

Fig. 1. Workshop participants in Sari, I. R. Iran.

1. Gap analysis

Seven working groups (WG) discussed the most important gaps of knowledge per species, per regions and in regard to the means available. Information was compiled by means of prepared forms and as a relative ranking in five categories from -2 (very poor) to 0 (acceptable) and +2 (very good). It should be noted that the assessment of the available knowledge and information in this chapter does not express a judgement on the topic itself, e.g. the j that the knowledge on the habitat quality for a potential reintroduction of the Persian lion was "good" does not imply that the quality of the habitat is good, only that there is an adequate knowledge base for a proper assessment and decision.

1.1. Species

Extant species

Knowledge about the species and understanding of threats is a prerequisite for the implementation of meaningful conservation actions. Workshop participants assessed the available information for the extant cat species for three subjects: **Status**: distribution, abundance and population trend; **ecology and biology**: diet, main prey, habitat, land tenure system, demography, taxonomy, genetics, health and diseases; **conservation**: threats, conflicts, and human attitudes. The conclusions regarding the presently available information is summarised in Table 1.

The knowledge base is generally considered poor. The mean score per item (a field in Table 1) was -0.75 in the scale of -2 to +2, indicating that the average level of information is below "acceptable". The information base is best for cheetah, leopard and lynx (see total score for Aj, Pp and Ly in Table 1) compared to the smaller felids, reflecting the fact that the larger species have received more attention in the past years. The least know species are the wildcat (although believed to be widespread), the Pallas's cat and the caracal.

Regarding the status of the species, the distribution within Iran is considered to be fairly known, with exception of the wildcat and the sand cat. Abundance and population trends, important variables to assess the conservation status of a species, are however insufficiently known for all species except the cheetah.

The largest gap of knowledge was identified for the biology and ecology of the species (items 4–12 in Table 1), as there has been very little research done in Iran in this field and most available information is anecdotal only[1]. Important information such as land tenure system and demography, or genetics and diseases are almost completely lacking. Some information (e.g. land tenure system) may be derived from general literature on the respective species, but features such as demography, inbreeding or disease may have a high relevance for conservation and should therefore be locally observed.

The generation of the crucial biological and ecological information will take time, but this must not necessarily delay first important steps in practical conservation of the cats, because information regarding threats and conflicts were generally assessed to be sufficient to good (items 13 and 14 in Table 1). This finding indicates that certain conservation measures addressing these threats and con-

[1] Some of this information was mentioned by the working groups in the species or regional forms. Such notes are not recapitulated here, but all forms and results from the workshop were made available in digital form to all participants.

flicts directly could be implemented in spite of the generally poor background information on the species.

Table 1. State of information and knowledge about the Iranian cat species. Aj *Acononyx jubatus venaticus* Asiatic cheetah, Cc *Caracal caracal* caracal, Ll *Lynx lynx* Eurasian lynx, Om *Otocolobus manul* Pallas's cat, Pp *Panthera pardus saxicolor* Persian leopard, Fc *Felis chaus* jungle cat, Fm *Felis margarita* sand cat, Fs *Felis silvestris* wildcat. -2 means that information and knowledge is very poor, 0 that it is acceptable and 2 that it is very good. Topics in blue were not included in the overall total as they were not assessed for all species.

	Nr	Topic	Species								
			Aj	Cc	Ly	Om	Pp	Fc	Fm	Fs	Σ
1.1.1	1.	Distribution	0	0	1	0	1	0	-1	-1	0
	2.	Abundance	0	-2	-2	-2	-2	-2	-2	-2	-14
	3.	Population trends	0	-2	-2	-2	-2	-1	-1	-2	-12
1.1.2	4.	Diet	1	-1	0	-1	0	0	0	-1	-2
	5.	Status of main prey	1	0	-1	-2	1	2	-1	-1	-1
	6.	Habitat preference	0	-1	0	-1	1	0	0	-1	-2
	7.	Land tenure system	0	-2	-1	-2	-1	-2	-2	-2	-12
	8.	Demography	0	-2	-1	-2	-1	-2	-1	-2	-11
	9.	Competition/-titors	0		0				-1	-1	
	10.	Taxonomy (e.g. ssp)	1	-2	0	-1	2	-1	-2	-2	-5
	11.	Genetics (e.g. inbreeding)	-1	-2	-1	-2	-2	-2	-2	-2	-14
	12.	Health/diseases	-2	-2	-1	-1	-2	-2	-2	-2	-14
1.1.3	13.	Threats	1	0	2	0	1	0	0	0	4
	14.	Conflicts	1	0	1	0	1	0	2	-1	4
	15.	Human attitude	0		0						
	16.	Local people knowledge		-1	0						
	Σ		2	-16	-5	-16	-3	-10	-12	-19	-79

Extinct species

For the two extinct species, Caspian tiger and Persian lion (Table 2), information about diet and status of main prey was considered to be good, based on available studies on the species preferred prey from studies in other countries and on information on large herbivores in Iran. Knowledge on habitat quality and extension was also considered to be sufficient to good, although it needs to be emphasised that no habitat suitability study for a potential reintroduction for tiger or lion in Iran was done so far. Consequently, knowledge on the land tenure system and the viability of a potential population was judged to be poor. Former threats, potential new threats and possible conflicts in the case of a reintroduction are however sufficiently or even well understood.

Table 2. Knowledge base for the extinct species tiger (*Panthera tigris*, Pt) and lion (*Panthera leo*, Pl), and cats in captivity (cc).

Nr	Topic	Knowledge base		
		Pt	Pl	Cc
1.	Diet	1	1	1
2.	Status of main prey	1	1	
3.	Habitat extension	1	1	
4.	Habitat quality	0	1	
5.	Land tenure system	-1	-1	
6.	Viability	-1	-2	2
7.	Health/diseases	-2	-2	1
8.	Former threats	0	1	
9.	Potential new threats	1	1	
10.	Potential conflicts	1	1	
11.	Husbandry			0
12.	Facility design			1
13.	Enrichment			0

Cats in captivity

For cats in captivity, the knowledge base regarding diet, health and diseases, and the viability of the captive population was considered to be good (Table 2). Information on husbandry and enrichment of the enclosures were judged to be sufficient, but knowledge on facility design as poor. In order to gain a representative overview on the knowledge needs of captive facilities for cats, such a gap analysis should however be done with Iranian zoo people.

1.2. Regions

For a regional approach, six regions were defined (Fig. 2): northwest (NW), north (N), northeast (NE), west (W), central (C), and south (S), each presenting a typical ecotone of Iran. The gap analysis per region was done for the themes (1) Information and data collection, (2) awareness and cooperation, (3) protected area capacity (Table 3).

Information and data collection

Information on cat species presence and distribution is only very good in the NW region, otherwise sufficient at best. Knowledge on population trends is however nowhere good. Data on cat mortality is considered to be good in two regions (W and S), but at least in three regions, material from dead specimens is collected sufficiently or well. Remarkably, for all regions chance observation collection is considered at least “good”. This would provide a base for a systematic monitoring (see Chapter 4). A good monitoring for cats is done in four regions, whereas NW and W judge their cat monitoring system insufficient. The ungulate (as prey base for the larger cat species) monitoring was considered good in all but the W region (Table 3).

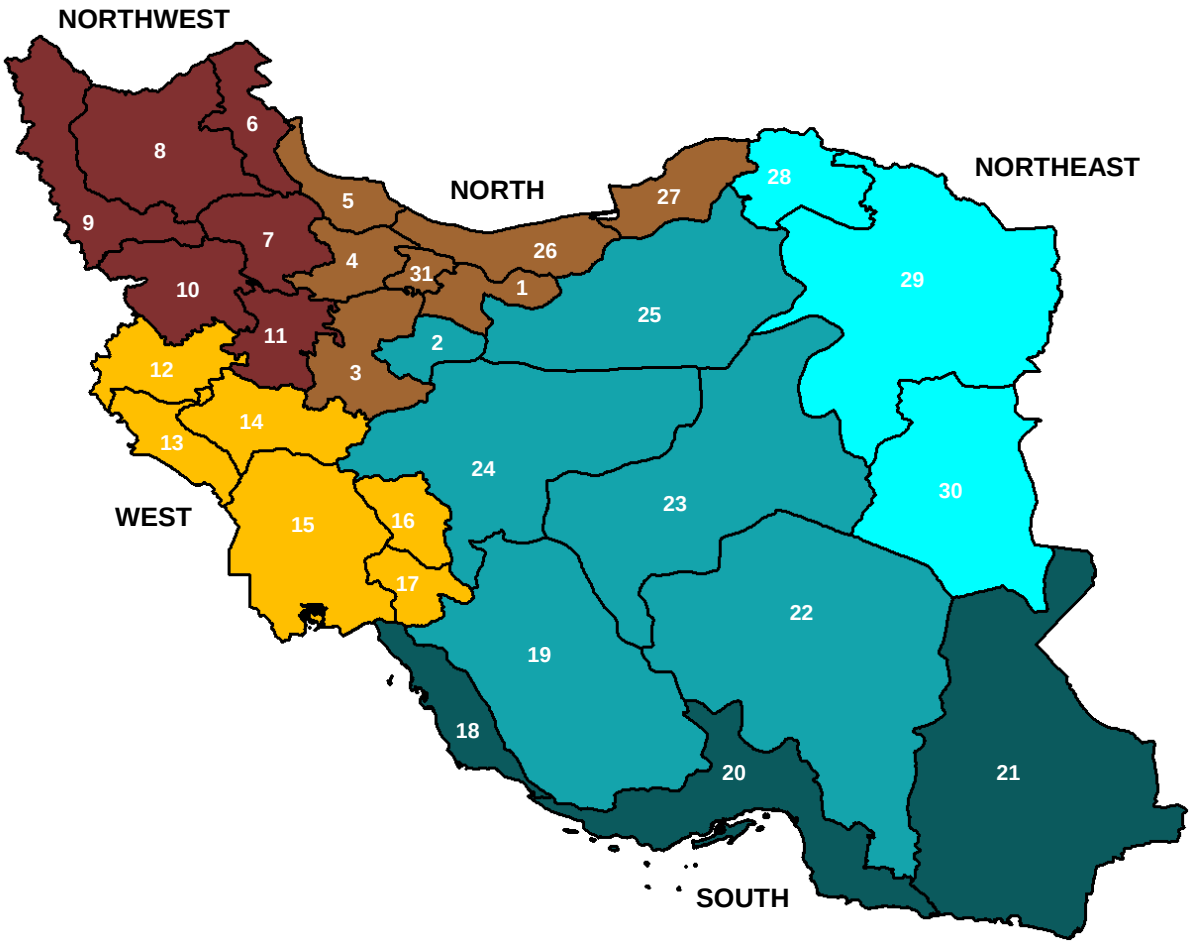

Fig. 2. Regions and Provinces (white numbers) of I. R. Iran. Provinces: 1 Tehran, 2 Qom, 3 Markazi, 4 Qazvin, 5 Gilan, 6 Ardebil, 7 Zanjan, 8 East Azarbaijan, 9 West Azarbaijan, 10 Kordestan, 11 Hamedan, 12 Kermanshah, 13 Ilam, 14 Lorestan, 15 Khuzestan, 16 Chahar Mahal va Bakhtiari, 17 Kohgiluyeh va Buyerahmad, 18 Boushehr, 19 Fars, 20 Hormozgan, 21 Sistan va Blouchestan, 22 Kerman, 23 Yazd, 24 Esfahan, 25 Semnan, 26 Mazandaran, 27 Golestan, 28 North Khorasan, 29 Khorasan-e-Razavi, 30 South Khorasan, 31 Alborz.

Asiatic cheetahs (Photo ICS/DoE/CACP/UNDP/Panthera)

Table 3. Present state of information and capacity in the respective regions. The judgement is: -2 situation very poor, -1 situation poor, 0 situation acceptable, +1 situation good, +2 situation very good. Regions: **NW** = north-west, **N** = north, **NE** = northeast, **W** = west, **C** = central, **S** = south according to Figure 2.

	Nr	Topic	Region					
			NW	**N**	**NE**	**W**	**C**	**S**
1.2.1	1.	Information on cat species presence and distribution	2	-1	0	0	0	0
	2.	Information on cat population trends	0	-1	-1	-1	-1	-1
	3.	Information/data on cat mortalities (e.g. road kills, poaching)	-1	-1	0	1	0	1
	4.	Recording of chance observations	2	1	1	1	1	1
	5.	Collection of dead specimens or samples from those	1	2	0	-1	-1	1
	6.	Are any specific cats monitoring projects going on?	1	1	1	-1	1	1
	7.	Are any specific ungulate monitoring projects going on?	1	1	1	-1	1	1
1.2.2	8.	Do NGOs carry out cat conservation project?	1	-1	1	-1	1	1
	9.	Cooperation between DoE regional/local staff and NGOs	-2	-1	-1	1	1	0
	10.	Cooperation with other ministries (e.g. mining, traffic)	-2	0	-2	-1	0	-1
	11.	Cooperation with local communities	0	1	-2	-1	1	1
	12.	Information on awareness and attitudes of local people	1	-1	0	-1	-1	-1
	13.	Are there any awareness/public education programmes?	1	-1	-1	-1	1	-1
1.2.3	14.	Protected Areas which are important for cats?	1	1	1	1	1	1
	15.	Status (category) and effectiveness of the PAs	1	0	0	-1	0	-2
	16.	DoE provincial/PA staff awareness of cat conservation	1	0	1	0	1	0
	17.	Law enforcement (e.g. anti-poaching) in PAs	0	0	0	0	0	0
	18.	Status (e.g. number of rangers) of staff in PAs	-1	-1	-1	-1	-2	-1
	19.	Education and training status of PA staff and DoE managers	1	0	0	-1	1	-2
	20.	Equipment of PA staff and DoE managers	-1	-1	-1	-1	-1	-1
		TOTAL	**7**	**-2**	**-3**	**-9**	**3**	**-2**

Awareness and cooperation

In the regions N, NE, C and S, NGOs are running specific cat conservation projects, but the cooperation between NGOs and the regional/local DoE institutions is considered to be good in only two regions, in C and also in W, where actually no NGO projects are carried out (Table 3). The cooperation with other state institutions is in all regions considered very bad to sufficient at best, whereas the cooperation with local communities differs strongly from very bad to good. Information on awareness and attitudes of local people is considered good only in the NW, otherwise it is insufficient. Cat-specific awareness/public education programmes are done only in the NW and C.

Protected area capacity

All six regions do have protected areas (PAs) considered important for cats. That indicates that throughout Iran, PAs could harbour important source populations for the wild felids. The status and effectiveness of the PAs is however considered good only in the NW, but sufficient in the others and even bad or very bad in the W and S, respectively. DoE and PA people are sufficiently or well aware of the importance of cat conservation, and law enforcement – primarily done by these people – is considered sufficient (but nowhere good!) in all regions. The assessment of the status and number, education and training, and equipment of PA staff and DoE personnel was generals considered bad, in some situations even very bad, with the only exception of the NW region, where training was judged to be good.

1.3. Means

The shortcomings identified in the regions were also reflected in the assessment of lacking means by the respective working group and the plenary. The lack of means was judged for the (1) conservation capacity, (2) funding available for cat conservation and (3) societal support for cat conservation and was ranked according to the importance of the shortcoming identified:

Very important shortcomings:

- The game warden recruitment lacks a proper selection mechanism that assures that people with sufficient education and motivation are chosen;
- Non-governmental funding is (almost) not available for cat research and conservation, and NGOs lack a proper framework and guidance for fund-raising;
- The support of other governmental institutions for cat/wildlife conservation is insufficient or non-existing because the relevant people lack awareness and the DoE does not have the proper relations to other GOs;
- A specific plan to integrate (local) communities into (cat) conservation is missing and hence there is a lack in community partnership in conservation.
- Fines for poaching of leopards and their main prey (wild goat and wild sheep) are too low as meat prices have gone up and it pays to poach.
- There is no differentiation between fines for poaching inside and outside protected areas.
- Procedures for proper law enforcement are lacking.

Important shortcomings:

- There is no proper selection mechanism for sustained managers of DoE;
- There is no specific education (e.g. university courses) for wildlife scientists and wildlife veterinarians;
- There are no practical wildlife training courses at the universities.
- There is no priority plan for the investment of the small amount of funding available for cat conservation;

- Law enforcement is insufficient because laws are based on an outdated assessment of threats and problems;
- A long-term planning and approach to address specific threats is missing.
- The budget for compensation programs conducted by DoE for human-wildlife conflicts is insufficient.

1.4. Conclusions gap analysis

Not surprisingly, the knowledge base for the two big species cheetah and leopard was judged to be better than for the smaller species. The big cats are the most threatened, and they are the top flagship species for conservation, hence getting most of the attention. This will most likely not chance in the years to come, especially not in terms of funding. However, all other cats will profit from capacity development, common protocols, infrastructure and awareness programmes for the big cats. The importance of the cheetah and the leopard is also visible in the regional gap analysis. Although the overall picture summarised in Table 2 is diverse and partly inconsistent within one region, it seems that the situations in the NW and C regions are generally considered more optimistic than for the other regions. This correlates with the two so far best-known cat conservation programmes, namely the CACP (the cheetah programme predominately implemented in the central regions) and the Caucasus Leopard Recovery Programme (with a clear focus in the north-western provinces within Iran). This indicates that specific projects with (large) cats as flagship species are helping to free conservation energy. The gap analysis revealed the relevance of the *Roadmap*. Several of the lacking means and instruments identified are addressed in this document, which also provides guidance for cooperation and promotes the synergistic use of available means.

Persian leopard (Photo ICS/DoE/CACP/UNDP/Panthera)

2. Priorities

Priorities were defined for species (extant, extinct and in captivity), regions, and for research in general, always asking the question: “What are the most important measures to be taken”? All working groups also assessed the relative importance (high, medium, low) to initiate (additional) conservation measures for all 8 extant species. The result of the species ranking is shown in (Fig. 3). The larger cats (leopard, cheetah, lynx) are those considered primarily in need of conservation efforts.

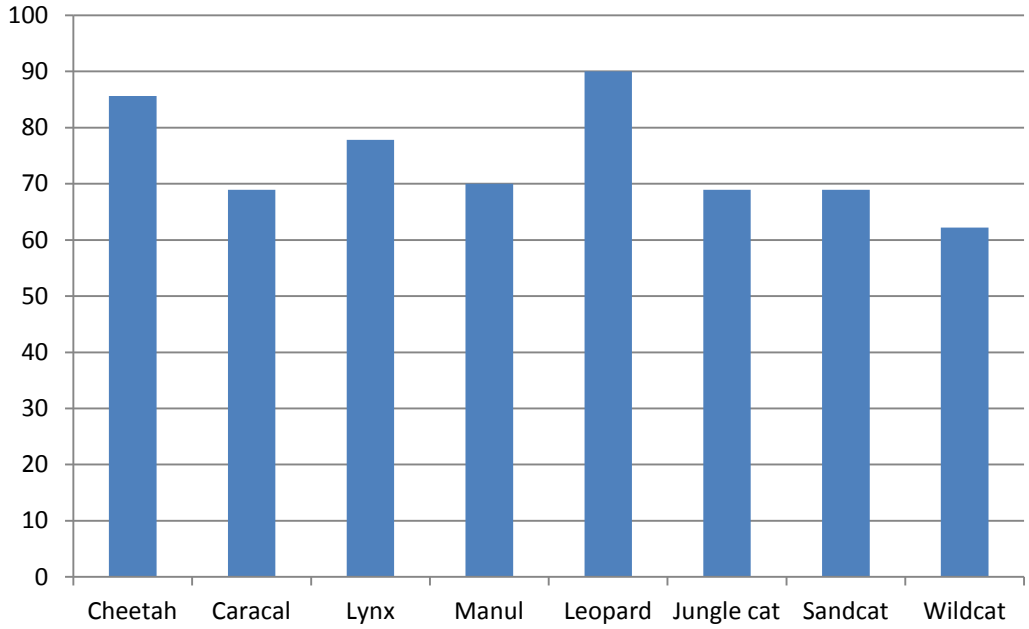

Fig. 3. Comparison of the importance of the eight cat species summed up over all six conservation measures and working groups. The columns represent the percentage of the possible points the respective species received from the workshop participants.

2.1. Priorities per species

Priorities per species were identified for the following fields of activity: (1) protection, (2) survey and monitoring, (3) research, (4) conflict mitigation, (5) awareness raising, and (6) restocking of small populations. The relative importance of these six subjects (Fig. 4) allows comparing the species, but also reveals the importance of each theme for a given species. As a general pattern, protection, survey and monitoring, and research was considered more urgent than conflict mitigation, awareness raising, and restocking of small populations. Research is a high priority for all species, but reached top values for the Pallas’s cat, the jungle cat, the sand cat and the wildcat, confirming the relatively low knowledge about the smaller cat species. Protection (e.g. creating save haven in PAs and law enforcement) is considered very important for the large species and less important for the small species, especially for the wildcat, which is a only cat species in Iran that is not (yet) granted legal protection. Survey and monitoring is important for all species (top ranked for lynx) as it builds the base for defining and controlling any sensible conservation and management intervention. Restocking of small population (or reintroduction in areas where the species has disappeared) is the lowest ranking measure for every species. The distribution (and hopefully the population status) of the felids in Iran

is still considered to be sufficient to grant the survival of the species in their historic range given the proper protection of and connectivity between the populations.

Suggested priority activities, research topics and priority regions/provinces for each species are compiled in Table 4. Most important conservation measures for the extant species are:

Cheetah: Besides continuous protection, a priority is to preserve the integrity of and the connectivity between the prime habitat sites of the cheetah through better livestock management, mitigation of development projects and maintenance of migration corridors. This implies research on population genetics, demography, land tenure system and habitat use (e.g. by means or camera trapping and radio telemetry).

Caracal: As a rather neglected species, the caracal is in need of survey and monitoring, and awareness raising.

Lynx: Protection of the species (law enforcement) and its habitats and mitigation of threats are important conservation measures. Research priorities are basic ecological and biological data (diet, land tenure system, demography) and a taxonomic review to identify subspecies of the Eurasian lynx in Iran.

Pallas's cat: Present only in two small areas in the north-west and north-east, the Pallas's cat requires strict protection of its (meta-) populations and habitats through awareness raising and training and law enforcement. As a prerequisite, more data on distribution, population status and trend, and the species' taxonomy (subspecies) are required.

Leopard: Conservation priorities are maintenance of prey populations and mitigation of the leopard-livestock conflict (compensation scheme, excluding livestock from PAs, etc.), preservation of prime habitats and corridors. This requires research on the leopard's diet, habitat preference, and population fragmentation. Fines for poaching of leopard and its main prey (e.g. wild goats and wild sheep) need to be significantly increased. Fines for poaching in protected areas need to be significantly higher than outside protected areas. Procedures need for efficient law enforcement need to be developed.

Jungle cat: To conserve the species, information on distribution, diet (conflict with livestock), and other basic ecological features are needed. As another overlooked species, it also requires an awareness raising programme.

Sand cat: Research must reveal the distribution of the sand cat, its habitat and prey preferences. The most important habitats must then be protected, livestock should be removed, and local people educated.

Wildcat: The distribution of the wildcat throughout the country needs to be surveyed, and threats and conflicts to be identified. Genetic research should reveal the subspecies status and the degree of hybridisation with domestic cats. Depending on the findings, the wildcat should receive legal protection and the local people must be educated.

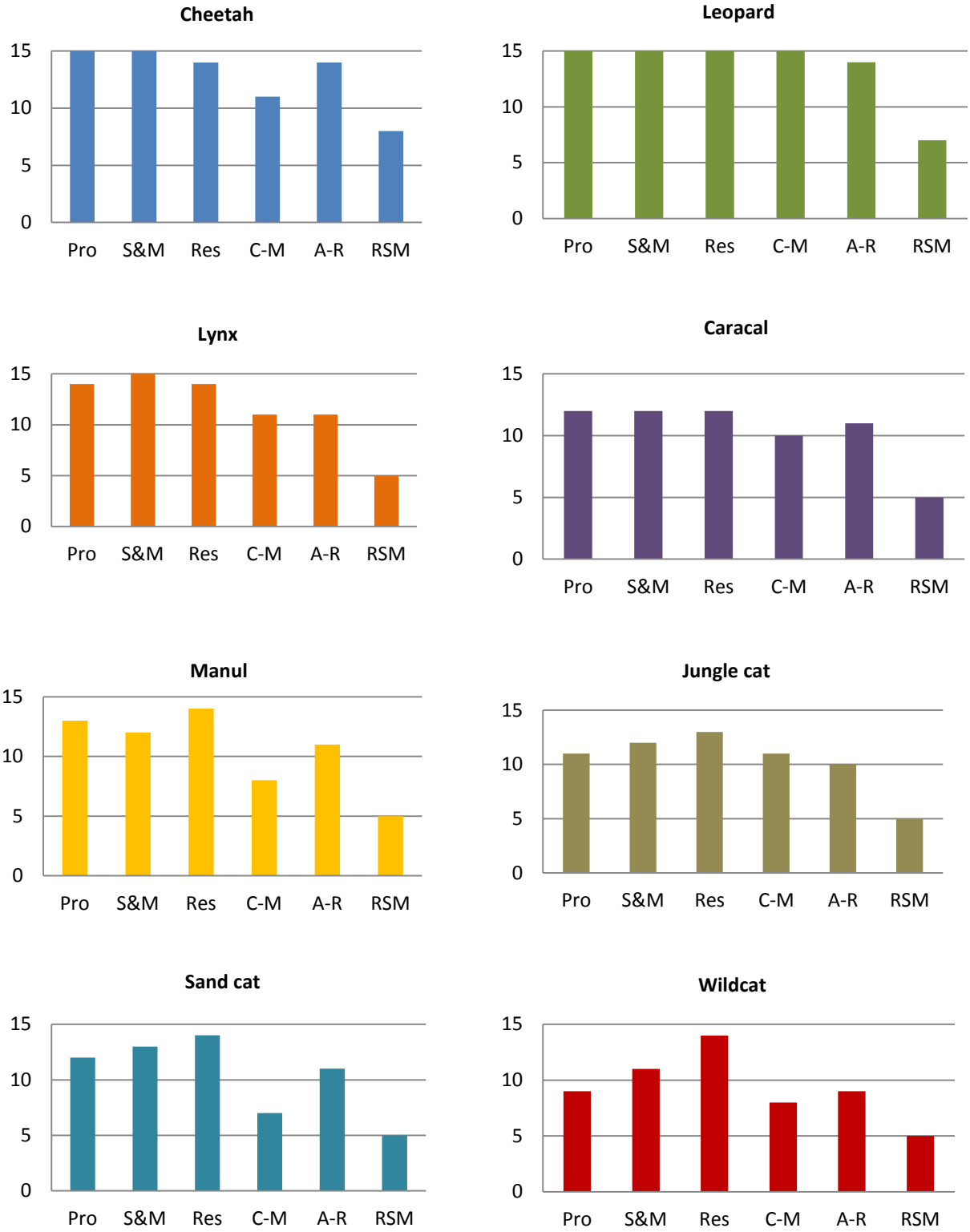

Fig. 4. Relative importance (1-3) of the six conservation measures for the respective species. Presented is the sum over all five working groups. Conservation measures: Pro protection, S&M survey and monitoring, Res research, C-M conflict mitigation, A-R awareness raising, RSM restocking of small populations. For more details for these categories see text.

2.2. Priorities for extinct species: Caspian tiger and Persian lion

The reintroduction of both the Caspian tiger (using the closely related Siberian tiger as a source, as the subspecies is extinct) and the Persian lion (existing still in India and in many zoos) in its former range in Iran is presently considered. To build a consistent baseline for the ongoing discussion, an assessment based on scientific methodology has to address the following points: (1) population and habitat viability analysis, (2) potential prey supply, (3) potential competition with co-predators (e.g. leopard), (4) past and present threats and possible mitigation, and (5) people's attitudes and opinion regarding the reintroduction.

2.3. Cats in captivity

Cats in captivity in Iran have a good potential to help raising awareness for their conservation and educate people working in conservation and wildlife management and the broader public. However, to achieve this effect, the cats must be well kept and properly presented (e.g. in a "natural" environment, showing a "natural" behaviour). For captive populations to serve conservation of free-living cats, a long-term strategy and management plans for each species have to be developed, specific personnel in the captive facilities (zoos and special breeding or rehabilitation centres) has to be educated and trained, and a manual for cat health and welfare has to be developed.

2.4. Conclusions priority setting

Setting priorities allows closing the most important gaps in a reasonable approach and order. For most cat species, basic surveys to define their distribution and population status, but also to identify threats, conflicts, and peoples' attitudes are still required and should have a high priority as they are a prerequisite for defining more targeted conservation measures. Baseline surveys or regional surveys could at least partly be planned as scientific projects (e.g. master theses), but the subsequent long-term monitoring cannot be the task of scientific institutions. Hence a tight cooperation between the DoE and universities is needed from the start. It is important to carry out surveys in a consistent way (comparable approach for all regions and all species) and in a way that they promote the establishment of a long-term monitoring programme.

Surveys may take a long time and will bind resources and hence need to be prioritised again for species and regions. But surveys can often be done for several species at the same time. E.g. a leopard survey in the NW has a high priority, but can likely be combined with the survey of lynx, other co-predators and wild ungulates.

Table 4. Priorities for cat conservation in Iran.

Measures	Areas	Research
Cheetah		
• Increase awareness about the cheetah and its habitats • Enhance protection: increase number of game wardens, equipment, training, etc. • Control livestock in cheetah habitats • Control development plans within the cheetah range • Identify and protect corridors	• Northern Core (Turan, Miandasht and Khosh Yeilagh) • Eastern Core (Naybandan and Ravar) • Central Core (Bafq, Dare Anjir, Ariz, Si-ahkouh and Abbas Abad)	• Population genetics of different core areas (kinship, inbreeding, heterozy-gosity, etc.) • Land tenure system using radio-collars • Demographic studies of the cheetah through camera trapping • Habitat preference of the cheetahs in Iran
Caracal		
• Survey and monitoring of the caracal in Iran • Raise awareness	• Siahkouh and Abbas Abad • Bahram Gour, Gode Ghoul and Qare Tappeh • Turan and Kavir • Caracal habitat in Ilam province	• Land tenure system using radio-collar • Taxonomic studies using genetics and morphology • Habitat use and diet studies
Lynx		
• Protection of key habitats • Public awareness & capacity development • Mitigation of threats • Law enforcement • Increase protected status of No Hunting Areas where lynx occur (e.g. Avaj, Alamout and Tarom in Qazvin prov., Kharaqan in Markazi prov.) as PA	• Mazandaran (Central Alborz PA, Do & Seh Hezar NHA) • East Azarbaijan (Arasbaran PA), Zanjan (Angouran WR) • Semnan (Parver PA)	• Population size and trend • Ecology (Diet, land tenure system) • Genetic studies (identify subspecies) • Radio-telemetry studies
Manul		
• Building capacity (provincial experts) and public awareness • Habitat protection (avoiding of road building and mining) • Mitigation of threats • Law supporting	• Semnan (Khoshyelagh WR, Damghan NH, Parvar PA), Manul habitats in Esfahan province • Khorasan-e- Razavi (Tandoureh), South Khorasan (Shaskouh PA) • East Azarbaijan(Sahand NH)	• Distribution (in detail) • Abundance and population trend • Genetics (identify subspecies)
Leopard		
• Habitat destruction and frag-mentation to be prevented • Conservation of prey species • Implementation of a compensa-tion programme • Identify potential habitat and corridors • Exclude livestock from Protected Areas • Fine for hunting of leopard and its prey to be urgently increased	• Zagros mountain range • Alborz mountain range • Iranian Central Region • East of Iran • East Azarbaijan province: Kag-hazkonan PA and NHA • West Azarbaijan province: North (particularly Marakan) and NW (borders with Turkey) • Others: Tarom in Zanjan and Qazvin prov., Southwest of Ar-debil prov. and Shahu and Kuh-salan in Kordistan prov. • Southern Iran (Khouzestan, Boushehr and Hormozgan)	• Identification of potential habitats and corridors (via e.g. telemetry, re-source selection). • Population studies including (i) population trend, (ii) monitoring (via e.g. systematic camera trapping) • Status of the leopard potential prey species. • Genetic studies on the population to check for fragmentation

Measures	Areas	Research
Jungle cat		
• Identification of distribution of the species in the country. • To study livestock-jungle cat conflicts and to identify the conservation requirements in this regards. • To conduct awareness rising programs.	• North-Eastern Iran covering diverse habitat types. • Several habitats in Boushehr province (e.g. Kuh Sorkh, Kuh Siah, Kisekan and Boushkan) are connected areas that contain the species but they are not protected (Only a total of 6.7% of Boushehr province is protected areas). • Chang-e-Almas, Kurdestan province which is threatened by various human factors. • Habitats of Doyraj and Meimeh in Dehloran Township of Ilam province • Hyrcanian forests of Northern Iran	• Ecological study (telemetry) to understand ranging behaviour and habitat use • To examine its diet and prey preferences. • Demographic study. • Genetic studies to classify its subspecies.
Sand cat		
• Survey throughout suitable habitat for preparing distribution map • Introduce the new habitat as PAs for this species according the distribution map • Exiting live stocks from PA • Local people education	• Sand cat habitats in Naeen (Abas Abad W.R) • Petergan desert in South Khorasan • Samsour desert in Sistan and Baluchestan (Iranshahr) • Kavir & Touran National parks in Semnan province	• Home range and territory by radio collar • Habitat suitability • Survey and identification of threats • Research (Diet, range and diseases)
Wildcat		
• Providing distribution map throughout their habitats • Conflict mitigation • Local people awareness and education • Add it to the list of protected species	• It's difficult to choose areas due to vast distribution • Petergan desert	• Genetic study to identify the subspecies • The reason of Wild cat absence in north of Iran and identify the competitor species • Diet in some areas with scat analysis and stomach contents. • Genetic research for hybridization between sub species and domestic cat

Waiting for the results from baseline survey is however no reason for delay the implementation of urgent conservation measures where critical problems were clearly recognised. If e.g. poaching was identified a threat to leopard, measures such as awareness raising projects, livestock compensation programmes, or law enforcement should be applied even if information on the population status is feeble. If however the reason for an assumed decline of a population is not understood, survey and research must first clarify the conservation status of and treats to the population.

Research priorities listed in Table 4 include social and land tenure systems, habitat use, demography, feeding ecology, and phylogenetic and genetic questions. Some of these questions will need to be answered in order to define purposeful conservation measures. Most of these questions will have to be addressed in the frame of university programmes, and it will take a while to establish the research groups and the respective infrastructure and equipment (e.g. genetic laboratories, GIS facilities, ra-

dio-telemetry equipment, camera- and video-trap pools, and the respective analytic capacity). The most efficient way to boost wildlife research is again through cooperation between universities and with outside institutions (DoE, NGOs) and to share data, information and material to make the best synergistic use of all work. E.g. genetic research to define the taxonomic status, population fragmentation, inbreeding or hybridisation is a typical task for universities, but the required samples and materials will most efficiently be collected in a broad cooperation with provincial DoE offices and NGOs (see chapter 5 Data and collections and 6 Partnership and cooperation).

3. Standards

Cat conservation in Iran needs to respect national laws and international obligations (e.g. according to endorsed international treaties) and needs to be implemented in the frame of existing national strategies and action plans. In order to grant compatible approaches for different species, areas and across international borders, standards and common procedures have to be defined. The framework for this *Roadmap* was assessed for the following subjects: (1) national legislation, (2) national strategies and action plans, (3) international agreements, (4) IUCN standards, and (4) guidelines for captive breeding.

3.1. National legislation

The framework of the national legislation consists of the constitution and the relevant laws and by-laws (regulations). The most important accredited existing legal statement concerning protection of the environment and preventing its pollution and degradation is Article 50 of the Constitution of the I. R. Iran from 1979. It states that all legal and real persons have the duty to protect the environment. Article 45 also relates to environmental protection and natural resource preservation[2].

The Fourth National Development Plan (2005-2009), devotes an entire chapter to environmental protection. The first Article in this chapter states the importance of biodiversity conservation and emphasises the government's commitment to implementing the National Biodiversity Strategy and Action Plan (NBSAP).

In the National Biodiversity Strategy and Action Plan (NBSAP) from 2001 articles 21, 22 and 25 include measures and strategies for the protection of endangered species and their habitat.

The DoE has been established in 1971. From 1956-71 there was only a small organisation dealing with conservation. The current hunting and fishing law is related to this period. Since the establishment of the DoE, a number of laws and regulations have been enacted to ensure biodiversity conservation[3], among which the most relevant for cat conservation are:

- Law for the Protection of Natural Resources and Forest Reserves, 1992;
- National Strategy for the Environment and Sustainable Development (NSESD), 1996;
- National Environmental Plan of Action (NEPA), 1997;
- National Law on Animal Husbandry, 2009.

[2] Source: Iran's 4th National Report to CBD, October 2010.
[3] Listed in: Iran's 4th National Report to CBD, October 2010

A book with the collection of laws and regulations for the protection of the environment has been published by the Legal Office of the DoE. The following laws and regulations refer to the wildlife issues and to protected areas:

- Hunting and Fishing law (1967): this law includes hunting regulations, guidelines for legal hunting and fishing, fines for poaching and illegal hunting of protected species as well as the Iranian Wildlife Red List (all cat species are considered as protected in this list except for the wildcat).
- Improvement and conservation of Environment law (1974): is related to protected areas and relative guidelines.

3.2. National/regional cat conservation plans and relevant national documents

Two cat conservation plans exist to date that relate to cats in Iran:

- Action Plan for the Conservation of the Asiatic Cheetah in I. R. Iran (2010, 19 pages);
- Strategy for the Conservation of the Leopard in the Caucasus Ecoregion (2007, 26 pages, approved by the Caucasus Ecoregional Council).

The following works/publications are of specific interest for the conservation of cats in Iran:

- Reference documents for research activities for 30 protected species, including 3 cat species (cheetah, leopard and lynx) have been prepared by the Faculty of Natural Resources of the University of Tehran;
- IUCN/SSC Cat Specialist Group, DoE and authors' collective: Cats in Iran: A comprehensive review of the conservation status of all extant and extinct cat species of Iran. Special issue of Cat news (in press);
- Karami M, Ghadirian T, and Faizolahi K: Atlas of Mammals of Iran (University of Tehran and DoE, in press);
- Darvishsefat A. A. 2006. Atlas of protected areas of Iran. University of Tehran and DoE.

3.3. International

Iran has ratified the following international agreements, which are relevant for the conservation of the cats: the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), the Convention on Migratory Species (CMS), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The Economical Cooperation Organisation (ECO) is an intergovernmental regional organisation established in 1985 and expanded in 1992 including Iran, Pakistan, Turkey, Afghanistan, Azerbaijan, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. Most ECO region countries have ratified the international treaties listed above, considered to be applicable tools for the protection and improvements of Asian natural environment and biodiversity. To answer complex conservation issues, a regional initiative proposed integrating National Biodiversity Strategies and Action Plans (NBSAPs) of all state members of the ECO region in order to develop a Regional Biodiversity Plan of Action (RBPA). This plan will foster transboundary cooperation in environmental protection and will be formally proposed by the Institute of Environmental Science and Technology (ECO-IEST), established to generate knowledge through research and studies on environment in ECO region. ECO-IEST was inaugurated in February 2011 and is hosted by the University of Environment in Karaj.

Iran is furthermore member of the Low Forest Cover Countries (LFCCs), a group focussing among others on the high value of forest for biodiversity conservation. The DoE is (besides several NGOs like ICS) member of the International Union for Conservation of Nature (IUCN) and of the Caucasus Biodiversity Council (CBC).

On a multilateral level, Iran is preparing agreements on Transboundary Protected Area TBPA with Armenia, Turkmenistan and Iraq. So far only a TBPA with Armenia has been completed and submitted to UNESCO for registration. Such transboundary parks with a common management will considerably support the conservation of cats such as the leopard.

3.4. IUCN authority files, guidelines and recommendations

IUCN has developed a number of instruments, guidelines and recommendations providing standards and templates for species conservation, which are also relevant for the conservation of the cats in Iran:

The IUCN Red List or Threatened Species[4]: The IUCN Red List of Threatened Species™ is widely recognized as the most comprehensive, objective global approach for evaluating the conservation status of plant and animal species. The goal of the Red List is to provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation.

Re-introduction Guidelines:[5]: The IUCN re-introduction guidelines are a comprehensive set of policy guidelines that ensure that the re-introductions effectively achieve their intended conservation benefit, and do not cause unfavourable environmental side-effects.

Handbook for Strategic Conservation Planning: This document provides guidance on when and how to prepare and promote what we call Species Conservation Strategies (SCSs).

Technical Guidelines on the Management of Ex-situ Populations for Conservation: The guidelines represent an attempt to synthesize current thinking on the strategic application of *ex situ* conservation for the maximum benefit of both threatened species and habitats.

Guidelines for Confiscated Animals: The guidelines were formulated to address the placement of increasing numbers of animals being confiscated from illegal and irregular trade worldwide.

Position Statement on the Translocation of Living Organisms: The Position Statement is an initial attempt to describe, in detail, important translocation terms such as Introductions, Re-introduction, and Re-stocking.

Animal Movements and Disease Risk: The health of endangered species, both in the wild and in captivity, could be seriously impacted by common and emerging pathogens. Animal health experts, conservation biologists, regulatory and trade officials, and natural resource agencies are all faced with implementing risk management strategies in the face of relatively little existing information. Risk analysis is a growing field concentrated on accumulating and organizing existing information in order to prioritize relative risks to support decision-making in the face of uncertainty.

[4] www.iucnredlist.org
[5] All documents released by IUCN can be found and downloaded under www.iucn.org.

3.5. Standards for captive breeding and cats in zoos

International zoo organisations such as the World Association of Zoos and Aquariums (WAZA; www.waza.org) or the European Association of Zoos and Aquariums (EAZA; www.eaza.net) and the IUCN Conservation Breeding Specialist Group (CBSG; www.cbsg.org) provide guidelines, tools and manuals for the management of cats in captivity or the assessment of habitat and population viability. Examples of such documents are:

- World Zoo Conservation Strategy: A statement of the role of zoos and aquariums of the world in conservation (WAZA members);
- EAZA Felid TAG Mission Statement and Best Practice Code: A jointly formulated code of practice towards captive felid husbandry and management;
- CBSG Vortex software: Simulation of the effects of deterministic forces as well as demographic, environmental and genetic stochastic events on wildlife populations.

4. Monitoring – *See also Chapter 5. Data & collections*

Survey and monitoring are a prerequisite for all target-oriented conservation and management interventions. A proper survey helps to design a meaningful conservation programme, and monitoring allows to correct errors and to adapt to new developments while implementing the conservation actions.

4.1. Definition of terms and monitoring methods

Survey is a one-time inquiry to define and assess a given situation, e.g. the status of a population or the attitudes of people. A *baseline survey* is a survey with a broad approach in a predefined area to generate a full set of data describing the situation of a population mostly in an area with limited information. *Monitoring* is the repeated gathering of a single or multiple set of data to verify a progress or the accomplishment of a target. The term *monitoring* is also used for the continuous observation of a population by means of a standardised methodology.

We distinguish *opportunistic* and *deterministic monitoring*. In the *opportunistic monitoring*, data and information are collected as they occur, e.g. sampling of traffic victims, compiling of chance observations, or examination of killed livestock. *Deterministic monitoring* is the application of a exactly defined method in a pre-defined area and a fixed period, e.g. systematic camera trapping for a given number of nights in a reference area, or a fixed number of track transects over a defined distance in a certain season. Opportunistic monitoring is cheaper and can generate a wealth of data, but it is always biased, e.g. road kills occur only on busy roads, livestock kills only when herds are present. Deterministic monitoring is more expensive (because it often uses more sophisticated techniques), but it is not or at least less biased and allows for quantitative analyses and provides an estimation for the accuracy of the results, e.g. based on capture-mark-recapture (CMR) calculations.

A number of techniques and approaches can be used for surveying or monitoring cat populations. Some of these methods are only useful for opportunistic or deterministic monitoring, but some can

be used for both. The most efficient, also cost-effective monitoring system is a *stratified monitoring*, consisting of a combination of various opportunistic and deterministic approaches. In a stratified monitoring approach, cheap, but less reliable opportunistic monitoring methods are used across large areas, whereas expensive, but more accurate methods are applied in determined reference areas and used to control and calibrate the data generated on the larger level.

The following methods and approaches can be used for surveys or monitoring of cat species[6]:

1. *Baseline survey*: A large-scale and rapid assessment of the situation of a population in a region where the species is believed or know to be present, but no detailed information is available. A representative sample of local people (even distribution, target groups such as hunters, shepherds, etc.) is interrogated regarding the species' presence, trend, prey species, conflicts, attitudes, etc.
2. *Collection of chance observations*: Systematic recording of all observations (e.g. direct sightings, kills, tracks, etc.) or a cat species reported by the public. It is recommended to use well-designed forms and categorise the observations, e.g. into "hard facts" (C1), "confirmed reports" (C2), and "unconfirmed reports" (C3).
3. *Raster surveys*: A one-time or repeated (e.g. every year) inquiry by means of a (simple) questionnaire distributed by mailing according to a pre-defined raster, e.g. by communities or counties or according to a 10 x 10 km grid. The purpose is not to gain detailed information, but to generate a consistent reporting over a large area in order to be able to distinguish between "no cats" and "no information".
4. *Opportunistic camera trapping*: Use of camera traps throughout the year at favourable spots (e.g. at kills or forced passages) in order to confirm the presence of the species, reproduction, etc., and take as many photos of different individuals as possible. The results from opportunistic camera trapping cannot be used for CMR analyses (possibly for occupancy studies), but they help to identify individual cats during a deterministic camera trapping session in the same area.
5. *Deterministic camera trapping*: Systematic observation of a reference area over a fixed time (e.g. 60 nights in a density of 1 camera trap per 5 km²) in order to make "captures" of individuals to be used for capture-mark-recapture estimations. Deterministic camera trapping is today the best methods to produce scientifically robust density estimations for individually distinct cats.
6. *Track and sign transects*: Systematic transects to confirm the presence of a cat species in a given area either for a survey or a repeated monitoring. Track and sign transects are useful for large cats leaving distinct signs (e.g. scrapes of leopards) and allow to cover relatively large areas at low cost, but they require trained personnel and are biased regarding the substrate, seasons and weather conditions.
7. *Genetic CMR*: Collection of representative samples of excrements (e.g. along transects) or hairs (e.g. by means of hair traps) to be used for molecular-genetic identification of individuals and analysed by means of CMR statistics. Probably strong bias in regard to age of scats (uneven degradation of DNA) and social marking behaviour at hair traps. But genetic identification of the

[6] This is only a very brief presentation of the different methods. For more information, an extended scientific literature on all methods mentioned is available.

species (without individual CMR) can be very helpful to confirm the presence of a certain species in a given area, especially for smaller cats, which can easily be mistaken.

8. *Radio telemetry*: Generally not used for survey or monitoring, but for more in-depth ecological studies, but very helpful to calibrate date from less intensive monitoring methods. Densities of cats are generally correlated with home range size, and this is best studied by means of radio telemetry.
9. *Examination of kills*: Cats kill and eat their prey in a distinct way. Systematic examination of killed wildlife and domestic animals by trained personnel therefore is a good way to confirm the presence of a cat species and allows integrating local people into the monitoring programme. Systematic examination of killed livestock is strongly recommended if any kind of compensation programme is set up.
10. *Examination of dead cats*: Systematic collection and necropsy of all wild cats found dead is ultimate as it reveals a wealth of information such as distribution, age structure, causes of mortality, health and genetic constellation. It requires trained personnel (wildlife pathologists) and a long-term consistent sampling to generate a valuable data set.
11. *Collection, analyses and storage of genetic samples*: Taxonomy, heterozygosity (inbreeding), and an increasing number of other conservation-relevant questions such as population fragmentation, connectivity, abundance, etc. can today be addressed by means of molecular-genetic analyses. It is therefore strongly recommended to not only collect genetic samples for specific research projects, but also to generate and maintain a gene bank allowing addressing long-term questions.
12. *Collection of skulls, skeletal bones and hides*: Parts of cats found dead such as skulls, (large) skeletal bones or furs are valuable to address long-term questions in the field of evolution, taxonomy or genetic or veterinary health. Such parts should therefore systematically be collected, professionally prepared and stored in an adequate place such as a natural history museum.

The protocols and practical approach for the application of any of these methods on the eight cat species will be very similar and can be easily adapted.

Pallas's cat or manul (Photo F. Esfandyari)

4.2. Application and organisation of monitoring methods for the cat species in Iran

Table 5 summarises the usefulness and importance of the above listed monitoring and survey methods for the eight extant cat species of Iran according to the conclusions of the Sari Workshop. Baseline surveys, a repeated raster survey, and collection of dead specimens, genetic samples and body remains were considered to be important for all cat species. Opportunistic camera trapping is recommended for most species, deterministic camera trapping for some species. The limits for the latter are that some cat species such as caracal or sand cat will be difficult or impossible to individually identify from pictures. Track transects and genetic CMR are less recommended because of the relatively low efficiency or cost-effectiveness.

Table 5. Monitoring, survey and screening methods regarding their importance for the conservation of the cat species in Iran and their implementation costs. Not all methods can be implemented, and some are "cheaper" if applied for several species. The importance of a specific method per species is follows: 0 = not recommended or not applicable, 1 = least recommended, 2 = recommended, 3 = highly recommended. Costs are ranked relatively as L = low, M = medium, and H = high costs. Type of monitoring: d = deterministic, o = opportunistic. Species abbreviation as in Table 1.

Nr.	Method	Type	Costs	Aj	Cc	Ll	Om	Pp	Fc	Fm	Fs
1.	Baseline survey	d	M	3	3	3	3	3	3	3	3
2.	Collection of chance observations	o	L	3	2	3	3	3	2	3	2
3.	Raster survey	d	L	3	3	3	3	3	3	3	3
4.	Opportunistic camera trapping	o	M	3	3	3	3	3	2	3	2
5.	Deterministic camera trapping	d	H	3	1	2	1	3	1	3	1
6.	Track and sign transects	d	M	1	2	2	1	1	2	2	2
7.	Genetic CMR	d	H	1	1	1	1	1	1	1	1
8.	Radio telemetry	d/(o)	H	3	2	3	3	3	3	3	2
9.	Examination of livestock depredation	o/(d)	M	2	3	2	2	3	2	2	2
10.	Collection of dead specimens and systematic autopsies	o/(d)	M	3	3	3	3	3	3	3	3
11.	Collection of genetic samples	o/(d)	M	3	3	3	3	3	3	3	3
12.	Collection of skulls, skeletons and hides	o	M	3	3	3	3	3	3	3	3

To foster the application of the various survey and monitoring methods, the workshop participants suggested for each of the methods institutions that should be involved in the development of specific protocols, in the implementation of these protocols, and organisations that could possibly financially support the monitoring (Table 6). As long-term monitoring is typically a governmental task, the DoE was identified as the leading organisation, but also as the main funder of surveys and monitoring.

Table 6. Development, implementation and funding of monitoring methods for cat species in Iran. For the relevance of the methods for each species see Table X. DoE = Department of Environement, ICS = Iranian Cheetah Society, P4L = Plan for the Land Society, ALSS = Asian Leopard Specialist Society, CMR = Capture-Mark-Recapture, SGP = Small Grant Program, IF-Org = International Funding Organization.

Nr.	Method	Development	Implementation	Funding
1.	Baseline survey	Universities, DoE, NGOs (ICS, P4L, ALSS)	Office of natural environment (DoE), provincial DoE offices, ICS, P4L, ALSS	DoE, SGP
2.	Collection of chance observations	DoE, NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	N/A
3.	Raster survey	Universities, DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE
4.	Opportunistic camera trapping	DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE
5.	Deterministic camera trapping	DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE IF-Org
6.	Track and sign transects	DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE
7.	Genetic CMR	DoE (Genetic Storage Bureau), Universities	Provincial DoE offices, NGOs	DoE, IF-Org
8.	Radio telemetry	DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE, IF-Org
9.	Examination of livestock depredation	DoE (Wildlife Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE
10.	Collection of dead specimens and systematic post mortem autopsies	DoE (Wildlife Bureau & Genetic Storage Bureau)	Provincial DoE offices, NGOs	DoE
11.	Collection and analysis of genetic samples	DoE (Genetic Storage Bureau), Universities and ICS	Provincial DoE offices, NGOs	DoE
12.	Collection of skulls, skeletons and hides	DoE (Genetic Storage Bureau), NGOs (ICS, P4L, ALSS)	Provincial DoE offices, NGOs	DoE

4.3. Conclusions survey and monitoring

Survey or monitoring work needs to be organised, coordinated, and carried out. The main organiser and coordinator have to be the DoE and its Bureau of Biodiversity and Wildlife. The structure of the DoE with offices in all provinces and stations in most protected areas furthermore grants the systematic and consistent application of agreed survey and monitoring principles. These principles should then be applied by all institutions compiling monitoring data. To secure long-term availability of all survey and monitoring data generated, a common approach (protocols), a centralised database, standardised analyses, and a consensus regarding the interpretation of the findings are required. The development of a specific cat monitoring manual for Iran is strongly recommended. Priority species and regions for survey and monitoring should be defined according to Chapter 2, Priorities. The DoE (or a designated institution) should also maintain a large database compiling all monitoring data and a GIS project to manage all geo-referenced information on cats.

The DoE, universities and NGOs should participate in the development and implementation of the monitoring methods (Table 6; see also Chapter 5) under the lead of the DoE. Universities are invited to actively develop and test specific monitoring methods. These are tasks that can be typically organised as master or doctoral theses and can lead to many continued projects of a scientific working group within a university department. NGOs are less prepared to deal with methodological approaches and long-term monitoring, but a lot of monitoring data can be compiled while implementing other conservation projects, if the proper standards and protocols are established. The most important funding agency for a cat monitoring system will be the DoE (Table 6). Monitoring is typically a task of a public institution, and the DoE is well-organised throughout the country, so that many monitoring tasks can be organised as an in-kind contribution and will go parallel to the daily work of DoE staff in the provincial offices and in the field. In the DoE headquarter, however, the appropriate monitoring unit and structures have to be created.

As concrete steps towards a consistent cat monitoring system in Iran, the following actions are recommended:

1. Create a cat monitoring task force under the lead of the DoE to implement the recommendations in this chapter;
2. Review the priority species and regions for (1) baseline surveys and (2) for a consistent continuous monitoring;
3. Define the methods to be applied and the main target species as well as species for which the same approach can be applied as a "side effect";
4. Identify institutions involved in the development or adaptation[7] of the monitoring protocols and distribute assignments;
5. Define the proper and long-term storage of data and materials (e.g. genetic samples) and identify the appropriate institutions to host databases and collections (see also Chapter 5, Data and collections);
6. Develop a cat monitoring manual for Iran and instruct and educate all personnel (DoE, NGOs, university students, etc.) involved in cat monitoring;
7. Secure funding for the long-term monitoring and start implementing the monitoring activities according to the manual.

[7] Several monitoring protocols have already been developed e.g. in the frame of the CACP; see also Chapter 5, Data and collections. Such protocols should be used and adapted to a more general use or for other cat species.

5. Data and collections

Beyond generating data in the field and the immediate reporting, monitoring data need to be compiled and stored using a system that grants the long-term usability (secure storage and understandable documentation) of the information. It is hence important to agree on the later management and availability of monitoring data from the very beginning. The workshop participants have reviewed the available protocols, reporting systems, and archives and have made recommendations for data sharing and standardised reporting.

5.1. Protocols and forms, reporting, data sharing and storage

Table 7 summarises the review and recommendations regarding standardised protocols (available or recommended), database or storage systems (archives), and data sharing and reporting for the 12 potential data sets as listed in Chapter 4.1 and in Table 5 and 6.

Table. 7. Standards and rules for recording, storing, sharing and communicating data, samples and information. Rec = recommended, Av = available. The last two columns indicate for which datasets to share data and have a common reporting. Cells left white: not applicable.

Nr.	Method/data set	Protocol		Forms		Database		Storage		Reporting	
		Rec	Av	Rec	Av	Rec	Av	Rec	Av	Shared	Reporting
1.	Baseline survey	Y	Y	Y	Y	Y	Y			N	Y
2.	Collection of chance observations	N	Y	N	Y	N	Y			Y	Y
3.	Raster survey	Y	N	Y	N	Y	N			N	Y
4.	Opportunistic camera trapping	Y	Y	Y	Y	Y	Y			N	Y
5.	Deterministic camera trapping	Y	Y	Y	Y	N	Y			N	Y
6.	Track and sign transects	Y	Y	Y	Y	Y	N			Y	Y
7.	Genetic CMR	Y	N	Y	N	Y	N			N	N
8.	Radio telemetry	Y	Y	Y	Y	Y	N			N	N
9.	Examination of kills	Y	Y	Y	Y	Y	Y			Y	Y
10.	Examination of dead cats	Y	Y	Y	Y	Y	N	N	Y	N	Y
11.	Genetic samples	N	Y	N	Y	Y	N	N	Y	Y	N
12.	Skulls, skeletons and hides	Y	Y	Y	Y	Y	N	N	Y	Y	N

The working group also reviewed items (protocols, forms, etc.) already available and made recommendations for further cooperation in regard to data treatment:

1. *Baseline survey*: Some NGOs (P4L, ICS, ALSS, KM, CACP) have already developed protocols and forms for baseline surveys. The DoE (e.g. in the frame of the monitoring task force recommended in Chapter 4, Monitoring) should develop and provide a standardised format (adapted to individual species wherever needed) to be used in the provincial offices, by the universities and NGOs. Databases have been set up by CACP (cheetah), P4L (cheetah, leopard, wildcat, sand cat), ICS (cheetah, lynx, leopard, caracal, manul), and ALSS (leopard, jungle cat). *A priori* data

sharing is not recommended, but data and findings should be made available through reports and publications.

2. *Collection of chance observations*: A protocol and form for the reporting of chance observations has been developed by the DoE, which should also host a centralised database. An online Persian leopard database recording and storing system has been already developed by DoE and ALSS which financially supported by a SGP <www.persian-leopard.com>. Shared data will be stored and annually monitored and reported to the members by relative authorities.

3. Data should be shared and commonly reported by all partners involved, e.g. in annual reports by provinces.

4. *Raster surveys*: Is recommended (Table 5, 6, 7), but so far, no protocols or forms are available. Raster surveys could be established to gain a quick overview on the implementation of the monitoring system e.g. based on county and carried out by the provincial DoE offices on behalf of the head office. Data sharing is not needed, but reporting must be regular based on the decided survey interval.

5. *Opportunistic camera trapping*: Protocols and forms are available from several NGOs and from CACP. The DoE should provide a standardised protocols and database structures for the provincial offices and should assure a tight cooperation between the provincial offices and the head office, e.g. a yearly reporting and data transfer to the head office and its central database. Data sharing is not recommended (but see also Chapter 5.3, Conclusions). However, data owners should make data and findings available in public reports or publications after the termination of the project.

6. *Deterministic camera trapping*: Protocols are available from some NGOs and the CACP, but the DoE should organise a standardisation (per species) to assure compatibility of results. Databases are already maintained by CACP (cheetah until 2011) , ICS (2011-2013 Iran's Cheetah National Monitoring, lynx in Angouran), and P4L, ICS, and ALSS (leopard). Data sharing is not recommended (but see also Chapter 5.3, Conclusions), findings should be made available in reports and publications.

7. *Track and sign transects*: Protocol and form available from ALSS, to be used by DoE for standardisation. Refer also to scientific literature! Databases are recommended to be maintained by the provincial offices with a regular (e.g. annual) data transfer to the DoE head office. Sharing data and joint reporting is recommended wherever possible.

8. *Genetic CMR*: If genetic CMR is foreseen, the DoE should work with universities to develop a proper protocol. Data sharing and regular reporting is not recommended.

9. *Radio telemetry*: Protocol and form available from ALSS, to be used as starting points by other NGOs or universities launching radio telemetry projects. Refer also to scientific literature! Databases should be maintained by the organisations generating the data. Neither data sharing nor joint reporting is recommended (but see Chapter 5.3, Conclusions).

10. *Examination of kills*: Protocols and forms available from CACP, ICS and P4L. A standardised form should be used throughout the country. Databases are already maintained by ICS (lynx in Angouran), P4L (leopard in Golestan), and CACP (cheetah in Touran and Miandasht). Information should be shared and disseminated in annual reports by the DoE.

11. *Examination of dead cats*: Some provincial DoE offices already collect such information, but there is no standardised protocol. Such a protocol (and the respective forms) should be developed in cooperation between the DoE, the relevant universities and WCS experts already cooperating with CACP. It is recommended to save the data in the provincial offices and in a centralised database at the Pardisan Museum (DoE). Data sharing is not needed, but data owners/researchers should publish case studies and reviews as suitable.
12. *Collection, analyses and storage of genetic samples*: Some provincial DoE offices act as regional gene bank holders, e.g. in Esfahan, East Azerbaijan, Khorasan-e-Razavi, Hormozgan, Tehran, Khouzestan, and the Pardisan Museum (DoE). Additional material is stored by P4L and ALSS (leopard), and ICS (leopard, cheetah, and caracal). It is important to secure the adequate long-term storage of all samples and to compile all samples into a centralised database with a proper and explicit labelling! It should even be considered to establish a central storage facility for such samples. Data sharing (e.g. in a mutually maintained gene database) is recommended, regular reporting is not needed beyond scientific publications.
13. *Collection of skulls, skeletal bones and hides*: Protocols and forms are available from Pardisan Museum (DoE), some provincial offices and ALSS. These institutions also store materials from dead cats. Additional material is kept by CACP (cheetah skulls), ICS, P4L and ALSS (leopard skulls). It is recommended to create a central database of specimens available at museums and NGOs in the DoE. Data sharing (e.g. in a mutually maintained database) is recommended, regular reporting is not needed beyond scientific publications.

5.2. Existing protocols, forms, databases, archives

During the Sari Workshop, a list of examples of already available protocols, database systems and reports was compiled (Table 8).

5.3. Conclusions data and collections

Monitoring data and samples collected in the field often have a value beyond the project for which they were generated. Many monitoring data sets actually gain expressiveness and explanatory power over the years, and combining several data sets often provides better understanding than analysing each data set individually. Hence shared data can be more than the sum of the single units.

Consequently, secure data storage and controlled data sharing is of outstanding importance. Loss of information through inadequate storage of data and samples, insufficient documentation or labelling of original data, or lack of efficient back-up systems is widespread and a waste of funding and efforts to generate the data. Such loss of data and information must be prevented through a well-organised data transfer and securing system.

In order to secure data and allow for retrospective analysis in the future, all original records must be kept, even if these data are transferred into digital systems. The original owner of the data (normally the one generating the data) should keep the original forms and the database. But all digital data should regularly, at least once a year, be transferred into a centralised database system that is professionally maintained. This centralised database should be located at the DoE head office or at a designated institution.

Table 8. List of already available protocols, databases and periodic reports.

Name of document	Purpose	Developer/Organisation
Protocols and forms		
Felid chance observations in PAs	Distribution mapping and species richness	M. Mousavi, Iran DoE
Remote camera-trapping	Presence/Absence, Min. Pop. Ass., CMR	NGOs (ICS, P4L, KM, ALSS); CACP
Track and sign surveys	Leopards	ALSS
Livestock depredation	Wild cats	Iran DoE ; CACP ; ICS ; P4L ; ALSS
Genetic sampling	Misc	Iran DoE; P4L; ICS; ALSS
Databases and archive systems		
Wild cats occurrence	Distribution mapping	M. Mousavi, Iran DoE; E. M. Moqanaki, ICS; A. Sanei, ALSS; T. Ghadirian, P4L
Cat mortalities	Threats and cause of mortalities	M. Mousavi, Iran DoE; K. Baradarani, ICS; A. Sanei, ALSS
Genetic samples	Storage (and research)	Z. Fatollahzadeh, Iran DoE
Cheetah samples	Storage (and research)	M.Eslami, ICS; CACP and DoE
Leopard skulls	Craniometery and sexual dimorphism	M. S. Farhadinia, ICS; A. Sanei, ALSS
Leopard occurrence, mortalities, biometry, craniometric data, livestock depredation, complaints of local communities, opportunistic records including photo, video, track signs	Storage of the species data, distribution mapping, monitoring species status, threats	ALSS and DoE
Examples of existing regular reports		
Prey species status	Internal report (yearly)	M. Mousavi, R. Khalaji, Iran DoE
Wild cat mortalities	Internal report (yearly)	M. Mousavi, Iran DoE

Sharing data with a (scientific) value between potentially competing organisations is always a delicate issue. Hence data transfer, storage, and further use has to be strictly regulated and agreed by all users, both data provider and data users. The rights and interests of the original data owner have to be granted. This can be done through classification of the data provided, e.g. data sets can be declared as “private” (for a certain period), “available on demand”, or “public”. Furthermore, the use of shared data should base on consensus and agreement of all data providers. Such a system respects the short-term interest of the data owner and the long-term demand of monitoring data to observe the development of populations over time and large areas.

The monitoring task force proposed in Chapter 4 should develop a data storing and sharing protocol and consult with all potential data providers to reach consensus on establishing a partnership to build and maintain a cat conservation database system for Iran.

6. Partnership and cooperation

Cat conservation in Iran must base on a broad cooperation between several institutional partners, namely the DoE (the leading conservation GO), NGOs involved in cat conservation, and research institutes, building a wide network of cat conservation institutions. The Sari Workshop participants compiled actual and potential members of such a network and discussed their factual or possible role.

6.1. Partners

The following institutions were identified which are already or might be in the future involved in cat conservation and research:

Governmental organizations (GOs): The different DoE bureaus, branches and provincial offices are the most important national governmental nature conservation institutions and in charge of all protected areas of Iran. The most important DoE institutions for cat conservation are:

- DoE, Deputy of Natural Environment: Main decision making body in regard to cat conservation;
- DoE, Wildlife and Biodiversity Bureau: Prioritising research and conservation aspects;
- DoE, Habitats and PA's Relations Bureau: Support for PAs information and cat habitats upgrade;
- DoE, Conservation and Hunting and Fishing Management Bureau: Implementing proper legal hunting programme and support for conservation measures in PAs at national level;
- DoE, Legislations Bureau: Follow up and consultancy in law enforcement issues;
- DoE, Rangers Force Bureau: Direct conservation and protection in PAs at national level;
- DoE, Provincial Offices, Deputy of Natural Environment: Propose new initiatives for research and conservation regarding cats and implement approved decisions for conservation and support for research programmes.
- Natural history museums and Genetic Storage Bureau: Support genetic studies and gene bank of plant and animal species, meanwhile management of natural history museum in Pardisan Park.

Non-governmental organizations (NGOs), national: Design, develop and implement new initiatives towards conservation and research at national level and contribute to international organizations at international level. National NGOs so far involved in cat conservation were:

- Plan for the Land Society (www.plan4land.org);
- Asian Leopard Specialist Society (www.leopardspecialists.com);
- Iranian Cheetah Society (www.wildlife.ir);
- Mohitban Society (www.mohitban.org);
- Persian Wildlfe Heritage Foundation (www.persianwildlife.org);
- East-Azarbaijan Wildlife and Aquatic Conservation Institute (r_masoud84@yahoo.com).

Non-governmental organizations (NGOs), local or regional: Participation in implementation of research, monitoring and conservation actions and projects.

Non-governmental organizations (NGOs), international: Support in fund raising, capacity development, design and implementation of conservation and research projects. The two most important international partners so far were the Wildlife Conservation Society (WCS; www.wcs.org) and Panthera (www.panthera.org), both mainly involved in the CACP.

Universities: Educate and train human resources for research and conservation, design and develop research programmes on cat conservation and collaborate with international academic organisations. Universities so far or potentially involved in cat research are:

- University of Environment, Karaj;
- University of Tehran, Faculty of Natural Resources, Environment Department, Karaj;
- University of Shahid-Beheshti, Faculty of Science;
- University of Isfahan of Industry, Faculty of Environment;
- Azad University, Science and Research Department;
- University of Yazd, Faculty of Natural Resources, Department of Environmental Engineering;
- University of Gorgan, Faculty of Fisheries and Environment, Environment Department;
- University of Guilan, Environment Department;
- University of Zabol, Environment Department;
- University of Shiraz, Environment Department;
- University of Tehran, Faculty of Veterinary;
- University of Birjand, Environment Department;
- Ferdowsi Mashhad University, Faculty of Science;
- Tarbiat Modares University, Faculty of Natural Resources and Marine Sciences;
- University of Shahr-e-Kord, Department of Fisheries and Environment;
- University of Malayer, Environment Department;
- University of Kordestan, Environment Department;

Zoos, wildlife museums and private wildlife owners: Participation in education and in-direct conservation of cat species, such as monitoring, health issues, and captive breeding programmes.

International and intergovernmental organisations:

- IUCN/SSC Cats Specialists Group: Facilitate the development of conservation plans and research programmes and capacity development;
- EAZA/WAZA: Support for captive breeding programs and capacity in breeding and management of captive populations.

Affiliated partners and wider network: Beyond the partners directly involved in cat conservation or research, the following GOs should be informed about this *Roadmap*: Ministry of Interior, Ministry of Road and Transportation, Ministry of Education, Ministry of Science, Research and Technology, Ministry of Industries and Mines. Furthermore, the *Roadmap* should be propagated through radio and television stations and the print media.

6.2. Conclusion partnership and cooperation

Cat conservation in Iran is a lasting obligation involving many institutions with different backgrounds, namely the DoE as the leading conservation governmental organisation, several NGOs with a strong commitment to cat conservation (see e.g. Table 6), and universities who engage in research and education of young researchers. Each part of this “triangle of conservation” has to play a different role, but the partners have to work together and to follow a common philosophy, strategy and methodology, outlined by this *Roadmap*.

The DoE as the leading conservation governmental institution and its nation-wide network plays an outstanding role in monitoring, law enforcement and protected area management. Furthermore, the DoE is the central unit and needs to assume the coordination of cat monitoring and to host the central database. Good conservation needs to be based on good data. Research in the broader sense of "generating data and knowledge" has to be tackled on various levels; GOs (e.g. the DoE); conservation NGOs and universities need to work together. For most cat species, surveys to define their distribution and population status are still required. Baseline surveys or regional surveys could at least partly be planned as scientific projects (e.g. master theses), but the subsequent long-term monitoring cannot be the task of scientific institutions. Hence a tight cooperation between the DoE and universities is needed from the start. Genetic research to define the taxonomic status, population fragmentation, inbreeding or hybridisation, radio-telemetry projects, GIS modelling, etc. are other typical task for universities in the frame of research projects, but needs samples, material, local knowledge and support that can most efficiently be provided by provincial DoE offices or NGOs. Non-governmental organisations, on the other hand, are often better positioned to work with local people than the GOs or universities. Hence NGOs are the best suited partners to implement human dimension projects, educational programmes or co-management and economic action plans.

Such a broad strategic cooperation between many governmental and non-governmental institutions may require a number of agreements, which need to be more detailed and very specific, but should all base on the principles outlined in this *Roadmap*.

7. Capacity development

To implement the *Roadmap* and provide the constant capacity for cat conservation, the continuous education of researchers, managers, and wildlife rangers/field staff must be secured.

7.1. Demand for training and continuous education

Table 9 lists the education subjects identified at the Sari Workshop for academic (universities), management (DoE) and practical (DoE, NGOs) needs and the institutions, which could possibly offer such a training.

7.2. Existing training units and courses

A number of training units and courses are already available for university students.
In Iran's public universities, Engineering of Natural Resources (Branch Environment) is the main branch for BSc degree in this subject. Master's degree fields include: Biodiversity, Land use planning, and Environmental pollution.

BSc. courses:
Human and environment, park engineering and designing, soil conservation, environmental and fisheries laws and regulations, zoology, limnology, marine ecology, genetics, forestry, research methods, environmental evaluation, wildlife biology, ornithology, range land management, wildlife

ecology, wildlife management and techniques, land use planning, environmental pollution, landscape ecology, protected areas and wildlife management.

MSc. courses:
Management of ponds and migratory birds, industrial pollution, development impacts evaluation, habitat evaluation procedures, conservation biology, GIS courses including remote sensing techniques. Management of water ecosystems, statistical advanced methods, complementary wildlife ecology, and waste management recycling.

DoE holds some courses for staff in collaboration with universities and DoE's experienced experts. CACP and NGOs including ICS, ALSS, Plan4 land and Mohitban Society have awareness raising projects for local communities (e.g. students and others), provincial DoE staff and field staff (e.g. game wardens and rangers). ALSS held a national project which was supported by Central DoE, SGP, and DoE Provincial Offices of North Khorasan, Boushehr, Golestan and West Azarbaijan provinces in 2012/13. These workshops were conducted regionally and covered all 31 provinces in the country. Two main subjects were addressed in these workshops: 1- wildlife research and sampling techniques, with main focus on distribution modeling studies (case study: distribution modeling of the Persian leopard in each region using MAXENT) and also, 2- capacity development and awareness raising programs' techniques for local communities in Iran (case study: local communities' awareness raising and capacity building requirements for leopard conservation in each region).

Table 9. Capacities needed for researchers, managers and field staff for the implementation of the *Roadmap*. b = basic training (general understanding and practical application), c = complete education (including theoretical background and practical application). (c) indicates that DoE managers of NGO representatives may have been educated at universities.

Training/education/course	Research	DoE		NGOs
		Managers	Field staff	
Field techniques	c	(c)	b	(c)
New techniques in wildlife studies	c	(c)	b	(c)
Wildlife veterinarian	c	(c)	b	(c)
Wildlife management	c	c	b	b
Habitat management	c	(c)	b	(c)
Wildlife monitoring	c	(c)	b	b/c
Law enforcement	-	c	b	b
Environmental science	c	(c)	-	b
Public relation	b	b	b	b
Local culture	b	b	b	b
Human-dimension methods/approaches	c	b	b	b/c

7.3. Conclusions capacity development

Initial training and continuous education in wildlife conservation and research techniques is needed for scientists, managers, and rangers. There is nowadays a scattered offer of training units, but no comprehensive overview on academic curriculums or practical courses. Wildlife research and management should become a clearly defined part of the curriculum of some biological/ecological and veterinarian faculties and higher educational institutes. It is important to organise not only the initial training of researchers and managers, but also the continuous education (refresher courses) for practitioners such as DoE provincial managers and field personnel (PA guards and rangers). If the teaching capacity is not presently available in Iran, the cooperation with foreign research and conservation institutions and international organisations should be strived for, e.g. with organisations such as Panthera or WCS already involved in cat conservation in Iran, or with IUCN (conservation assessment, conservation planning) or CITES (wildlife crime control, law enforcement). These institutions are experienced to train researches, managers and field personnel and have developed specific courses or educational material. Another (increasingly used) option is to encourage young Iranian scholars to get part of their education at foreign universities with a strong curriculum in wildlife research and conservation biology.

Recommendations:

1. Produce comprehensive overview on academic courses fostering wildlife conservation at universities and higher educational institutes in Iran;
2. Produce comprehensive overview on practical educational units and training materials in Iran;
3. Define need for wildlife conservation and management education (initial and continuous training) for DoE at the level of managers and field staff (rangers);
4. Make agreement between DoE and universities/higher educational institutes for academic and practical courses in wildlife research and management and assure the training capacity needed (“train the trainers”).
5. Invite universities to develop a specific wildlife research and conservation biology curriculum and foster the cooperation with foreign academic institutions (Iranian students abroad, international teachers to Iran).

8. Communication

The implementation of the *Roadmap* requires generous communication and exchange of information within the organisations (internal communication), between the partners (network communication), and with the media and the public (public information). The Sari Workshop participants defined the need for communication and reviewed already existing communication means.

8.1. Community communication and public information

Intra-organisational communication: Defining and structuring the inter-organisational communication is of importance mainly to the DoE, which is a large and widely distributed organisation, but other organisations of the network may adapt some of the recommendations, too. The simplest and fastest forms of communication within an organisation are direct discussions (personal talks, meetings, phone calls, e-mails). For on-going discussions with several participants, regular meetings, e-mail lists or conference calls are favourable. It is however important to summarise decisions in minutes or proceedings and to distribute these documents to all partners, which need to be informed.

In the case of the DoE, the information and data flow between the head office, the provincial offices and the field stations are of crucial importance. Data (e.g. digitised field forms) and reports must frequently (some e.g. monthly, other annually) be submitted and incorporated into the (central) databases. Sharing information must however include also a feedback in order to keep up the motivation of the personnel working in the field. The head office must assure that the provincial offices and the field personnel regularly (at least every year) receive analytic reports summarising and interpreting the data collected in the field.

Network communication (inter-organisational communication): Communication between institutions involved in cat conservation in Iran requires direct discussions (regular or occasional topical meetings with minutes) and electronic information exchange (e-mail lists and websites). Besides the already existing organisational websites, it would be helpful to establish an online cat conservation platform where news can be distributed easily and where information and documents to be shared can be posted. Such a website could work with different password-protected access levels, so that sensitive information or data are not visible for the general public.

To condense the state of the art in cat research and conservation, organising regular conferences is recommended. This would provide a forum for cat conservationists from GOs, NGOs and universities to meet and exchange information and ideas. Such a conference, e.g. organised every second year, could also be opened for more general wildlife conservation and research issues and would also offer the opportunity to hold seminars on international and transboundary cat conservation issues.

Public information: Information distributed to a wider audience will mainly serve to raise awareness and to secure public support for cat conservation. For a general public, the means of information are movies/television, broadcasting, press releases, exhibitions, and websites. For a more specific audience such as students (elementary, high school) or local people (e.g. in a project area), targeted information material has to be produces, e.g. booklets and brochures, educational movies (DVD, website). Public communication and student or local people education are tasks appropriate for NGOs in collaboration with the DoE head office or provincial offices, but also with other state institutions, e.g. the Ministry of Education. Partners in spreading information of cats are journalists and publishers of all kinds of printed or electronic media.

8.2. Existing means for communication

A number of tools to disseminate information on the wild cats in Iran have already been set up, mainly in Farsi, but partly also in English for an international public. Existing communication forums are summarised in Table 10.

Table 10. Existing tools and means for communication and reporting.

Purpose/message	Medium (incl. URL)	Rhythm	Responsible
Information sharing	CACP newsletter (www.cacp.ir)	Every 2 month	CACP
	ICS Cheetah letter (www.wildlife.ir)	Bi-annually	ICS
	ALSS newsletter (www.leopardspecialists.com)	Bi-monthly	ALSS
Information sharing	Bloggers	Regularly	Individuals
Information on cats	Reports from Provinces to DoE	Seasonally	Provincial offices
Raising public awareness	Websites	Regularly	DoE, NGOs
Raising public awareness/information sharing	Islamic Republic of Iran Broadcasting DoE makes press releases	Regularly	DOE
Raising public awareness/information sharing	Popular magazines	Occasionally	NGOs
Raising public awareness/information sharing	Movies on wildlife	Occasionally	NGOs, DoE
Information experience sharing	Student thesis	Occasionally	Universities

8.3. Conclusions communication

Communication and information exchange is crucial for working efficiently everywhere. In regard to the implementation of the *Roadmap*, communication is complex because many different and diverse partners are involved, spread across the entire country and with unlike access to technical means. Modern communication tools such as GSM (Global System for Mobile Communications, the cellular network used by mobile phones) and the World Wide Web (internet) ease communication, but it is important to balance (1) between distributing all information needed to all people in need *versus* distributing an overwhelming amount of unnecessary information and (2) establishing an efficient communication strategy *versus* investing too much time into a bureaucratic communication system. A good way to share information is to post materials on an internet platform, where they can be downloaded on demand. The wider audience, which has no professional interest in cat conservation, needs however to be informed through the printed and electronic media. To do this, regular contacts to media people especially interested in cat conservation should be maintained.

Recommendations:

1. Create a DoE-internal working group to review the present communication channels and define communication and information exchange (data flow, reporting, feedback) for cat monitoring, conservation and management among the experts in the head office, the provincial offices and the field personnel.
2. Establish a task force at the network level to propose a concept for inter-organisational communication and public information.
3. Produce and share minutes of all relevant meetings and assure that they are distributed to all partners needed to be informed.
4. Establish an internet platform in Farsi and English dedicated to distributing and sharing information relevant to cat research, monitoring and conservation.
5. Identify inform a group of journalists from the printed and electronic media especially interested in wildlife issues and regularly inform them on cat conservation.

9. Implementation and revision of the *Roadmap*

This document has been drafted by Urs Breitenmoser and Christine Breitenmoser-Würsten (co-chairs, IUCN/SSC Cat Specialist Group) based on the results from the working groups and the plenary discussion of the Sari Workshop 12–14 May 2012, and has been reviewed by reviewers of the Sari Working Groups: Afshin Alizadeh, Morteza Eslami, Kaveh Faizolahi, Mohammad S. Farhadinia, Taher Ghadirian, Amir H. Khaleghi, Marzieh Mousavi, Mohammad Nosrati, Arezoo Sanei and Bahareh Shahriari.

The final draft has been reviewed and endorsed by Dr. Ahmad A. Keykha on 15. December 2013, translated into Farsi and distributed to all Sari Workshop participants and other potential network institutions and interested groups and individuals.

After endorsement, the Task Force has been created to facilitate the implementation of the *Roadmap*. The *Roadmap* is a living document and needs to be adapted to new requirements and updated with new developments at regular intervals. The first revision is foreseen to start two years after it initial implementation, so that first experiences with the use of the Roadmap can be integrated into an updated version of the document.

Appendices

I – List of participants Sari Workshop

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