

## **PART 4**

# **Action Plan for Canid Conservation into the 21st Century**

# Some Considerations for Setting Priorities and Measuring Success for Canid Conservation

M.G.L. Mills

## 19.1 Introduction

One of the major challenges in conservation is the setting of priorities and measuring the success of the actions. There is the temptation when developing a conservation action plan to draw up a wish list of projects and actions, many of which have little chance of being funded. As a result many projects and actions in action plans are not implemented. An objective approach that sets priorities is clearly worth striving for. A method of auditing progress towards achieving the goals set out is equally important. In this section, some simple guidelines and principles for setting priorities and measuring their success are suggested.

## 19.2 Selecting priority species

The conservation status of a species, as determined by applying the IUCN Red List Categories and Criteria, is obviously the most important criterion when prioritising species for conservation action (Appendix 1). While all threatened species (i.e., those classed as Critically Endangered, Endangered and Vulnerable) deserve to be the focus of concerted conservation efforts, Critically Endangered and Endangered species should receive immediate attention, and separate and unique action plans. The IUCN Red List remains the most important tool for prioritising species on a global basis (Lamoreux *et al.* 2003).

Fifteen member dhole pack (*Cuon alpinus*) in pre-hunt bonding ritual. From top left: Alpha male, second male, alpha female. Bandipur National Park, Karnataka State, India, 1997.



Krupakar Senani

However, a problem arises when a species is Endangered globally, but not uncommon regionally; for example, the African wild dog (*Lycaon pictus*). At first thought, most of the action would seem to be needed where the species is most threatened. However, pouring resources into an area where the chances of success are low may not be as prudent as applying resources in areas where the species is doing well in order to ensure its continued survival there. Synthesis of action plans with a focus on regional or local conservation priorities is important. It is worth noting here that the IUCN, recognising the value and importance placed in the Red Listing process of species at a national or regional level by governments and other policy-making institutions, has developed guidelines for applying the IUCN Red List Categories and Criteria at the regional level (IUCN 2003). Consequently, species whose threat status has been assessed nationally or regionally could be prioritised on a comparable scale by local or regional conservation groups. However, globally threatened species remain the top conservation priorities.

In addition to the IUCN Red List status, Mills *et al.* (2001), in their analysis of geographic priorities for carnivore conservation in Africa, also applied a number of other criteria, such as taxonomic distinctiveness and degree of endemism and extent of occurrence, in an attempt to strengthen the evaluation of priority scores for African carnivores. They also included body size, as an estimator of the potential for human conflict, on the premise that larger carnivores would be more likely to attack livestock and, therefore, potential for human-wildlife conflict would be greater. This analysis gave rise to some rather unexpected results, although it did identify the Ethiopian wolf (*Canis simensis*) and the African wild dog as the first and second highest priority species requiring conservation action for the African continent. Nowell and Jackson (1996) applied a similar approach to the Felidae.

Not surprisingly, many projects represent the personal bias of the individuals involved. We often tend to focus on the local, abundant, problematical and economically valuable species, or the charismatic large ones (Ginsberg 2001). This is not always necessarily a bad thing as long as the motivation is transparent and the goals serve the interests of conservation. Local buy-in and involvement is

very important and is likely to enhance the chances of success of plans and actions.

The most widely applied priority-setting approach in conservation is the hotspots model first developed by Myers (1988; see Myers *et al.* 2000), which attempts to focus conservation on areas of high species endemism and threat. By combining hotspot models with the use of iterative selection algorithms where representation is achieved using the principle of complementarity, as has been provisionally applied by Mills *et al.* (2001) for African carnivores, it might be possible to highlight areas of importance for canids. However, the basic problem of knowing the distribution patterns of the species concerned may often inhibit such a process and would appear to be a priority in many cases.

### 19.3 What to do

Priority-setting exercises tell us what to save first, not how to do it. Operational strategies need to be implemented in order to address the conservation issues. These can be broadly identified as research and management actions.

Perhaps one of the most fundamental differences in approach towards conservation issues is the species versus ecosystem approach. By definition, the IUCN Species Survival Commission (SSC) is based on a species approach. A major criticism of the species approach is that it is not holistic and does not necessarily take into account ecosystem functioning. While this is true, species projects, particularly those on threatened species, are often essential, and when strategic can achieve unprecedented success. There is also the argument that some charismatic species such as the Ethiopian wolf or African wild dog can be used as umbrella species to help conserve an ecosystem. However, we should never lose sight of the fact that a species is only a part of an ecosystem and that the final goal of conservation must be not only to conserve species, but also viable natural ecosystems and the patterns and processes that make them. Species conservation should not undermine ecosystem functioning.

In order to evaluate the conservation status of a species it is imperative to be able to say something about its distribution, abundance and population trends, its taxonomic status, and the threats facing the species. Surveys and population monitoring, therefore, are an extremely important aspect of species conservation. However, for many species, even highly visible ones like African wild dogs, it is often extremely difficult to obtain accurate figures of abundance and trends. Indeed, there may be too much importance attached to numbers as opposed to population viability, which, although linked, are not necessarily the same thing. Numbers *per se* and even short-term population trends are less important than the long-term viability of a population.

This action plan, like all SSC action plans, is concerned with only one small component of the rich biodiversity that makes up the planet, in this case the family Canidae. The considerable advantage of this approach is that specialists can focus in on their particular area of expertise. However, there are limited resources that can be channeled into conservation and, wherever possible, collaboration between specialists in different fields is desirable. For example, if a survey of wild dogs is to be undertaken in Nigeria, those responsible should contact other specialist groups such as the Cat and the Hyaena specialist groups to discuss with them the possibility of including additional species in the survey. This might be possible to achieve at little extra cost or output. An integrative approach would also promote guild-level studies and further elucidate the conservation importance of guild shifts and mesopredator release (Ginsberg 2001).

Detailed field studies investigating particular issues, or in an attempt to identify a species' role and needs in the ecosystem, are often required in order to draw up management strategies. In this regard an adaptive management approach, whereby the consequences of actions or conditions are studied, is likely to be particularly rewarding.

Ensuring the ecological integrity of an area and including full habitat representation is important. If suitable habitat is available, animals will survive if poaching is controlled. In the case of Data Deficient species, especially the small cryptic canids, habitat preservation is probably the best approach rather than detailed and difficult attempts at surveys. The greatest challenge in implementing ecoregional conservation plans is to ensure sufficient areas of contiguous habitat to be set aside for wildlife. Where this is not possible, more manipulative metapopulation management strategies could be applied (Mills *et al.* 1998).

### 19.4 Measuring success

Maintaining an objective and up-to-date measure of success is difficult to implement and requires discipline and time. Progress reports are very important and useful, but from time to time a wider overall evaluation of the action plan programme is needed. Perhaps a steering or core committee of the Canid Specialist Group should be constituted which could meet, say every two to three years, to evaluate progress. At a longer time scale, regular updating of action plans at ten-year intervals is essential for keeping abreast of developments and issues. Most importantly, species need to be assessed according to the IUCN Red List Categories and Criteria, using the most recent and up-to-date information available, on a regular basis.

## Action Plan for Canid Conservation into the 21st Century

C. Sillero-Zubiri, D. W. Macdonald and the Canid and Wolf Specialist Groups

In this section we list the projects and actions that we believe are priorities for canid conservation over the next ten years, chiefly focusing on threatened species (see Appendix 1). Given that canids are present throughout the world, and that many of the range countries do not have appropriate scientific and conservation infrastructure, we have attempted to identify the most essential projects and actions to improve the conservation status of threatened canid species, rather than present a wish list of projects per country as other IUCN action plans attempt. We aim to achieve a realistic list of projects and actions that would have a good chance of being implemented.

We take advantage from the individual Action Plans that have already been published for the Ethiopian wolf and African wild dog. For these two species we incorporate a mix of proposed and new projects and actions needed prepared by the relevant panel of experts from their Working Groups. Projects that have already been successfully implemented are excluded. Detailed projects for dholes, island, kit and swift foxes were also prepared by the experts of the relevant Working Groups.

Projects and actions are presented in a simple summary form and are organised into two sections. Section I consists of general projects affecting all canids, which address major issues in canid conservation, many covered in Part 3 of this document. Section II includes a larger group of single species projects and actions, laid out in the same geographical order as the Species Accounts. Threatened species are listed first (their IUCN Category indicated in square brackets), followed by Data Deficient species. Whenever possible, the projects for a given species are listed in order of priority. To locate projects for a certain region or species, see the summary list which follows. Although these projects are numerous, they do not address all species, nor all the general recommendations made for future work in Part 3 of this volume.

A **project** is defined as a research activity with objectives. It involves data collection, analysis and interpretation, followed by the making of recommendations.

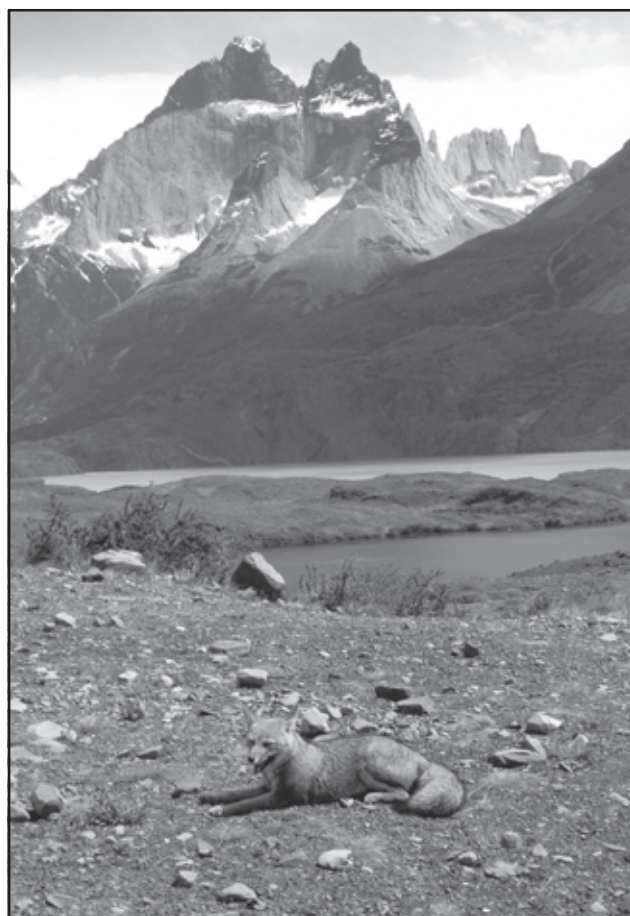
An **action** entails doing something that is not focused on research, but that will in some measure improve the conservation status of the species involved.

We have included both ongoing and proposed projects in the Action Plan. Existing projects have received varying amounts of their budgeted funding, and a contact address

is provided for donors and other interested parties. They are distinguished from the second group by the placement of an asterisk (\*) following the title.

The second type of project consists of those proposed by Regional Sections and Canid Specialist Group members-at-large. These projects need detailed proposals, funding and, in many cases, workers. Donors and other interested parties should use the suggested contact and email (full mail addresses in Appendices 3 and 4) or contact the CSG directly for details. The CSG maintains a database of contacts for the executors of existing projects, and asks that the CSG be informed of contacts and progress related to these projects.

Chilla (*Pseudalopex griseus*) in Torres del Paine National Park, Chile, 2002.



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Budgetary needs are considered, but the cost information provided here is for planning purposes only. This aspect of the action plan will be refined as funding or management constraints dictate. Projects are categorised as follows in terms of approximate annual budget (all figures in US\$):

- I \$10,000 or less
- II \$10,000 to \$20,000
- III \$20,000 to \$50,000
- IV \$50,000 to \$100,000
- V over \$100,000
- ? Not known

## List of Priority Projects and Actions

### I. Project and actions involving all species

#### Implementation of Canid Action Plan

- 1.1 [Action] Employ a Programme Officer to act as liaison between the Canid Specialist Group, project managers and potential donors

#### Canid Project Database

- 1.2 [Action] Maintain a database of existing and planned projects on wild canid species\*

### Status surveys

- 1.3 [Action] Promote short field surveys of Data Deficient canid species
- 1.4 [Project] Develop standardised survey methodology
- 1.5 [Action] Support the development of non-invasive population monitoring methodology

### Education and public relations

- 1.6 [Action] Raise support for Canid News and <http://www.canids.org>\*
- 1.7 [Project] Investigate methods for initiating effective education campaigns at local level\*

## II. Species projects and actions

### South America (Chapter 3)

#### 2. Darwin's fox [CR]

- 2.1 [Project] Biology of Darwin's foxes in Chiloé Island\*
- 2.2 [Project] Finding the missing links: uncovering additional mainland populations of the Darwin's fox
- 2.3 [Project] Local attitudes and conservation education in Chiloé Island\*
- 2.4 [Project] Presence of canine infectious diseases and the risk of transmission to the Darwin's fox population\*
- 2.5 [Project] Reproductive success of Darwin's foxes in fragmented versus intact forest\*

#### 3. Bush dog [VU]

- 3.1 [Project] Bush dog ecology in Paraguay\*
- 3.2 [Project] Survey the population status of bush dogs within protected areas
- 3.3 [Project] Evaluate the historical distribution and current status of bush dogs at country level\*

#### 4. Maned wolf [NT]

- 4.1 [Project] Maned wolf population survey and habitat assessment throughout the species range
- 4.2 [Project] Mammal communities on the rainforest-savanna boundary in Bolivia\*
- 4.3 [Project] Environmental and human factors affecting maned wolf conservation in Argentina\*
- 4.4 [Action] Involving local people in the conservation of maned wolves in Argentina\*

#### 5. Short-eared dog [DD]

- 5.1 [Project] Distribution and status of short-eared dog
- 5.2 [Project] Ecology and conservation of short-eared dogs in south-eastern Peru\*

#### 6. Sechuran fox [DD]

- 6.1 [Project] Natural history, distribution and status of Sechuran fox
- 6.2 [Project] Epidemiology of disease in Sechuran fox populations

- 6.3 [Action] Sechuran fox utilisation and conservation education in rural areas of Peru

## Central and North America (Chapter 4)

### 7. Red wolf [CR]

- 7.1 [Action] Promote support and funding for the Red Wolf Coalition's education activities on behalf of the red wolf restoration effort in north-eastern North Carolina\*
- 7.2 [Project] Determine the effectiveness of the U.S. Fish and Wildlife Service's Adaptive Management Plan to reduce hybridisation between red wolves and coyotes\*

### 8. Island fox [CR]

- 8.1 [Project] An assessment of mate choice in captive island foxes\*
- 8.2 [Project] Enhancing reproduction in captive island foxes on San Miguel Island\*
- 8.3 [Project] An assessment of non-invasive techniques for monitoring wild island foxes\*
- 8.4 [Project] An assessment of variation at the major histocompatibility complex in the island fox\*
- 8.5 [Project] An exploration into the factors causing population decline in the San Clemente Island fox\*
- 8.6 [Action] Complete removal of golden eagles from the Northern Channel Islands
- 8.7 [Action] Captive island foxes to remain in captivity until the threat of golden eagle predation is completely mitigated
- 8.8 [Action] An evaluation of cryogenic storage of sperm and artificial insemination as a means to increase reproduction in captive island foxes
- 8.9 [Action] Cessation of trapping of island foxes on San Clemente Island as part of the San Clemente Loggerhead Shrike Recovery Program
- 8.10 [Action] Development of educational outreach to inform public of the decline of the island fox

### 9. Arctic fox [LC]

- 9.1 [Action]. Establish and promote legal protection for the endemic subspecies of Arctic fox (*Alopex lagopus pribilofensis*) on Pribilof Islands, Bering Sea, Alaska\*

### 10. Kit fox [LC]

- 10.1 [Action] Monitor kit fox populations throughout their range
- 10.2 [Project] Distribution and strongholds of the kit fox in the southern portion of its range\*
- 10.3 [Action] Monitor populations of San Joaquin kit foxes in central California, USA\*
- 10.4 [Project] Investigate mitigation strategies for San Joaquin kit foxes
- 10.5 [Project] Investigate interactions between San Joaquin kit foxes and non-native red foxes

### 11. Swift fox [LC]

- 11.1 [Project] Determine habitat selection of reintroduced swift foxes in Canada and Montana
- 11.2 [Project] Determine serology and health of swift foxes and sympatric canids in Canada and Montana
- 11.3 [Project] Determine gene flow and connectivity within the reintroduced Canadian/Montana swift fox population
- 11.4 [Action] Develop a swift fox recovery strategy that is compatible with Canada's Species at Risk Act
- 11.5 [Action] Monitor the reintroduced swift fox population in Canada and Montana
- 11.6 [Project] Role of parental attendance and habitat heterogeneity in the reproductive success of swift fox under different disturbance regimes\*

### 12. Grey wolf [LC]

- 12.1 [Action] Revise the U.S. Fish and Wildlife Service's Mexican Wolf Recovery Plan\*
- 12.2 [Action] Revise the federal rules governing management of wolves that travel outside the Blue Range Wolf Recovery Area in south-eastern Arizona and south-western New Mexico\*
- 12.3 [Project] Spatial analysis of restoration potential and population viability of the Mexican wolf in the south-western United States and northern Mexico\*
- 12.4 [Project] Utility of an experience centre for improving the survival of captive-born Mexican wolves released to the wild
- 12.5 [Action] Promote support and funding for the Wolf Forum for the Southern Rockies\*
- 12.6 [Action] Promote support and funding for the Southern Rockies Wolf Restoration Project\*

### 13. Gray fox [LC]

- 13.1 [Project] Evolution and conservation of the Cozumel Island gray fox\*

## Europe and North and Central Asia (Chapter 5)

### 14. Arctic fox [LC]

- 14.1 [Project] Conservation of insular Arctic fox populations endemic to Bering Sea Islands in Alaskan and Russian waters
- 14.2 [Action] Saving the Endangered Fennoscandian *Alopex lagopus* [SEFALO+]\*

### 15. Grey wolf [LC]

- 15.1 [Project] Conservation and management of grey wolves in Finland\*

### 16. Raccoon dog [LC]

- 16.1 [Project] The spatial ecology of small carnivores in south-east Finland and the control of rabies\*

## Sub-Saharan Africa (Chapter 6)

### 17. Ethiopian wolf [EN]

- 17.1 [Action] Coordination of Ethiopian wolf conservation\*
- 17.2 [Project] Ethiopian wolf population surveys\*
- 17.3 [Project] Monitoring wolf populations, their Afroalpine ecosystem and human activities within the ecosystem\*
- 17.4 [Project] Prioritisation of areas for conservation\*
- 17.5 [Project] Social structure and ecology of wolf populations in northern Ethiopia
- 17.6 [Project] Wolf MHC gene variability
- 17.7 [Project] Screening wolf populations for dog genes
- 17.8 [Project] Ethiopian wolf phylogeography\*
- 17.9 [Action] Disease prevention\*
- 17.10 [Project] Test methods to reduce disease transmission and incidence in domestic dogs and Ethiopian wolves\*
- 17.11 [Project] Control of domestic dog populations within and surrounding Ethiopian wolf ranges
- 17.12 [Action] Hybrid management\*
- 17.13 [Action] Inform and educate the people of Ethiopia about the Ethiopian wolf and its Afroalpine ecosystem\*
- 17.14 [Action] Inform and lobby organisations in Ethiopia of the importance of the environment as a cross-cutting issue\*
- 17.15 [Action] Build the capacity of Ethiopia in the fields of ecology, conservation, epidemiology, conservation education and conservation policy\*
- 17.16 [Project] Attitudes of local people to the Ethiopian wolf and its Afroalpine ecosystem\*
- 17.17 [Action] Secure the protection of the Bale Mountains National Park\*
- 17.18 [Action] Secure the protection of other areas of Afroalpine ecosystem in Ethiopia\*
- 17.19 [Action] Promote tourism and other methods of generating revenue in wolf ranges\*
- 17.20 [Action] Financial sustainability of the Ethiopian Wolf Conservation Programme\*
- 17.21 [Action] Feasibility of establishing a captive breeding population
- 17.22 [Action] Preservation of Ethiopian wolf genetic material

### 18. African wild dog [EN]

- 18.1 [Action] Maintenance and expansion of very large wildlife areas, including Corridors and Transfrontier Conservation Area Development
- 18.2 [Project] Develop specific, low-cost methods and techniques for reducing human and livestock conflict
- 18.3 [Project] Develop tools to foster coexistence of wild dogs with livestock farmers in Kenya\*

- 18.4 [Project] Develop tools to foster coexistence of wild dogs with livestock farmers in the Kalahari region
- 18.5 [Project] Develop tools to foster coexistence of wild dogs with people in Zimbabwe\*
- 18.6 [Project] Coexistence between game farmers and wild dogs in South Africa
- 18.7 [Project] Develop tools to evaluate disease threats to wild dogs and determine whether intervention is necessary
- 18.8 [Project] Vaccine trials on wild dogs held in captivity\*
- 18.9 [Project] Monitoring population and pack dynamics of wild dogs in Kruger National Park, South Africa\*
- 18.10 [Project] Monitoring population and pack dynamics of wild dogs in the Okavango region, Botswana\*
- 18.11 [Project] Monitoring of the distribution, density, and mortality of wild dogs in Zimbabwe\*
- 18.12 [Project] Monitoring and evaluation of management strategies for wild dogs in the Rungwa-Ruaha ecosystem, Tanzania
- 18.13 [Project] Ecology of wild dog populations in dryland areas of the Kalahari region
- 18.14 [Project] Status and ecology of the African wild dog in central and northern Mozambique\*
- 18.15 [Project] Status, distribution, and ecology of an unprotected wild dog population in north-eastern Kenya\*
- 18.16 [Project] Status of African wild dog populations in West Africa
- 18.17 [Project] Establish distribution and status of wild dogs in southern Sudan
- 18.18 [Project] Establish distribution and status of wild dogs in central Africa
- 18.19 [Project] Determine status of wild dogs in Teffedest Mountains, Algeria
- 18.20 [Project] Develop low-tech methods for surveying and monitoring wild dogs
- 18.21 [Action] Establish a second wild dog population in South Africa by setting up a series of smaller populations and managing them as a meta-population\*
- 18.22 [Action] Development of a viable community conservation programme in Zimbabwe\*

## North Africa and the Middle East (Chapter 7)

### 19. Desert canid community

- 19.1 [Project] Natural history, distribution and status of the pale fox, Rüppell's fox and fennec fox
- 19.2 [Project] Distribution and status of Rüppell's fox and Blanford's fox in south-west Saudi Arabia, Yemen and Oman
- 19.3 [Project] Survey of canid species in the central Sahara Desert

## 20. Blanford's fox [VU]

- 20.1 [Project] Distribution and status of the Blanford's fox in Egypt, Sudan and the Horn of Africa

## 21. Rüppell's fox [DD]

- 21.1 [Project] Causes for local extinction of Rüppell's fox in Israel

## 22. Grey wolf [LC]

- 22.1 [Project] Status of little known populations of the grey wolf in Iran, Iraq and Syria  
22.2 [Project] Status of populations of the grey wolf in the southern Arabian Peninsula  
22.3 [Project] Status and taxonomic elucidation of *Canis aureus lupaster*

## South Asia, South of the Himalaya [Chapter 8]

### 23. Dhole [VU]

- 23.1 [Project] Development and evaluation of survey methods  
23.2 [Project] Genetic studies  
23.3 [Project] Ecological and behavioural studies  
23.4 [Action] Surveys and monitoring  
23.5 [Action] Prioritisation of populations for conservation action  
23.6 [Action] Understanding the epidemiology of disease in dholes  
23.7 [Action] Protection of dholes and their habitat  
23.8 [Action] Management of the prey base  
23.9 [Action] Conflict with people  
23.10 [Action] Conflict with other threatened species  
23.11 [Action] Captive breeding of dholes  
23.12 [Action] Reintroduction and translocation of dholes  
23.13 [Action] Legislative issues affecting dhole conservation

## Australia and Oceania [Chapter 9]

### 24. Dingo [VU]

- 24.1 [Project] Status and taxonomic elucidation of New Guinea singing dog  
24.2 [Action] Identify suitable reference material to assess dingo genetic introgression  
24.3 [Project] Assess the conservation implications of dingo genetic introgression

## I. Projects and actions involving all species

### Implementation of Canid Action Plan

#### 1.1 [Action] Employ a Programme Officer to act as liaison between the Canid Specialist Group, project managers and potential donors

*Objectives:* To run the everyday business of the Specialist Group and implement activities proposed in the Canid Action Plan.

*Implementation details:* A full-time Programme Officer will run the everyday business of the specialist group, including membership, communication, publication of Canid News, liaison, maintenance of Canid Project Database and oversee implementation of the Canid Action Plan. The Project Manager will respond to request for information, documentation, contacts and other assistance in connection with the implementation of Canid Action Plan activities.

*Annual budget:* III

*Time frame:* Long-term

*Contact:* Canid Specialist Group, canids@zoo.ox.ac.uk

### Canid Project Database

#### 1.2 [Action] Maintain a database of existing and planned projects on wild canid species\*

*Objectives:* To assist the implementation of the Canid Action Plan by further developing the existing Canid Project Database, in order to facilitate communication between project managers and potential donors; communication of project results and dissemination of information on canid conservation for public education and awareness.

*Implementation details:* The Canid Specialist Group has already established an online Canid Project Database (Appendix 5) of existing and planned projects on all wild canid species. The database will be expanded to incorporate project outputs and links to other useful information, as well as to manage contacts and grey literature (e.g., unpublished reports and thesis). The Canid Project Database will be instrumental in ensuring that conservation successes can be duplicated elsewhere and failures avoided.

*Annual budget:* II

*Time frame:* Ongoing, needs funding

*Contact:* Canid Specialist Group, canids@zoo.ox.ac.uk

### Status surveys

#### 1.3 [Action] Promote short field surveys of Data Deficient canid species

*Objectives:* Facilitate planning and funding of field surveys on little known canid species; encourage wildlife

biologists in range countries to collect data on distribution and status of Data Deficient species.

*Implementation details:* Relatively inexpensive short-term surveys would help provide needed information on the lesser-known canid species. The Canid Specialist Group will help channel relevant information on any suitable small-grant programme to those in the field better able to undertake necessary surveys.

*Annual budget:* II

*Time frame:* Long-term

*Contact:* Canid Specialist Group, [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

#### **1.4 [Project] Develop standardised survey methodology**

*Objectives:* To develop a standard for short survey methodology.

*Implementation details:* Canids can be difficult to survey, particularly rare species or those occurring at very low densities (see Chapter 15). Questionnaires can be important to obtain a coarse-scale evaluation of presence/absence, habitat preference and trends, and may also include assessment of threats. A standard, simple to use questionnaire, should be made available to those likely to undertake field surveys in areas of interest. Questionnaires may be supplemented with spot-light transect counts, selective live trapping and opportunistic collection of tissue samples and faeces, and standard protocols would be provided for these methods as well. Calibration at specific locations of known canid density can help test whether information and trends estimated with questionnaires at a larger scale are reliable. Any data derived from short surveys should be submitted to the Canid Specialist Group and stored in the database.

*Annual budget:* I

*Time frame:* 6 months

*Contact:* Canid Specialist Group, [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

#### **1.5 [Action] Support the development of non-invasive population monitoring methodology**

*Objectives:* To promote the investigation of novel approaches for long-term estimation of trends on threatened canid populations; prepare adequate field protocols.

*Implementation details:* For threatened species that require monitoring to assess the effects of threats over a certain period (i.e., ten years) a relative measure of population status can be more informative (and cheaper) than estimates of total population size. Monitoring does not need to cover the entire distribution range of a species, but rely on 'sentinel' populations as a surrogate. Trends are also a good parameter to evaluate the success or failure of conservation measures applied during a given period.

New non-invasive techniques are emerging (see Chapter 15), which offer the potential to monitor populations without disturbance, and would make

evaluating population trends much simpler and cheaper in the future. These include using genetic identification of individual animals using systematic collection of hair or faeces and capture-mark-recapture techniques for estimating population size and structure (See Projects 8.3, 15.2, 16.20). For low density species domestic dogs may be trained to recognise and locate canid faeces and other sign. Calibration at specific locations of known canid density can help test new approaches. Techniques based on photographic records and spoor surveys have been developed in the past, but may only be applicable for conspicuous diurnal species and open, sandy habitats respectively.

*Annual budget:* II

*Time frame:* 1 year

*Contact:* Canid Specialist Group, [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

### **Education and public relations**

#### **1.6 [Action] Raise support for Canid News and <http://www.canids.org>\***

*Objectives:* To secure funding for the Canid Specialist Group peer-reviewed online journal and CSG website.

*Implementation details:* The Canid Specialist Group produces an online peer-review journal Canid News (Appendix 5), which replaced the CSG's original newsletter. Canid News is hosted in the CSG website, which in itself is an instrumental communication tool and information exchange between the CSG, people involved in canid conservation and other interested parties. Funds are required to maintain the hardware and keep software up-to-date, redesign the site and cover annual server fees.

*Annual budget:* II

*Time frame:* Ongoing, needs funding

*Contact:* Canid Specialist Group, [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

#### **1.7 [Project] Investigate methods for initiating effective education campaigns at local level\***

*Objectives:* Investigate education strategies commensurate with canid conservation goals such as lessening human-canid conflict, reducing disease transmission and explaining the ecological role of carnivores. Provide a framework to help plan and implement effective conservation campaigns to improve public understanding.

*Implementation details:* Through a literature review, interviews and questionnaire surveys define primary conservation goals, target groups, geo-political, social and cultural contexts affecting peoples attitude to wild canids. Develop education and communication strategies (non-formal, informal, formal); identify and source appropriate levels of funding, human resources, materials and equipment; identify ways to foster multi-disciplinary and multi-agency cooperation; train conservation project personnel on the basics of conservation education.

*Annual budget:* II

*Time frame:* 1–2 years

*Contact:* Canid Specialist Group, [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk), and E4C Education for Conservation, Denise Taylor, [denise.taylor@btinternet.com](mailto:denise.taylor@btinternet.com)

## II. Species projects and actions

### South America [Chapter 3]

#### 2. Darwin's fox [CR]

##### 2.1 [Project] Biology of Darwin's foxes in Chiloé Island\*

*Objectives:* To obtain basic information on the ecology and genetic structure of the Darwin's fox on Chiloé Island.

*Implementation details:* A multidisciplinary team supported by local agencies and NGOs are conducting research at a few intensive sites and several rapid-assessment sites throughout Chiloé Island. A combination of intensive trapping and non-invasive techniques are used to monitor foxes, determine population size and relative abundances, map the vegetation and study the genetic structure of all the sub populations in the island. A predictive model will be constructed to better understand the factors affecting fox distribution and abundance.

*Annual budget:* IV (funded by the UK Department of Agriculture and Rural Affairs)

*Time frame:* 3 years

*Contact:* Jaime E. Jiménez, [jjimenez@ulagos.cl](mailto:jjimenez@ulagos.cl), <http://www.darwinfox.org>

##### 2.2 [Project] Finding the missing links: uncovering additional mainland populations of the Darwin's fox

*Objectives:* To search for additional populations of the Darwin's fox on Chile's mainland, targeting the dense, virgin forests between Maullin and Nahuelbuta Mountains, and remaining coastal forest north of Chiloé.

*Implementation details:* With only two, widely separated, populations of Darwin's foxes known in Chile, there is great interest in discovering information on or actual populations of Darwin's foxes in other areas on the mainland. Recent evidence indicates that there might be populations of Darwin's foxes persisting on the mainland in remaining pockets of forests. This project will seek to locate additional populations and to determine potential threats to these populations. Field searches will use extensive remote camera systems, trapping, and collection of droppings to identify fox presence using molecular techniques.

*Annual budget:* II

*Time frame:* 1 year

*Contact:* Canid Specialist Group (South America Regional Section), [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

##### 2.3 [Project] Local attitudes and conservation education in Chiloé Island\*

*Objectives:* To sensitise Chiloé Island's population toward fox conservation and sustainable use of biodiversity through an education programme; build up capacity of local conservation biologists to further the conservation of Darwin's foxes.

*Implementation details:* Rural and urban local peoples' attitudes to wildlife and native forest conservation are determined using a questionnaire survey. Using the Darwin's fox as a flagship for forest conservation slide shows, posters, fliers, courses, and a website are used to educate and improve the awareness of the local communities on the unique and rapidly declining island biodiversity. Using the project resources, priority will be given to train local biologists that would take on future Darwin's fox conservation initiatives.

*Annual budget:* II

*Time frame:* 3 years

*Contact:* Jaime E. Jiménez, [jjimenez@ulagos.cl](mailto:jjimenez@ulagos.cl), <http://www.darwinfox.org>

##### 2.4 [Project] Presence of canine infectious diseases and the risk of transmission to the Darwin's fox population\*

*Objectives:* Evaluate presence of canine infectious diseases in local domestic dog and fox communities in Chiloé and Nahuelbuta National Park; determine possible modes of disease transfer that may affect the Darwin's fox.

*Implementation details:* Domestic dogs are found in and around Darwin's fox populations in Chiloé and Nahuelbuta National Park. Small populations are potentially at risk if they come into contact with infected dogs, and there have been recent outbreaks of rabies and canine distemper in wild canids in nearby Argentina. Two separate site-specific projects seek to identify which canine diseases are present in the area and to what extent. Blood samples are collected from foxes and domestic dogs (including park visitors' dogs that are frequently allowed in the park). In Nahuelbuta samples will also be collected from sympatric chilla and culpeo, to establish their role as carriers.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Nahuelbuta: Elise McMahon, [emcmahon@forwild.umass.edu](mailto:emcmahon@forwild.umass.edu);  
Chiloé: Jaime E. Jiménez, [jjimenez@ulagos.cl](mailto:jjimenez@ulagos.cl)

##### 2.5 [Project] Reproductive success of Darwin's foxes in fragmented versus intact forest\*

*Objectives:* Determine reproductive success of the Darwin's fox population in Nahuelbuta National Park, comparing pairs living outside and on the borders of the park to those living within the park.

*Implementation details:* Darwin's foxes on the mainland are protected within the boundaries of the Nahuelbuta National Park. However, there are breeding pairs whose home ranges lie beyond the park on privately owned land. This land of highly fragmented forest is used for cattle grazing and wood extraction, heavily used by both humans and their dogs, and has a higher density of culpeos, a potential predator of Darwin's foxes. Breeding pairs will be radio-collared, monitored and their breeding success measured, the latter determined by number of pups and/or juveniles trapped within the parental home range and confirmed by DNA analysis.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Elise McMahan, [emcmahan@forwild.umass.edu](mailto:emcmahan@forwild.umass.edu)

### 3. Bush dog [VU]

#### 3.1 [Project] Bush dog ecology in Paraguay\*

*Objectives:* To investigate bush dog ecology within a diverse carnivore community in Atlantic Forest.

*Implementation details:* Bush dogs are one of 16 confirmed mammalian carnivore species in the Mbaracayú Forest Biosphere Reserve, a fragment of Interior Atlantic Forest in eastern Paraguay. This project evaluates the ecological role of bush dogs within this community using non-invasive methods. Permanent camera-trapping grids, coupled with baited tracking stations and hair snares, will be established throughout the reserve during wet and dry seasons. Individual bush dogs will be identified from faeces via molecular techniques. Current diet-based indices of interactions between bush dogs and other carnivores from the reserve (i.e., overlap, niche breadth) will be tested for long-term consistency, diet analyses and the examination of habitat patterns will continue. Bush dog locations will be entered in a GIS to evaluate habitat and land use by all carnivore species; spatial comparisons will be made between bush dogs and other species.

*Annual budget:* IV

*Time frame:* Ongoing, 5–8 years

*Contact:* Gerald L. Zuercher, [geraldz@ksu.edu](mailto:geraldz@ksu.edu), <http://www.ksu.edu/kscfwru/>

#### 3.2 [Project] Survey the population status of bush dogs within protected areas

*Objectives:* To survey key protected areas in Paraguay, Brazil and elsewhere within bush dog range, and attempt to estimate population status and trends.

*Implementation details:* Although bush dogs are widely distributed and known to occur in several locations of Brazil and Paraguay, they are confirmed for only a few sites and there are no estimates of population numbers and trends. Furthermore, there is little idea as to their

status in most protected natural habitat throughout their range. A number of selected protected areas will be surveyed using replicates of 1km<sup>2</sup> camera grids, coupled with baited tracking stations and hair snares. Faeces from bush dogs will be collected both opportunistically and in deliberate search efforts. Collected faeces will be tested by molecular techniques for both species and individual identification. Confirmed bush dog faeces will serve as exact locations for habitat analyses and examined for diet content. Land-owners and indigenous peoples, in and around sites, will be interviewed for information of recent dog sightings. Results will be extrapolated to derive some idea of country-wide population distribution and sizes.

*Annual budget:* III (country projects require independent funding)

*Time frame:* 3–5 years

*Contact:* Canid Specialist Group (South America Regional Section), or Brazil: Tadeu G. de Oliveira, [tadeu4@yahoo.com](mailto:tadeu4@yahoo.com), <http://www.procarivoros.org.br>, Paraguay: Claudia Mercolli, [cmercolli@mbertoni.org.py](mailto:cmercolli@mbertoni.org.py), <http://www.mbertoni.org.py>

#### 3.3 [Project] Evaluate the historical distribution and current status of bush dogs at country level\*

*Objectives:* To evaluate the historical distribution of bush dogs and assess current status and trends at a country level using a mail questionnaire.

*Implementation details:* Knowledge of population status and trends is needed for the development of long-term conservation plans. Unfortunately this information is largely missing for the secretive bush dogs. Using a mail questionnaire sent to rangeland countries this project will compile information of historical and current presence/absence data, opportunistic sightings, habitat preferences, records of mortality and disease. Additional information will be obtained from the literature of previous surveys and museum specimens. The information collated will be combined with GIS maps of potentially available habitat to prioritise regions for research and conservation.

*Annual budget:* I

*Time frame:* 1–2 years

*Contact:* Karen DeMatteo, [KDeMatteo@aol.com](mailto:KDeMatteo@aol.com)

### 4. Maned wolf [NT]

#### 4.1 [Project] Maned wolf population survey and habitat assessment throughout the species range

*Objectives:* To develop population and habitat surveys within and around protected natural areas throughout the species range; estimate population status and trends

in specific areas to assess whether protection within those areas is successful.

*Implementation details:* Current estimates of maned wolf populations are very rough and often mere extrapolations on the size of what is thought to be suitable habitat. Estimates of population trends over a time period can be more important than estimates of total population size in providing information to assess the effects of threats and the success or failure of conservation measures applied during that period.

An assessment of suitable habitat throughout the species range is also needed. This should include:

- a) defining what constitutes suitable habitat for the maned wolf, and
- b) determining how much habitat remains, and the degree of connectivity and threats between remnants of suitable habitat.

Methods need to be developed and tested to reliably assess long-term population trends of maned wolves in specific locations with different degrees of protection.

*Annual budget:* III

*Time frame:* 2 years

*Contact:* Canid Specialist Group (South America Regional Section), [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

#### **4.2 [Project] Mammal communities on the rainforest-savanna boundary in Bolivia\***

*Objectives:* To study the ecology, behaviour, and habitat use of maned wolf in a complex habitat mosaic at the pampa/forest boundary in Parque Nacional Noel Kempff Mercado, Santa Cruz, Bolivia.

*Implementation details:* This study forms part of a larger project aimed at understanding the ecology of mammal communities in Bolivia's rainforest-savanna boundary. Radio-tracking, diet, health and genetic studies of maned wolves are in progress. Inter-annual variation in small mammal prey is being followed by yearly, standardised trapping (now in 5th year). This may be the only current study of the species in seasonally flooded grasslands.

*Annual budget:* II

*Time frame:* Ongoing

*Contact:* Louise Emmons, [emmons.louise@nsmnh.si.edu](mailto:emmons.louise@nsmnh.si.edu)

#### **4.3 [Project] Environmental and human factors affecting maned wolf conservation in Argentina\***

*Objectives:* To study the ecological requirements of maned wolves in the southern end of their range and evaluate human impacts threatening their conservation.

*Implementation details:* Agricultural expansion and conflicts with humans appear to be the most important threats to the maned wolf in Argentina. Interviews with local people are being done to detect problems and attitudes toward the maned wolf and to map land use.

*Annual budget:* III

*Time frame:* 2002–2005

*Contact:* Lucía Soler, [luengos@criba.edu.ar](mailto:luengos@criba.edu.ar),  
<http://www.oikoveva.org>

#### **4.4 [Action] Involving local people in the conservation of maned wolves in Argentina\***

*Objectives:* Contribute to change attitudes of local people towards maned wolf conservation.

*Implementation details:* An education conservation programme is being developed in collaboration with local people to highlight the importance of biodiversity conservation and to plan different actions to promote conservation. The National Park Administration, Private Reserves, and social leaders are involved in conservation efforts. National and international workgroups are promoted to develop integrative conservation action plans for maned wolves.

*Annual budget:* II

*Time frame:* 2002–2005

*Contact:* Lucía Soler, [luengos@criba.edu.ar](mailto:luengos@criba.edu.ar)

### **5. Short-eared dog [DD]**

#### **5.1 [Project] Distribution and status of short-eared dog**

*Objectives:* To conduct basic presence/absence surveys in key parts of the species range, including western Brazil, Ecuador, Bolivia, Colombia, and northern Peru; to map their distribution and evaluate species status.

*Implementation details:* Although widespread, the short-eared dog is arguably the least-known canid species in South America. Detailed information on population abundance or status is missing. This project will seek to clarify, through a series of mail questionnaires and subsequent presence/absence field surveys in selected locations, the current distribution and status of the species. Survey techniques will be carefully designed to avoid confusion between sympatric species. Biological samples for morphological and genetic studies will also be collected if possible.

*Annual budget:* II–III

*Time frame:* 2–3 years

*Contact:* Canid Specialist Group (South America Regional Section), or M.R.P. Leite Pitman, [mrpl@duke.edu](mailto:mrpl@duke.edu)

#### **5.2 [Project] Ecology and conservation of short-eared dogs in south-eastern Peru\***

*Objectives:* To study the ecology and implement basic conservation measures to protect short-eared dogs in Cocha Cashu Biological Station and the Alto Purus Reserved Zone, south-eastern Peru.

*Implementation details:* Simple presence/absence surveys and a radio-tracking study have yielded some information

on this little-known species, suggesting that the Peruvian Amazon may represent one of the best enclaves for this species. Concern exists that disease transmitted by domestic dogs may be the main threat to this low-density forest specialist. The project is seeking funding to establish a domestic dog vaccination programme in the protected areas of Amazonian Peru and to expand field work to other sites within the species' range.

*Annual budget:* III–IV

*Time frame:* Ongoing

*Contact:* M.R.P. Leite Pitman, mrpl@duke.edu

## 6. Sechuran fox [DD]

### 6.1 [Project] Natural history, distribution and status of Sechuran fox

*Objectives:* To study the basic biology and ecological requirements of the Sechuran fox; determine distribution range, population size and status; determine existence of subspecies.

*Implementation details:* The Sechuran fox is one of the least-known canid species. Just a few studies about this species have been undertaken, principally in northern Peru. Its distribution, population size, existence of subspecies, reproductive ecology and other aspects of its behaviour are unknown. Sechuran foxes appear to tolerate traditional human land use but may be threatened in some parts of their range. Therefore, it is important to increase our knowledge of the species and design and implement a conservation action plan. The project should include field surveys in southern Ecuador, northern and central Peru (to 14°S), using tracking, sightings, camera traps, collection of genetic material, and an interview survey on interactions with local people.

*Annual budget:* II

*Time frame:* 1–2 years

*Contact:* Canid Specialist Group (South America Regional Section), canids@zoo.ox.ac.uk

### 6.2 [Project] Epidemiology of disease in Sechuran fox populations

*Objectives:* To study disease transmission in foxes and domestic animals and evaluate its importance in Sechuran fox conservation.

*Implementation details:* The Sechuran fox inhabits areas with high rural human density and predominantly agricultural land use. The parasites and diseases affecting the species are unknown, but individuals with disease symptoms are regularly observed. The project will include field surveys, collection of blood, ectoparasites, faeces and any carcasses found opportunistically for laboratory analysis, and evaluation of domestic dogs for disease in the surveyed areas.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Canid Specialist Group (South America Regional Section), canids@zoo.ox.ac.uk

### 6.3 [Action] Sechuran fox utilisation and conservation education in rural areas of Peru

*Objectives:* To reduce the use of Sechuran fox parts to make amulets; mitigate livestock predation by Sechuran fox and other sympatric carnivores; introduce a carnivore and habitat conservation ethic in rural areas of northern Peru and southern Ecuador.

*Implementation details:* Sechuran fox parts are priced to make amulets and foxes are sometimes caught and their tails cut, but the extent of this practice is not known. Wildlife product trade (primarily for carnivores) needs to be assessed and local authorities supported in controlling such trade. One way of changing peoples' perception for predators in Peruvian and Ecuadorian rural areas is to deliver education programmes, including child education, to mitigate the impact of predation on livestock.

*Annual budget:* II

*Time frame:* 2–3 years

*Contact:* Canid Specialist Group (South America Regional Section), canids@zoo.ox.ac.uk

## Central and North America [Chapter 4]

### 7. Red wolf [CR]

Compiled by the Wolf Specialist Group

#### 7.1 [Action] Promote support and funding for the Red Wolf Coalition's education activities on behalf of the red wolf restoration effort in north-eastern North Carolina\*

*Objectives:* The Red Wolf Coalition promotes red wolf recovery by: fostering public-private partnerships; increasing public awareness; raising funds and other contributions; and advocating for the species as an integral component of the south-eastern United States.

*Implementation details:* Promote red wolf recovery by educating and involving the public in the restoration effort in north-eastern North Carolina. Seek additional funding to implement more education programmes and to construct a red wolf education centre in Columbia, North Carolina. Liaise with other conservation and community projects to seek new ideas for improving the effectiveness of the Coalition and for resolving conflicts between local residents and red wolves.

*Annual budget:* V

*Time frame:* Ongoing, long-term

*Contact:* Aubrey White Remige, redwolf@coastalnet.com, <http://www.redwolves.com>

## **7.2 [Project] Determine the effectiveness of the U.S. Fish and Wildlife Service's Adaptive Management Plan to reduce hybridisation between red wolves and coyotes\***

*Objectives:* Investigate the feasibility, effectiveness, and repeatability of an Adaptive Management Plan to reduce (or prevent) hybridisation between red wolves and coyotes in north-eastern North Carolina, so that the red wolf can be restored to a significant portion of the species' historic range.

*Implementation details:* From 1987 through 1994 efforts to restore a population of red wolves via the reintroduction to the Alligator River National Wildlife Refuge were successful. During the mid-1990s the status of the project changed as hybridisation between red wolves and coyotes became increasingly common. In response the U.S. Fish and Wildlife Service developed an Adaptive Management Plan that called for hybridisation to be eliminated or reduced through intensive fieldwork to euthanise or sterilise coyote and hybrids and promote the formation and maintenance of red wolf pairs. Implementation of the plan began in April 1999 and some progress has been recorded. Additional fieldwork and analysis of data need to be completed to assess the plan's overall feasibility, effectiveness, and repeatability. This assessment is requisite to determining the likelihood of recovering the red wolf given that coyotes are widespread throughout the red wolf's historic range.

*Annual budget:* V

*Time frame:* Ongoing, 3–5 years needed

*Contact:* Buddy Fazio, [buddy\\_fazio@fws.gov](mailto:buddy_fazio@fws.gov), <http://alligatorriver.fws.gov/redwolf.html>

## **8. Island fox [CR]**

Compiled by the CSG Island Fox Working Group (Gary Roemer, Tim Coonan, Linda Munson, Robert Wayne and Rosie Woodroffe)

The projects and actions proposed for conservation of the island fox reflect the species extremely restricted island distribution and recent population decline. Found only on the six largest California Channel Islands, the total number of island foxes has dropped from over 6,000 to less than 1,200 individuals (Roemer 1999; Roemer *et al.* 2001a, 2002). Current management actions to save the island fox from extinction include:

- i) live-capture and translocation of golden eagles;
- ii) the reintroduction of bald eagles as a potential deterrent to golden eagles;
- iii) the establishment of four captive breeding facilities;
- iv) the application of an experimental vaccine to confer immunity to canine distemper virus;

- v) continued disease surveillance and a determination of mortality factors;
- vi) continued population monitoring of wild fox populations; and
- vii) the eradication of feral pigs.

## **8.1 [Project] An assessment of mate choice in captive island foxes\***

*Objectives:* To develop a methodology that will allow unpaired female island foxes to choose an unrelated mate to improve captive propagation.

*Implementation details:* Island fox reproduction in some captive breeding facilities has been poor and there is a need to improve reproductive output for eventual release back into the wild. Determination of relatedness based on microsatellite profiles will be used to select unrelated males that will then be introduced to captive females. Female hormone levels will be monitored and female behavioural response to urine from the selected males along with behavioural cues to introduced males will be interpreted. The male 'selected' by the female will then be used to establish a pair for future captive propagation or release. Implementation of the project would need to occur on three islands (San Miguel, Santa Rosa and Santa Cruz) administered by the National Park Service.

*Annual budget:* III

*Time frame:* Long-term

*Contact:* Gary Roemer, [groemer@nmsu.edu](mailto:groemer@nmsu.edu), or Cheri Asa, [ASA@slu.edu](mailto:ASA@slu.edu)

## **8.2 [Project] Enhancing reproduction in captive island foxes on San Miguel Island\***

*Objectives:* To enhance reproduction in paired island foxes in the San Miguel Island captive breeding facility.

*Implementation details:* Since its initiation in 1999, the captive population on San Miguel Island has doubled, from 14 to 28, but few pairs have contributed to this growth. This past breeding season only 3 of 10 pairs produced litters. Island fox reproduction in the San Miguel captive breeding facility has been less than optimal and there is a need to improve reproductive output for eventual release back into the wild. Methods may include but are not limited to: hormonal assays to evaluate female oestrous cycle; behavioural studies of mate choice (See Project 20.11.1 above) and artificial insemination (See Action 20.11.8. below). In addition, there is a reproductive skew within two of the captive facilities, Santa Rosa and San Miguel that may prove useful for breeding purposes. On Santa Rosa there is an excess of females and on San Miguel there is an excess of males. An inter-island transfer of females from Santa Rosa to San Miguel would provide additional pairings that could bolster reproduction in the San Miguel facility. However, this suggested hybridisation between two distinct subspecies has both genetic and disease related concerns.

*Annual budget:* III  
*Time frame:* Long-term  
*Contact:* Tim Coonan, Tim\_Coonan@nps.gov

### **8.3 [Project] An assessment of non-invasive techniques for monitoring wild island foxes\***

*Objectives:* To develop microsatellite markers and DNA extraction methods from non-invasively collected samples (faeces or hair) to monitor released foxes during the breeding season.

*Implementation details:* Trapping of foxes during the breeding season can influence reproduction. Non-invasive methods offer the potential to monitor populations during this critical period without disturbance. DNA will have to be extracted from faeces or hair collected in a systematic manner. Microsatellite profiles generated from non-invasive samples will be compared to DNA extracted from white blood cells. Captive populations offer a convenient avenue for such exploration. This work would be a collaborative effort between the National Park Service and UCLA's Conservation Genetics Lab.

*Annual budget:* III  
*Time frame:* Long-term  
*Contact:* Robert Wayne, rwayne@ucla.edu,  
or Tim Coonan, Tim\_Coonan@nps.gov

### **8.4 [Project] An assessment of variation at the major histocompatibility complex in the island fox\***

*Objectives:* To assay for variation at the major histocompatibility complex (MHC) in the island fox to locate alleles that may confer resistance to disease and to use this information in the development of a captive breeding strategy.

*Implementation details:* Documenting variation at fitness related genes in the Island fox is useful in identifying functionally relevant genetic loci for the current captive breeding programmes. These data will be incorporated into developing breeding strategies for the maintenance of genetic diversity within the captive populations on San Miguel, Santa Rosa, Santa Cruz and Santa Catalina Islands. Variation has already been assessed at three MHC loci across all island fox populations.

*Annual budget:* I  
*Time frame:* 2 years  
*Contact:* Robert Wayne, rwayne@ucla.edu

### **8.5 [Project] An exploration into the factors causing the population decline in the San Clemente Island fox\***

*Objectives:* To determine the factors contributing to the population decline of the San Clemente Island fox and to implement management actions to reverse the decline.

*Implementation details:* Over the past decade, the population size of the San Clemente Island fox has

declined by 40–60% owing, in part, to a predator control programme aimed at protecting the San Clemente loggerhead shrike (see Action 20.11.9 below). Other factors, including habitat conversion, vehicular collision and disease may be playing a role in this decline.

*Annual budget:* III  
*Time frame:* Long-term  
*Contact:* Jan Larson, Larson.Jan.K@ni.cnrs.w.navy.mil

### **8.6 [Action] Complete removal of golden eagles from the Northern Channel Islands**

*Objectives:* To completely remove the threat posed by golden eagles to wild island foxes remaining on Santa Cruz Island and to captive-reared foxes that are to be released on San Miguel, Santa Rosa and Santa Cruz Islands.

*Implementation details:* Predation by golden eagles has been the principal factor in the decline of island foxes on the Northern Channel Islands. An eagle live-capture and translocation programme implemented since 1999 has been very successful: 31 golden eagles have been removed from the islands. This programme has been unable to remove all of the golden eagles, however, because some are wary of being trapped. The remaining eagles, estimated to be between 6 and 10 birds, are continuing to prey on foxes preventing their recovery. Other means, including lethal control of the eagles that cannot be trapped need to be explored to remove this mortality factor. This is an urgent action that needs immediate attention.

*Annual budget:* III  
*Time frame:* Long-term  
*Contact:* Gary Roemer, groemer@nmsu.edu,  
Rosie Woodroffe, rwoodroffe@ucdavis.edu,  
Brian Latta, blatta@cats.ucsc.edu,  
Devra Kleiman, dgkleiman@aol.com,  
or Katherine Ralls, rallsk@thegrid.net

### **8.7 [Action] Captive island foxes to remain in captivity until the threat of golden eagle predation is completely mitigated**

*Objectives:* To minimise the threat posed by golden eagles to captive-reared foxes by maintaining the foxes in captivity until golden eagles are removed.

*Implementation details:* Two of three captive-reared foxes released on Santa Cruz Island in 2002 were killed by golden eagles with 16 of 19 fox mortalities attributed to predation by golden eagles between 2000 and 2003. Because of their naïve nature, it is likely that captive-reared foxes released back into the wild would suffer high mortality owing to predation by golden eagles. Releases conducted while golden eagles are present would potentially waste valuable reintroduction stock and the funds that supported the rearing of those released animals. A release conducted in the presence of golden eagles may hamper the recovery effort and should be avoided.

*Annual budget:* III

*Time frame:* Short-term

*Contact:* Tim Coonan, Tim\_Coonan@nps.gov,  
Rosie Woodroffe, rwoodroffe@ucdavis.edu,  
Gary Roemer, groemer@nmsu.edu,  
Devra Kleiman, dgkleima n@aol.com,  
or Katherine Ralls, rallsk@thegrid.net

### **8.8 [Action] An evaluation of cryogenic storage of sperm and artificial insemination as a means to increase reproduction in captive island foxes**

*Objectives:* To develop techniques to obtain and store sperm and inseminate receptive female island foxes to improve captive propagation.

*Implementation details:* There is a need to improve reproductive output of island foxes in captive facilities for eventual release back into the wild and the need to store gametes for protection of genetic stock. Cryogenic methods of sperm storage should be implemented and a semen bank created at the Saint Louis Zoo. Methods of artificial insemination need to be developed as a safeguard to bolster poor reproduction within captive facilities.

*Annual budget:* IV

*Time frame:* Long-term

*Contact:* Cheri Asa, ASA@slu.edu

### **8.9 [Action] Cessation of trapping of island foxes on San Clemente Island as part of the San Clemente Loggerhead Shrike Recovery Program**

*Objectives:* To formalise discussions with the U.S. Navy and U.S. Fish and Wildlife Service for the express purpose of evaluating the impact on foxes of current management actions aimed at protecting the San Clemente loggerhead shrike. If necessary, stop management actions that are adversely affecting the San Clemente Island fox.

*Implementation details:* Management actions directed at predators of the San Clemente loggerhead shrike appear to be adversely impacting the San Clemente Island fox. Actions aimed at capturing and confining island foxes during the fox breeding season need to be re-evaluated. Discussions and meetings between recovery teams for both species should be held and alternative methods for protecting the shrike that do not impact the fox developed.

*Annual budget:* I

*Time frame:* 5 years

*Contact:* Gary Roemer, groemer@nmsu.edu, or Robert Wayne, rwayne@ucla.edu

### **8.10 [Action] Development of educational outreach to inform public of the decline of the island fox**

*Objectives:* To develop informational brochures that can be mailed to the general public and especially boat

owners that frequent the Channel Islands, to inform them of the dangers of introducing diseases via domestic dogs to the island fox.

*Implementation details:* Hire a person whose specific task will be the development of the information brochure and its subsequent dissemination. Part-time assistance would be needed with funds funnelled to Channel Islands National Park and/or the Santa Catalina Island Conservancy.

*Annual budget:* II

*Time frame:* 2 years

*Contact:* Tim Coonan, Tim\_Coonan@hps.gov

## **9. Arctic fox [LC]**

### **9.1 [Action]. Establish and promote legal protection for the endemic subspecies of Arctic fox (*Alopex lagopus pribilofensis*) on Pribilof Islands, Bering Sea, Alaska\***

*Objectives:* To establish legal protection for the endemic Pribilof fox. Designate the Pribilof Islands, Alaska, as a distinct game management unit (GMU), to allow for implementation and enforcement of state game management regulations that more accurately reflect the origin and taxonomic status of the islands' Arctic fox populations (at present, the Pribilof Islands fall within a GMU in which there is no closed season and no limit on the number of arctic foxes that may legally be killed).

*Implementation details:* Provide recommendations to the Alaska Department of Fish and Game (ADFG) that the Pribilof Islands be designated as a distinct GMU. Within that GMU, provide legal protection for the endemic Pribilof fox. Utilise recent data (1990–2002) on population estimates and trends to set a sustainable limit on annual fox harvesting on the Pribilof Islands. Broaden public education programmes that provide factual information regarding the origin and status of the Pribilof Islands fox populations. Both locally and globally, promote conservation of these unique insular canids.

*Annual budget:* I

*Time frame:* ongoing, 1–2 years

*Contact:* Paula A. White, PAW@carnivoreconservation.com

## **10. Kit fox [LC]**

### **10.1 [Action] Monitor kit fox populations throughout their range**

*Objectives:* Monitor the presence and abundance of kit foxes throughout their range, particularly in marginal regions such as the northern and southern parts of the range.

*Implementation details:* Kit fox populations should be monitored so that profound population declines in any region can be identified and addressed in a timely manner. Such monitoring may be particularly important in marginal areas in the northern and southern portions of the range where kit fox abundance may be naturally low.

*Annual budget:* V

*Time frame:* Long-term, continuous

*Contact:* Canid Specialist Group (Central and North America Regional Section)  
Mexico: Rurik List, rlist@prodigy.net.mx,  
USA: Brian Cypher, bcypher@esrp.org

### **10.2 [Project] Distribution and strongholds of the kit fox in the southern portion of its range\***

*Objectives:* Determine the current distribution of the kit fox in Mexico. Identify areas important for kit fox conservation.

*Implementation details:* The precise distribution of the kit fox in the southern portion of its range is not well defined, but is necessary for effective conservation. The project intends to use probability distribution models and ground-truthing to define the distribution. Land conversion, urban development and overgrazing within the Chihuahuan desert are affecting native vegetation throughout, thus the identification and protection of areas important for the conservation of the species are of prime concern. To achieve this, interviews with biologists within the southern range of the kit fox and field surveys will be used to obtain this information.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Rurik List, rlist@prodigy.net.mx

### **10.3 [Action] Monitor populations of San Joaquin kit foxes in central California, USA\***

*Objectives:* Monitor presence and abundance of the subspecies *Vulpes macrotis mutica* throughout its range.

*Implementation details:* San Joaquin kit foxes continue to be subject to a variety of threats including continuing habitat loss and degradation, rodenticides, and larger competitors such as expanding populations of non-native red foxes. Population monitoring has been either local or inconsistent, and a more systematic annual monitoring programme should be implemented throughout the range of this subspecies.

*Annual budget:* IV

*Time frame:* Long-term, continuous

*Contact:* Brian Cypher, bcypher@esrp.org

### **10.4 [Project] Investigate mitigation strategies for San Joaquin kit foxes**

*Objectives:* Identify strategies to mitigate adverse impacts to San Joaquin kit foxes from urban, agricultural, and industrial development.

*Implementation details:* San Joaquin kit foxes are threatened by continuing urban, agricultural, and industrial development. Strategies to mitigate such impacts warrant further investigation, especially impacts associated with urban development and highway construction.

*Annual budget:* V

*Time frame:* 3–6 years

*Contact:* Brian Cypher, bcypher@esrp.org

### **10.5 [Project] Investigate interactions between San Joaquin kit foxes and non-native red foxes**

*Objectives:* Investigate interspecific interactions between San Joaquin kit foxes and non-native red foxes.

*Implementation details:* Non-native red foxes are expanding in distribution and abundance within the range of the San Joaquin kit fox. Observed impacts by red foxes on kit foxes include predation, competition for den sites, and competition for food resources. The severity and implications of these impacts are not well understood, and additional impacts such as disease transmission have not been investigated. A rigorous investigation of this potentially significant threat to kit foxes is warranted.

*Annual budget:* IV

*Time frame:* 5–10 years

*Contact:* Brian Cypher, bcypher@esrp.org

## **11. Swift fox [LC]**

### **11.1 [Project] Determine habitat selection of reintroduced swift foxes in Canada and Montana**

*Objectives:* Determine GIS habitat suitability model, based upon habitat-specific trapping rates; predict ideal sites for future swift fox reintroductions.

*Implementation details:* The reintroduced swift fox population in Canada and Montana is isolated from swift foxes elsewhere. The habitat model, which is based on systematic trapping censuses, will be updated every 5 years as additional data are obtained through replicated surveys. The initial model will be available in 2004/2005. Model results will be integrated into population viability analyses, for demographic projections.

*Annual budget:* II

*Time frame:* Model development: 1–2 years, Model refinement continuous

*Contact:* Axel Moehrenschrager, axelm@calgaryzoo.ab.ca

### **11.2 [Project] Determine serology and health of swift foxes and sympatric canids in Canada and Montana**

*Objectives:* Determine the prevalence and likelihood of disease transmission between swift foxes, red foxes,

coyotes, and domestic dogs; determine the haematology and parasite load of swift foxes and sympatric canids.

*Implementation details:* The reintroduced swift fox population in Canada and Montana is isolated from swift foxes elsewhere. Initial surveys revealed a high prevalence of canine parvovirus and canine distemper in the swift fox population. Swift foxes are in frequent contact with potential disease reservoirs, such as domestic dogs that have not been vaccinated. Blood analyses will be conducted on swift foxes in different age classes as well as on the sympatric canids.

*Annual budget:* III

*Time frame:* 2004–2006

*Contact:* Axel Moehrenschrager, axelm@calgaryzoo.ab.ca

### **11.3 [Project] Determine gene flow and connectivity within the reintroduced Canadian/Montana swift fox population**

*Objectives:* Determine whether the population, which was primarily created through the establishment of two isolated subpopulations, is now connected; determine the potential spread of disease outbreaks in the population.

*Implementation details:* The reintroduced swift fox population in Canada and Montana is isolated from swift foxes elsewhere. Hair samples have been collected from over 20,000km<sup>2</sup> over a five-year period, and 88 have been analysed with 12 polymorphic loci. Additional samples will be analysed, and interpreted using appropriate software to identify kin, dispersal, and gene flow questions.

*Annual budget:* IV

*Time frame:* 2004–2007

*Contact:* Axel Moehrenschrager, axelm@calgaryzoo.ab.ca

### **11.4 [Action] Develop a swift fox recovery strategy that is compatible with Canada's Species at Risk Act**

*Objectives:* Compile the current scientific and jurisdictional knowledge regarding swift foxes in Canada; identify and prioritise strategies that will lead to the downlisting of swift foxes from 'endangered' status (on the U.S. Endangered Species Act) to a 'least concern' status in the next 15 years; set specific targets within defined time frames that can be achieved through the collaboration of provincial agencies.

*Implementation details:* The reintroduced swift fox population in Canada and Montana is isolated from swift foxes elsewhere. This recovery strategy is spearheaded by the Calgary Zoo staff in conjunction with the Canadian swift fox recovery team. The final strategy will be approved by Canada's Environment Minister, and actions will largely be implemented by responsible agencies in Alberta and Saskatchewan.

*Annual budget:* I

*Time frame:* 2004–2005

*Contact:* Shelley Pruss, spruss@calgaryzoo.ab.ca, or Axel Moehrenschrager, axelm@calgaryzoo.ab.ca

### **11.5 [Action] Monitor the reintroduced swift fox population in Canada and Montana**

*Objectives:* Sample a portion of the swift fox population annually to obtain trend information; conduct a comprehensive census across the population every five years to assess trend, abundance, and habitat selection changes.

*Implementation details:* The Canadian population was comprehensively surveyed in 1996/1997 and Montana was included in a similar survey in 2000/2001. The primary survey tool has been live-trapping, supplemented with snow-tracking surveys. These will continue, but genetic censusing techniques are also being refined.

*Annual budget:* 2004, 2007–2009, 2012–2014: II; 2005/2006 and 2010/2011: V

*Time frame:* 2004 onwards, long-term

*Contact:* Axel Moehrenschrager, axelm@calgaryzoo.ab.ca

### **11.6 [Project] Role of parental attendance and habitat heterogeneity in the reproductive success of swift fox under different disturbance regimes\***

*Objectives:* Monitor swift fox populations under different disturbance regimes in Colorado; determine the impacts of grazing, military training, and no grazing on community structure (vegetation, prey base, predator guild, swift fox demographics); examine parental care of pups at the den.

*Implementation details:* Swift foxes are being monitored across six study areas (2 replicates of grazing/no military training; 2 replicates of military/no grazing; 2 replicates with no grazing/no military). At each site, vegetation, small mammals, and fox demographics (density, survival, reproduction, movements, dispersal, space use) are being documented. Parental care, den attendance, and behaviours are being recorded at several swift fox dens to examine behavioural budgets of adults attending pups.

*Annual budget:* V

*Time frame:* 3–5 years

*Contact:* Eric Gese, egese@cc.usu.edu

## **12. Grey wolf [LC]**

Compiled by the Wolf Specialist Group

### **12.1 [Action] Revise the U.S. Fish and Wildlife Service's Mexican Wolf Recovery Plan\***

*Objectives:* Ensure long-term survival of wild Mexican wolves (*Canis lupus bailey*) through restoration and

conservation measures outlined in a federally approved Recovery Plan

*Implementation details:* Promote recovery of the Mexican wolf by revising the federal Recovery Plan for the species. The existing plan was authorised in 1982 and is now obsolete. Effort needs to be expended to assemble the logistical, fiscal, and intellectual resources to develop a new Recovery Plan that will guide future activities to recover the Mexican wolf.

*Annual budget:* II

*Time frame:* 2–4 years

*Contact:* Brian Kelly, [brian\\_t\\_Kelly@fws.gov](mailto:brian_t_Kelly@fws.gov),  
<http://mexicanwolf.fws.gov>

### **12.2 [Action] Revise the federal rules governing management of wolves that travel outside the Blue Range Wolf Recovery Area in south-eastern Arizona and south-western New Mexico\***

*Objectives:* Ensure the success of the Mexican wolf restoration project being implemented in the south-western USA.

*Implementation details:* Promote survival of Mexican wolves in the south-western USA by eliminating the need for management actions catalysed by the wolf crossing an imaginary/arbitrary boundary. Currently federal rules governing the restoration project require wolves that wander outside the restoration area to be captured and returned or placed in captivity. This provision runs counter to the dispersal abilities of the species and management of grey wolves elsewhere. The provision ignores the presence of suitable habitat outside the restoration area and the importance of genetic exchange between subpopulations of Mexican wolves that must eventually be restored to recover the species. Consequently, the rules need to be modified to allow wolves to inhabit areas outside the restoration area in the absence of a valid management concern. Local, state, and federal officials need to be lobbied so they endorse the changes. Conservation organisations need to be supported so they can catalyse the necessary changes.

*Annual budget:* II

*Time frame:* 1–2 years

*Contact:* Brian Kelly, [brian\\_t\\_kelly@fws.gov](mailto:brian_t_kelly@fws.gov),  
<http://mexicanwolf.fws.gov>

### **12.3 [Project] Spatial analysis of restoration potential and population viability of the Mexican wolf in the south-western United States and northern Mexico\***

*Objectives:* Assess potential habitat, landscape-level threats, and population viability for Mexican wolves across the south-western U.S. and northern Mexico.

*Implementation details:* The potential for recovering the Mexican wolf throughout a significant portion of the

species historic range needs to be assessed before future restoration activities can be initiated.

Methods useful for the assessment include:

1. Combining habitat suitability modelling with population viability analyses to allow mapping of restoration priority areas;
2. Determination of subpopulation persistence within a larger metapopulation (e.g., through dispersal and consequent demographic rescue effect); and
3. Consequent insight into “how much is enough?” habitat to ensure population viability and eventual species recovery.

This assessment is critical to future recovery planning for the Mexican wolf.

*Annual budget:* III

*Time frame:* 2 years

*Contact:* Carlos Carroll, [carlos@sisqtel.net](mailto:carlos@sisqtel.net),  
<http://www.conservationresearch.org>

### **12.4 [Project] Utility of an experience centre for improving the survival of captive-born Mexican wolves released to the wild**

*Objectives:* Investigate the feasibility and effectiveness of improving the survival of captive-born Mexican wolves released in a restoration area by first subjecting them to life in the wild at an experience centre.

*Implementation details:* Management approaches need to be developed that maximise the survival of captive-born animals released to the wild. One approach calls for captive-born animals to first be subjected to the rigors of life in the wild at an experience centre (encompassing about 1,500km<sup>2</sup> of wildlands) before being released in a restoration area. Such an approach could advance recovery of Mexican wolves by providing naïve, captive-born animals with opportunities to enhance behaviours critical to survival, allowing some to produce wild-born pups for reintroduction, and by providing the U.S. Fish and Wildlife Service an opportunity to ‘preview’ the survival abilities of wolves that are being considered for release in a restoration area.

*Annual budget:* IV

*Time frame:* 5–10 years

*Contact:* Mike Phillips (Turner Endangered Species Fund), [tesf@montana.net](mailto:tesf@montana.net), <http://www.tesf.org>

### **12.5 [Action] Promote support and funding for the Wolf Forum for the Southern Rockies\***

*Objectives:* Promote educational initiatives designed to ensure that a proper decision is made about restoring grey wolves to the Southern Rockies Ecoregion in the U.S. (mostly western Colorado and northern New Mexico).

*Implementation details:* Supporting the Wolf Forum for the Southern Rockies will help promote proper

decision-making about wolf recovery in the Southern Rockies Ecoregion. The Forum is dedicated to providing scientific information and diverse viewpoints on wolf restoration to the Southern Rockies. It encourages input from diverse organisations both opposing and favouring wolf restoration efforts. The Forum does not advocate any position relating to wolf recovery, but rather serves as a balanced resource for accurate information, and a forum for all perspectives relative to wolf restoration to the Southern Rockies. Seek additional funding to support Forum activities. Liaise with other conservation and community projects to maximise the effectiveness of the Forum's efforts.

*Annual budget:* IV

*Time frame:* Ongoing, long-term

*Contact:* Walter Medwid (International Wolf Center), wmedwid@wolf.org, <http://www.wolf.org>

### **12.6 [Action] Promote support and funding for the Southern Rockies Wolf Restoration Project\***

*Objectives:* Promote science-informed advocacy concerning wolf restoration to the Southern Rockies Ecoregion in the United States (mostly western Colorado and northern New Mexico).

*Implementation details:* Promote the restoration of the grey wolf to the Southern Rockies Ecoregion by supporting the efforts of the Southern Rockies Wolf Restoration Project. The Project is dedicated to restoring wolves to the Southern Rockies. The Project will use science-informed advocacy to advance its mission. Seek additional funding to support Project activities. Liaise with other conservation and community projects to maximise the effectiveness of the Project's efforts.

*Annual budget:* V

*Time frame:* Ongoing, long-term

*Contact:* Mike Phillips (Turner Endangered Species Fund), tesf@montana.net, <http://www.rockywolf.org>

## **13. Gray fox [LC]**

### **13.1 [Project] Evolution and conservation of the Cozumel Island gray fox\***

*Objectives:* Gain insights on the taxonomy and phylogenetics of the dwarf gray fox population in Cozumel Island, Mexico; evaluate current population status and assess conservation priorities.

*Implementation details:* Every aspect of the biology of the population of gray foxes on Cozumel Island Mexico is poorly known. We know gray foxes still exist on the island, but no living specimens have ever been closely examined in a research context, and the taxonomic status of the population has never been assessed. Subfossil specimens currently being analysed suggest the population is of reduced stature (dwarfed) and has

inhabited the island for at least several thousand years. Field reports suggest a very small (probably far less than 50 individuals) population persists, although exact numbers are unknown. We are currently assessing the taxonomic status based on the subfossil specimens. Field-work is carried out when possible in tangent to other studies of the dwarf carnivore fauna on Cozumel.

*Annual budget:* I–II

*Time frame:* Ongoing; 2–3 yrs

*Contact:* Matthew Gompper, gompper@missouri.edu

## **Europe and North and Central Asia [Chapter 5]**

### **14. Arctic fox [LC]**

#### **14.1 [Project] Conservation of insular Arctic fox populations endemic to Bering Sea Islands in Alaskan and Russian waters**

*Objectives:* To compare current conservation status and threats facing the three subspecies of Arctic foxes endemic to the Bering Sea Islands (*Alopex lagopus semenovi*, Mednyi Island, Commander Islands, Russia; *A. l. beringensis*, Bering Island, Commander Islands, Russia; *A. l. pribilofensis*, Pribilof Islands, Alaska).

*Implementation details:* Collaboration study comparing existing data on Bering Sea Island fox populations. A comparison of the natural history and ecology of Arctic foxes living on the Pribilof Island and Commander Island groups. Identification of threats to specific populations, including an assessment of disease transfer from domestic pets to insular arctic foxes. Investigation of an existing disease currently afflicting foxes on the Pribilof Islands, which may be contributing to the Pribilof fox population decline. Promotion of public awareness as to the conservation issues facing these insular fox populations.

*Annual budget:* III

*Time frame:* 2 years

*Contact:* Paula A. White, PAW@carnivoreconservation.com, in collaboration with Mikhail Goltsman (Commander Islands)

#### **14.2 [Action] Saving the Endangered Fennoscandian *Alopex lagopus* [SEFALO+]\***

*Objectives:* To protect the Arctic fox in Sweden, Finland and Norway, where it is threatened with extinction, using a dynamic management approach to monitor and allocate conservation actions efficiently.

*Implementation details:* The Arctic fox in Sweden, Finland and Norway is considered a priority species by the EU Habitat directive. There are less than 150 individuals in mainland Europe, even a small demographic change may dramatically affect the risk

of extinction. Large areas within the previous range of the Arctic fox are empty today and many young foxes have difficulties finding a non-related partner. The main threat is small population size, constrained by low food availability, and the foxes are highly dependent on a regular pattern of population cycles of small rodents (*Clethrionomys* sp., *Microtus* sp., *Lemmus* sp.). The red fox is a dominant competitor and a predator on juveniles and is currently increasing its range, taking over dens and excluding arctic foxes from parts of their breeding range.

The project will use a supplementary feeding programme to increase reproductive output and juvenile survival, and a red fox control programme to safeguard the best Arctic fox territories. In Sweden, areas around dens with Arctic fox cubs will be excluded from ptarmigan hunting, to decrease disturbance from hunting dogs. An information plan at local, regional and European level will promote public cooperation and understanding for the actions needed to support the Fennoscandian Arctic fox population.

*Annual budget:* V (EU LIFE-Nature 2003)

*Time frame:* 2003–2008

*Contact:* Anders Angerbjörn,

Anders.angerbjorn@zoologi.su.se,

<http://www.zoologi.su.se/research/alopex/>

## 15. Grey wolf [LC]

Compiled by the Wolf Specialist Group

### 15.1 [Project] Conservation and management of grey wolves in Finland\*

*Objectives:* To promote expansion of the wolf population from its limited eastern range so that wolves may establish themselves in parts of in central and western Finland.

*Implementation details:* Wolf attacks on dogs and livestock that are likely to impair public acceptance of wolf recolonisation to central Finland. The impact of wolves on livestock is mitigated by gathering information on the movements of wolves using radio-tracking and consequently informing hunters and farmers of the likely presence in their area. The main study area (c. 10,000km<sup>2</sup>) is located in eastern Finland, adjacent to Russian core regions. Dispersal patterns, space use and wolf-human conflicts are examined by means of radio- and satellite-tracking. Since 1998, 36 wolves from six territories located in east-central Finland have been equipped with transmitters and monitored.

*Annual budget:* V

*Time frame:* 10 years (1998–2007)

*Contact:* Ilpo Kojola, [ilpo.kojola@rktl.fi](mailto:ilpo.kojola@rktl.fi)

## 16. Raccoon dog [LC]

### 16.1 [Project] The spatial ecology of small carnivores in south-east Finland and the control of rabies\*

*Objectives:* To build models for rabies spread in south-east Finland and to prevent the disease from spreading from Russia to Finland. To demonstrate to hunters the effectiveness of oral vaccination for rabies control, rather than culling foxes and raccoon dogs.

*Implementation details:* Data on home ranges, movements and habitat use will be collected on the small carnivore community (chiefly red fox and raccoon dog) in south-east Finland by radio tracking, and contact rates between individuals, both within and between species, will be determined. Population densities are monitored. The study will be expanded to the Russian part of the border in cooperation with Russian researchers. The resulting model will assist planning of oral vaccination campaigns (i.e., where/when/how to vaccinate raccoon dogs and foxes to minimise the risk of rabies transmission and to minimise the costs of vaccinations).

*Annual budget:* IV

*Time frame:* 3–4 years

*Contact:* Kaarina Kauhala, [kaarina.kauhala@rktl.fi](mailto:kaarina.kauhala@rktl.fi)

## Sub-Saharan Africa [Chapter 6]

### 17. Ethiopian wolf [EN]

Compiled by the CSG Ethiopian Wolf Working Group (Stuart Williams, Karen Laurenson, Jorgelina Marino, Dada Gottelli, James Malcolm, Lucy Tallents, Zelealem Tefera Ashenafi and Claudio Sillero-Zubiri)

The following projects and actions are necessary for the conservation of Ethiopian wolves and their Afroalpine habitat to achieve the minimum population level to ensure their long-term survival. Overall, the actions and projects as described in the Ethiopian Wolf Action Plan (Sillero-Zubiri and Macdonald 1997) are further supported here. There are a number of projects and actions recommended in Sillero-Zubiri and Macdonald (1997) that have already been carried out and are, therefore, obsolete. To prevent the need to cross-reference that document, the actions that are still relevant are listed here, with the exception of the detailed actions necessary for the establishment of a captive breeding facility.

#### 17.1 [Action] Coordination of Ethiopian wolf conservation\*

*Objectives:* To ensure coordinated efforts for the conservation of the Ethiopian wolf and its Afroalpine ecosystem.

*Implementation details:* Efforts to conserve the Ethiopian wolf and its Afroalpine ecosystem need to be prioritised, agreed and coordinated. This includes not only the members of the CSG Ethiopian Wolf Working Group, but also, pertinently, the efforts within Ethiopia. This is done through the Ethiopian Wolf Conservation Committee, which is comprised of key stakeholders and decision-makers within Ethiopia.

*Annual budget:* I

*Time frame:* Ongoing, long-term

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.2 [Project] Ethiopian wolf population surveys\***

*Objectives:* To improve the information about the size and structure of wolf populations.

*Implementation details:* Examine the possibility of using genetic identification of individual animals from faecal matter as a means for carrying out capture-mark-recapture techniques for estimating the size and structure of wolf populations. If the technique is successful and once baseline information has been collected, populations could then be monitored using genetic techniques.

*Annual budget:* III

*Time frame:* Initially 3–4 years, thereafter ongoing and long-term

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.3 [Project] Monitoring wolf populations, their Afroalpine ecosystem and human activities within the ecosystem\***

*Objectives:* Continual assessment and monitoring of the threats to the Ethiopian wolf and their habitats; monitor the wolf demography, reproductive success, use of space and population trends in known wolf packs in all wolf ranges; monitor human activities in all wolf ranges, including use of habitats by domestic livestock and the areas used for subsistence agriculture; monitor for the presence or emergence of dog-wolf hybrids; monitor the changes in extent and quality of the wolf ranges; and monitor the prevalence of diseases among domestic dog and wolf populations.

*Implementation details:* These activities are ongoing in most wolf ranges at present including the BMNP, Guassa-Menz, South Wollo, North Wollo and Simien. Annual or bi-annual visits are made to the remaining wolf ranges – Arsi and Mt Guna. The monitoring of human activities should be underpinned by the assessment of changes in the vegetation, particularly degradation. The rate of habitat loss should be quantified from these assessments.

*Annual budget:* III

*Time frame:* Long-term. Monitoring should continue *ad infinitum*.

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.4 [Project] Prioritisation of areas for conservation\***

*Objectives:* To prioritise the areas for the conservation of the Ethiopian wolf and its Afroalpine ecosystem.

*Implementation details:* There is a need to prioritise the areas on which to focus efforts for the conservation of the Ethiopian wolf and its Afroalpine ecosystem. The assessment should include consideration of the distribution of the genetic variability among wolf populations to ensure that 90% of the genetic variation of the wolf is conserved for the forthcoming 100 years. In addition, the assessment should consider the ecological importance of each wolf range.

*Annual budget:* I

*Time frame:* 2 years

*Contact:* Stuart Williams (Ethiopian Wolf Conservation Programme), s.williams@telecom.net.et, <http://www.ethiopianwolf.org>

### **17.5 [Project] Social structure and ecology of wolf populations in northern Ethiopia**

*Objectives:* Initiate research to determine the social structure and ecology of the small, isolated wolf populations in northern Ethiopia.

*Implementation details:* Seek funding for doctoral/post-doctoral research; prioritise areas for research, taking into account logistic constraints.

*Annual budget:* IV

*Time frame:* 4–5 years

*Contact:* Wildlife Conservation Research Unit (Oxford University), wcru@zoo.ox.ac.uk, <http://www.wildcru.org>, <http://www.ethiopianwolf.org>

### **17.6 [Project] Wolf MHC gene variability**

*Objectives:* Determine the variation of the MHC gene complex within and among wolf populations.

*Implementation details:* Determination of the variation of the MHC gene complex within and among wolf populations would have two functions:

- i) to determine the variability within a part of the genome on which selection takes place; and
- ii) to give important information about the ability of wolves to respond to the disease threats.

If detailed information were collected on the Bale population, this would also determine the effects of the bottleneck that resulted from disease episodes during the early 1990s.

The implementation would be dependent on:

- i) funding;
- ii) sample collection from the field (in collaboration with the EWCP); and

iii) having a genetics laboratory to run the analyses.

*Annual budget:* IV

*Time frame:* 3 years

*Contact:* Wildlife Conservation Research Unit (Oxford University), [wcru@zoo.ox.ac.uk](mailto:wcru@zoo.ox.ac.uk), <http://www.wildcru.org>, <http://www.ethiopianwolf.org>

### **17.7 [Project] Screening wolf populations for dog genes**

*Objectives:* Screen all Ethiopian wolf populations for dog genes and, therefore, determine the degree of hybridisation and consequent dilution of the Ethiopian wolf genome.

*Implementation details:* The implementation would be dependent on:

- i) funding;
- ii) sample collection from the field (in collaboration with the EWCP); and
- iii) having a genetics laboratory to run the analyses.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Ethiopian Wolf Conservation Programme, [ewcp@zoo.ox.ac.uk](mailto:ewcp@zoo.ox.ac.uk), <http://www.ethiopianwolf.org>

### **17.8 [Project] Ethiopian wolf phylogeography\***

*Objectives:* To continue to examine wolf phylogeography.

*Implementation details:* The data would be used for further population viability analyses and to assess whether the data support the development of a metapopulation management plan; these data could be compared with other, closely related, sympatric species such as common jackals and domestic dogs that are distributed (albeit contiguous unlike the wolves) over the same broad area.

*Annual budget:* III

*Time frame:* 3–5 years

*Contact:* Jorgelina Marino, [jorgelina.marino@zoo.ox.ac.uk](mailto:jorgelina.marino@zoo.ox.ac.uk), <http://www.ethiopianwolf.org>; or Dada Gottelli, [dada.gottelli@ioz.ac.uk](mailto:dada.gottelli@ioz.ac.uk)

### **17.9 [Action] Disease prevention\***

*Objectives:* To prevent disease transmission from domestic dogs to Ethiopian wolves through parenteral vaccination of dog populations living within and surrounding selected wolf ranges.

*Implementation details:* In order to prevent the transmission of canine diseases from domestic dogs to Ethiopian wolves, the dogs within wolf ranges where the threat of disease is most acute (i.e., domestic dog densities are high within and surrounding the wolf range) need to be vaccinated against rabies, parvovirus and canine distemper, and those living in the areas surrounding the wolf ranges against rabies alone. Requires training of local veterinarians.

*Annual budget:* III

*Time frame:* Long-term, ongoing at present and no exit strategy envisaged

*Contact:* Ethiopian Wolf Conservation Programme, [ewcp@zoo.ox.ac.uk](mailto:ewcp@zoo.ox.ac.uk), <http://www.ethiopianwolf.org>; or Karen Laurenson, [karenlaurenson@fzs.org](mailto:karenlaurenson@fzs.org)

### **17.10 [Project] Test methods to reduce disease transmission and incidence in domestic dogs and Ethiopian wolves\***

*Objectives:* To determine the efficacy of oral vaccination of domestic dogs and Ethiopian wolves as a means of preventing disease outbreaks.

*Implementation details:* Despite the ongoing success of the EWCP's vaccination campaign, parenteral vaccination of domestic dogs can be challenging and, in areas where domestic dog densities are low, not the most cost-effective means of preventing disease among Ethiopian wolf populations. Research is necessary to determine the efficacy of oral delivery of vaccine among domestic dog and Ethiopian wolf populations, including determination of an effective method or bait for vaccine delivery, the rate of sero-conversion, the rate of non-target species consumption, the effect of multiple vaccination in individuals. Thereafter, test the cost-effectiveness of the different methods of disease prevention.

*Annual budget:* IV

*Time frame:* 4–5 years

*Contact:* Karen Laurenson, [karenlaurenson@fzs.org](mailto:karenlaurenson@fzs.org); or Darryn Knobel, [d.l.knobel@sms.ed.ac.uk](mailto:d.l.knobel@sms.ed.ac.uk), <http://www.epi.vet.ed.ac.uk>

### **17.11 [Project] Control of domestic dog populations within and surrounding Ethiopian wolf ranges**

*Objectives:* To investigate effective methods of reducing domestic dog populations within and surrounding wolf ranges.

*Implementation details:* Reduced dog populations within and surrounding wolf ranges would lead to reduced risk of disease transmission from dogs to wolves, and reduced risk of hybridisation, and the reduction of interference competition between dogs and wolves.

Methods of dog control need to be considered and tested, including removing the functional need for dogs by:

- i) encouraging people to build wildlife-proof enclosures for their livestock;
- ii) encouraging people to dig pit latrines; and
- iii) encouraging people to use inaccessible refuse pits.

The use of contraceptives and autoimmune techniques also need to be investigated.

*Annual budget:* IV

*Time frame:* 5–7 years

*Contact:* Ethiopian Wolf Conservation Programme, [ewcp@zoo.ox.ac.uk](mailto:ewcp@zoo.ox.ac.uk), <http://www.ethiopianwolf.org>

### **17.12 [Action] Hybrid management\***

*Objectives:* To manage dog-wolf hybrid animals when they are born.

*Implementation details:* Dog-wolf hybrids occur when female wolves mate with male dogs. If the fertile hybrid remains within the wolf population, the dog genes may spread to threaten the genetic integrity of the wolf population. When hybrid animals are recorded through the monitoring or surveys carried out by the EWCP, hybrid animals should be humanely killed, or caught and sterilised.

*Annual budget:* I

*Time frame:* Ongoing, long-term.

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.13 [Action] Inform and educate the people of Ethiopia about the Ethiopian wolf and its Afroalpine ecosystem\***

*Objectives:* To provide factual information on the Ethiopian wolf and its Afroalpine ecosystem, including their importance and conservation requirements.

*Implementation details:* The people of Ethiopia must embrace the Ethiopian wolf and its Afroalpine ecosystem as a symbol of the wildlife, and as part of the living heritage of the country. In order to do so, they must be informed and educated about the importance of the Ethiopian wolf and the Afroalpine ecosystem, and their conservation requirements. As such, an education campaign targeting Ethiopians at all levels, including local communities (farmers, pastoral people, school children, local authorities and traditional authorities), the general populous, and federal and regional governments. Informing and educating should also use local, national and international scientific and popular media. Where possible, the media should be provided with appropriate film, graphic and written information on the Ethiopian wolf and its Afroalpine ecosystem. The Ethiopian wolf should be promoted as a flagship species (together with the gelada baboon, *Theropithecus gelada* – an endemic primate genus) for Ethiopian fauna and flora, and for the Afroalpine ecosystem of the Ethiopian highlands, in particular. When targeting local communities, negative attitudes to the wolf should be counteracted through education. Where they exist, negative local beliefs about the Ethiopian wolf should be dispelled. This should include the production of road signs that work to dispel the local belief that an Ethiopian wolf crossing one's path is bad luck. The need for sustainable use of natural resources should underpin the education campaign. Local people should be informed about the need to reduce the number of domestic dogs coupled with education about the means that they might do this (see Project 17.11 above).

*Annual budget:* III

*Time frame:* Ongoing, long-term

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.14 [Action] Inform and lobby organisations in Ethiopia of the importance of the environment as a cross-cutting issue\***

*Objectives:* To promote the paramount importance of the environment as an issue cutting across all sectors and to encourage policy development and implementation in the environmental sector.

*Implementation details:* Despite the link between the chronic problems faced by Ethiopia and the environment, this sector is being largely marginalised. This undermines the sustainability of solutions being considered by organisations in Ethiopia. There is a need to inform, lobby and advise organisations in Ethiopia, including government, non-government and donors, at both federal and regional levels, on the environment, and to advise and assist with the development and implementation of policy and strategies in this sector. This should also include contributing to the development of school and college curricula within Ethiopia so that they include the environment, and wildlife and ecosystem conservation in particular.

*Annual budget:* I

*Time frame:* Ongoing, long-term

*Contact:* Stuart Williams, s.williams@telecom.net.et, <http://www.ethiopianwolf.org>

### **17.15 [Action] Build the capacity of Ethiopia in the fields of ecology, conservation, epidemiology, conservation education and conservation policy\***

*Objectives:* To train Ethiopians in the fields necessary to sustain management solutions, and activities necessary for the conservation of the Ethiopian wolf and its Afroalpine ecosystem.

*Implementation details:* Training Ethiopians in the fields of ecology, conservation biology, conservation education, conservation policy and epidemiology is necessary for the sustainability of conservation solutions for the Ethiopian wolf and its Afroalpine ecosystem. This includes the development of Ethiopian institutions, both governmental and non-governmental, that are involved in the field of wildlife conservation or environmental development.

*Annual budget:* III

*Time frame:* Ongoing, long-term

*Contact:* Stuart Williams, Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.16 [Project] Attitudes of local people to the Ethiopian wolf and its Afroalpine ecosystem\***

*Objectives:* To determine the attitudes of local people to the Ethiopian wolf and its Afroalpine ecosystem as a means of developing education campaigns, and thereafter to test the efficacy of the education campaigns.

*Implementation details:* An assessment of the attitudes of local people is necessary for the development and design of an appropriate education campaign with the aim of counteracting negative attitudes to the Ethiopian wolf and its Afroalpine ecosystem. The assessment can thereafter act as a baseline for continual assessments to examine the effectiveness of an education campaign.

*Annual budget:* II

*Time frame:* Ongoing, long-term

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.17 [Action] Secure the protection of the Bale Mountains National Park\***

*Objectives:* To secure the conservation of the Bale Mountains National Park and its ecological processes as the key area of the conservation of the Ethiopian wolf and its Afroalpine ecosystem.

*Implementation details:* The Bale Mountains is the stronghold of the Ethiopian wolf and is the largest area of Afroalpine ecosystem on the continent. Securing this area is essential for the conservation of the Ethiopian wolf. This can be best done by:

- i) facilitating the processes and projects necessary to strengthen the management and operation of the park;
- ii) assisting with the process of gazetting the park by the government of Ethiopia;
- iii) seeking international recognition of the area as a UNESCO World Heritage Site;
- iv) facilitating the processes and projects that enhance the social and economic well-being of local human communities by ensuring the sustainable use of natural resources.

*Annual budget:* III

*Time frame:* Ongoing, long-term.

*Contact:* Stuart Williams, s.williams@telecom.net.et, <http://www.ethiopianwolf.org>; or Belgian Technical Cooperation (Ethiopia) btc.eth@telecom.net.et

### **17.18 [Action] Secure the protection of other areas of Afroalpine ecosystem in Ethiopia\***

*Objectives:* To secure the conservation of other areas of Afroalpine in Ethiopia.

*Implementation details:* Lack of space is the ultimate limiting factor for Ethiopian wolves and it is essential that what habitat remains at present is protected. Only two areas of Afroalpine ecosystem are protected at

present: the Bale Mountains National Park (see above) and the Simien Mountains National Park (SMNP). The boundaries of the SMNP should be expanded to include adjacent and more important Afroalpine habitat, and activities by the national park, NGOs and multilateral organisations working in the area should be assessed to ensure that the conservation of the Ethiopian wolf and its habitat are being adequately addressed in their work. In other areas, there is a need to assess the possibility of assigning an appropriate protected area status, such as that which is being considered for the Guassa-Menz area at present. Legislation would have to be appropriate, allowing access and use of the area by local communities, but preventing the unsustainable exploitation that is the norm at present. The involvement of the local human community is essential to ensure the success of projects to assign protected area status.

*Annual budget:* IV

*Time frame:* Ongoing, long-term

*Contact:* Stuart Williams, s.williams@telecom.net.et, <http://www.ethiopianwolf.org>

### **17.19 [Action] Promote tourism and other methods of generating revenue in wolf ranges\***

*Objectives:* To ensure that all means of generating revenue from wolf ranges are realised and that the revenue is shared with local communities.

*Implementation details:* Reduction of dependency of local human communities on unsustainable exploitation of natural resources of the Afroalpine ecosystem to conserve Ethiopian wolf habitat. This includes development of tourism. The link between the income-generating scheme and the Ethiopian wolf and the Afroalpine ecosystem must be ensured in the understanding of the beneficiaries of the projects. This includes lobbying the federal and regional governments to develop and implement appropriate policy and legislation, to allow local communities to share revenue generated from national parks and other government institutions accrued as a result of the Ethiopian wolf, its Afroalpine ecosystem and/or other wildlife derived economic benefits.

*Annual budget:* II

*Time frame:* Ongoing, long-term

*Contact:* Ethiopian Wolf Conservation Programme, ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.20 [Action] Financial sustainability of the Ethiopian Wolf Conservation Programme\***

*Objectives:* To ensure the financial sustainability of the Ethiopian Wolf Conservation Programme (EWCP) for the forthcoming 15 years.

*Implementation details:* The Ethiopian Wolf Conservation Programme was established as the primary vehicle for

the conservation of the Ethiopian wolf and its Afroalpine ecosystem in 1995 and has the mandate to implement the *in situ* actions described in Sillero-Zubiri and Macdonald (1997) and those herein described. The EWCP is necessarily a long-term programme and, therefore, optimum mechanisms to ensure that funding is not a constraint to the implementation of conservation actions should be sought. The funding should span the forthcoming 15 years with moral engagements for 15 years beyond that. This should be facilitated by the development of a 15-year strategic plan for the EWCP.

*Annual budget:* I

*Time frame:* Ongoing, long-term

*Contact:* Ethiopian Wolf Conservation Programme,  
ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.21 [Action] Feasibility of establishing a captive breeding population**

*Objectives:* To ensure the survival of the Ethiopian wolf in the event of a catastrophe in Ethiopia.

*Implementation details:* Consider the best means of achieving the conservation of the Ethiopian wolf to prevent extinction in the event of a catastrophe in Ethiopia, whether political or climatic. Options may include a captive breeding facility, for which details of the necessary actions can be found in Sillero-Zubiri and Macdonald (1997), or intensely managing a selected area of Afroalpine habitat, probably in the Bale Mountains, to favour the persistence of the Ethiopian wolf. A precondition to this is to determine the political and financial ramifications of establishing a captive breeding facility; *in situ* conservation is deemed the priority and any form of captive breeding should not replace, hinder or compromise the goals or funding base of the *in situ* conservation efforts as these are deemed to be the priority.

*Annual budget:* I

*Time frame:* Long-term

*Contact:* Ethiopian Wolf Conservation Programme,  
ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>

### **17.22 [Action] Preservation of Ethiopian wolf genetic material**

*Objectives:* To preserve the genetic material of the Ethiopian wolf.

*Implementation details:* Examine the possibility of preserving the genetic diversity of the Ethiopian wolf using 'cryopreservation' technology within the gene bank facilities being established within Ethiopia but with expertise that is being developed with partners such as Saint Louis Zoo, USA. Implementation of the actions is dependent on the technology being perfected. The capture of wolves for the collection of gametes should be done opportunistically and not as an end in and of itself. As with captive breeding, funding should not be

diverted from the *in situ* work. A precondition would be to determine the political and financial ramifications of establishing an Ethiopian wolf 'gene bank' for similar reasons to those discussed above. If all the above conditions are acceptably met, carry out a pilot study and tests of the efficacy of the methods in this species.

*Annual budget:* IV

*Time frame:* 4–5 years and then in perpetuity

*Contact:* Ethiopian Wolf Conservation Programme,  
ewcp@zoo.ox.ac.uk, <http://www.ethiopianwolf.org>;  
or Cheri Asa, ASA@slu.edu

## **18. African wild dog [EN]**

Compiled by the CSG African Wild Dog Working Group (J.W. McNutt, Kim McCreery, Gus Mills, Gregory Rasmussen, Bob Robbins, Claudio Sillero-Zubiri and Rosie Woodroffe)

The actions proposed for conservation of the African wild dog reflect the serious extinction threats that the species faces. Wild dog populations require very large areas to persist. Populations occupying small areas or fragmented habitats are at risk of extinction through conflict with human activities, and infectious diseases shared with domestic dogs. As in Woodroffe *et al.* (1997), our primary recommendation is to seek creative ways to maintain and, where possible, expand large wildlife-friendly areas available to wild dogs. Resolution of conflicts between people and wild dogs requires further investigation, but several studies are planned or in place. Strategies for evaluating and managing disease threats to wild dogs remain severely limited by the available data; this issue requires urgent attention.

### **18.1 [Action] Maintenance and expansion of very large wildlife areas, including Corridors and Transfrontier Conservation Area Development**

*Objectives:* To identify and establish corridors prioritising transfrontier wildlife protected areas throughout sub-Saharan Africa to promote conservation of wide ranging wildlife populations, international cooperation and a broad wildlife conservation ethic among African nations.

*Implementation details:* Identify habitats and geographic corridors of importance for *Lycan* that could link protected areas across southern Africa. Specific corridors include:

- i) from the Okavango in northern Botswana north through Namibia and into south-eastern Angola and south-western Zambia;
- ii) Kruger National Park, South Africa and south-eastern Zimbabwe;
- iii) western Zimbabwe with north-eastern Botswana; and

iv) Selous Game Reserve with Niassa Game Reserve in northern Mozambique.

Corridor linkages necessarily include political and policy development for cooperation among governments, NGO's and local communities. Monitoring, poaching abatement and outreach programmes are required.

*Annual budget:* IV

*Time frame:* 4–8 years

*Contact:* John Hanks, hanksppt@iafrica.com

### **18.2 [Project] Develop specific, low-cost methods and techniques for reducing human and livestock conflict**

*Objectives:* To develop and implement techniques for limiting ranging in wild dog packs into areas where they are at high risk of mortality, such as livestock areas, roads and villages.

*Implementation details:* Wild dog numbers can be severely reduced near villages, roads, and livestock areas by poaching, automobiles, and disease transfer from domestic dogs. Wild dog pack ranges, even those associated with protected areas, often border and include at least one type of these high-risk areas within their territories. Protected area populations would benefit by avoiding these particular sites. Wild dogs use chemical communication through scent marking to advertise and delineate territorial boundaries with neighbouring packs. Areas beyond these boundaries tend to be avoided by other wild dogs. It may be possible to construct artificial boundaries, using the species' own chemical and olfactory communication system. Such boundaries could be expected to affect the ranging behaviours of resident packs near identified high-conflict areas. Reducing ranging even temporarily into an area, coupled with outreach programmes and education about improved animal husbandry could affect greater human tolerance for wild dogs ranging occasionally into livestock areas.

*Annual budget:* III

*Time frame:* 2–3 years

*Contact:* Megan Parker or J.W. McNutt (Botswana Predator Conservation Program), lycaon@info.bw

### **18.3 [Project] Develop tools to foster coexistence of wild dogs with livestock farmers in Kenya\***

*Objectives:* To reduce human impact on wild dogs by understanding the causes of wild dog depredation on livestock, and developing alternatives to lethal control of wild dogs.

*Implementation details:* Monitoring of five radio-collared packs of wild dogs living outside protected areas in Samburu and Laikipia Districts, northern Kenya. Comparison of stocking density, wildlife abundance and level of wild dog activity in areas with and without a history of depredation on livestock. Case-control

study comparing husbandry of herds that are and are not attacked by wild dogs.

*Annual budget:* IV

*Time frame:* 3 years

*Contact:* Rosie Woodroffe, rwoodroffe@ucdavis.edu

### **18.4 [Project] Develop tools to foster coexistence of wild dogs with livestock farmers in the Kalahari region**

*Objectives:* To understand:

- i) the impact of wild dogs on commercial livestock farms in the Kalahari region, and
- ii) the impact of farmers on dogs, and to develop approaches to reducing both wild dog predation and the need for lethal control by farmers.

*Implementation details:* Such a project would involve monitoring of wild dog packs in central Botswana (Ghanzi, Heineveldt, and Makalamabedi are candidate districts) and eastern Namibia (e.g., Herreroland). Natality and mortality of collared packs will provide a measure of farmer impact on wild dog populations, while monitoring losses of mainly free-ranging cattle, as well as smaller stock, will give a measure of wild dog impact. These projects will complement ongoing work in East Africa, which has an entirely different system of livestock husbandry and land use.

*Annual budget:* III

*Time frame:* 4 years

*Contact:* Botswana: Matthew Swarner,

mjswarner@ucdavis.edu;

Namibia: Robin Lines, wilddog@mweb.com.na

### **18.5 [Project] Develop tools to foster coexistence of wild dogs with people in Zimbabwe\***

*Objectives:* To reduce human impact on wild dogs by:

- i) establishing the true impact of wild dogs on livestock and managed game;
- ii) ameliorating negative attitudes towards wild dogs by providing reliable information on their true impact; and
- iii) developing non-lethal management tools to assist the species to reside in non-protected areas.

*Implementation details:* Monitoring the survival of packs resident in all areas contiguous with Hwange National Park and interacting with all the stakeholders where *Lycaon* is found to be present. Methods of ameliorating conflict and high mortality factors are researched for their usefulness and adopted. Tools researched include fitting protective collars to dogs in areas of high snare risk, evaluating methods of capture from a welfare angle, and developing efficient methods to translocate family units where necessary. Capture methodology is in its last phase with the use of 'fladry' being tested to effect boma capture without the aid of a helicopter which research showed to be stressful.

*Annual budget:* IV

*Time frame:* Ongoing

*Contact:* Gregory Rasmussen (Painted Dog Conservation Trust), phdr@mweb.co.zw

### **18.6 [Project] Coexistence between game farmers and wild dogs in South Africa**

*Objectives:* With the proliferation of game farms in the northern regions of South Africa, wild dogs are reappearing, yet they are not welcome by the game farmers. Ways need to be established whereby coexistence between game farmers and wild dogs can be achieved.

*Implementation details:* Surveys of the most important wild dog areas are needed. The ecological role of the wild dog in these areas and their movement patterns should then be established, as well as the development of wild dog ecotourism. Communication with and education of game farmers is needed.

*Annual budget:* II

*Time frame:* 3 years

*Contact:* Gus Mills, gusm@sanparks.org

### **18.7 [Project] Develop tools to evaluate disease threats to wild dogs and determine whether intervention is necessary**

*Objectives:* To develop tools to evaluate disease threats to wild dogs and determine whether intervention is necessary.

*Implementation details:* Infectious disease has contributed to the extinction of at least one well-studied population and thwarted two reintroduction attempts. While it appears that small populations, and those in close contact with domestic dogs, are most at risk, there are insufficient data available to determine the circumstances under which extinction risks are so high that intervention might be warranted.

This study will combine:

- i) screening of wild dogs and other disease hosts at a number of sites;
- ii) studies of wild dog movements relative to domestic dogs; and
- iii) spatial epidemiological modelling to evaluate disease risks to wild dog populations both inside and outside protected areas.

*Annual budget:* V

*Time frame:* 3–5 years

*Contact:* Rosie Woodroffe, rwoodroffe@ucdavis.edu

### **18.8 [Project] Vaccine trials on wild dogs held in captivity\***

*Objectives:* To develop safe, effective protocols for vaccination of African wild dogs that would be suitable for use in the field if and when necessary.

*Implementation details:* Both rabies and distemper have caused whole-pack deaths of wild dogs and may threaten

certain populations. At present there is no protocol known to be both safe and effective to protect free-ranging wild dogs from either disease. Wild dogs given a single dose of inactivated rabies vaccine are known to have died from wild strains of rabies in the field. Likewise, captive wild dogs given inactivated distemper vaccines have suffered catastrophic mortality from a wild strain of distemper. Worse, a number of wild dog pups given modified live distemper vaccines have died from vaccine-induced distemper. This study will build on existing work to investigate the role that multiple doses of inactivated rabies vaccine, orally-delivered live rabies vaccine, recombinant *Vaccinia*-vectored rabies vaccines, and subunit canarypox-vectored distemper vaccines, might play in protecting wild dogs from infection.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Rosie Woodroffe, rwoodroffe@ucdavis.edu

### **18.9 [Project] Monitoring population and pack dynamics of wild dogs in Kruger National Park, South Africa\***

*Objectives:* To monitor population trends and to understand the factors responsible for the large population and pack fluctuations in wild dogs in Kruger.

*Implementation details:* Monthly monitoring of a sample of five radio-collared packs and photographic surveys every four years of the entire park.

*Annual budget:* I (monthly monitoring), II (photographic surveys)

*Time frame:* Ongoing

*Contact:* Gus Mills, gusm@sanparks.org

### **18.10 [Project] Monitoring population and pack dynamics of wild dogs in the Okavango region, Botswana\***

*Objectives:* Continuous monitoring of one of the last remaining large populations of wild dogs.

*Implementation details:* The Botswana Wild Dog Project, begun in 1989, continues to monitor the wild dog population in the Northern Conservation Zone and represents the longest continuous life-history dataset for the species in the wild. The population is largely dependent on the Moremi Game Reserve and Chobe National Park, and the numerous wildlife management areas associated with the Okavango Delta, a World Heritage Site. An average of 10 wild dog packs each year are monitored using VHF and GPS/satellite radio telemetry. Direct observations include recording of reproductive efforts and success, dispersal and territorial behaviours.

*Annual budget:* IV

*Time frame:* Continuous, ongoing

*Contact:* J.W. McNutt (Botswana Predator Conservation Program), lycaon@info.bw

### **18.11 [Project] Monitoring of the distribution, density, and mortality of wild dogs in Zimbabwe\***

*Objectives:* To identify population trends as well as hotspots where attention may be required to safeguard the wild dog population.

*Implementation details:* Sightings and causes of mortality are continually sought by liaison with wildlife societies, farmers' unions and the Department of National Parks and Wildlife Management. Every five years, questionnaires are sent out countrywide. Provide results and recommendations to relevant national authorities to enable the species to be beneficially managed.

*Annual budget:* I

*Time frame:* Ongoing

*Contact:* Gregory Rasmussen, phdr@mweb.co.zw

### **18.12 [Project] Monitoring and evaluation of management strategies for wild dogs in the Rungwa-Ruaha ecosystem, Tanzania**

*Objectives:* To assess the status and local distribution of the Rungwa-Ruaha wild dog population, and identify management practices affecting their density and distribution in the Rungwa-Ruaha Landscape.

*Implementation details:* Preliminary implementation would focus on identifying the local area occupied by wild dogs within the landscape. Subsequent activities will focus on population assessment and establishing baselines for monitoring and surveillance. These activities will form the foundation for evaluation of existing and proposed management activities, including hunting of other carnivores and disease management in domestic dogs surrounding the protected area complex.

*Annual budget:* IV

*Time frame:* 3–5 years (monitoring to be ongoing)

*Contact:* Peter Coppolillo, PCoppolillo@WCS.org

### **18.13 [Project] Ecology of wild dog populations in dryland areas of the Kalahari region**

*Objectives:* To determine the size and distribution of wild dogs in the drier habitats of central and southern Botswana.

*Implementation details:* Estimates of the wild dog population in the Central Kalahari Game Reserve (CKGR) and associated wildlife management areas in what is called the Southern Conservation Zone (164,000km<sup>2</sup>, National Predator Strategy, 2003) indicate a potentially important population for the species. The population estimate of 621 wild dogs in the zone is based on spoor sampling in the CKGR (0.8 dogs/100km<sup>2</sup>, DWNP, Botswana) and, therefore, gives a wide confidence range (approximately 100–1,200 wild dogs). The possibility that such a large population, contiguous with the northern population exists in and

around wildlife habitats in central and southern Botswana merits more intensive investigation. Study would emphasise detailed observations of a sample of the population (4 to 6 packs) to determine density and ranging behaviours through the use of GPS and satellite radio telemetry. Detailed data on this sample population would provide greater confidence in the population estimates given for the entire region.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Matthew Swarner or J.W. McNutt (Botswana Predator Conservation Program), lycaon@info.bw

### **18.14 [Project] Status and ecology of the African wild dog in central and northern Mozambique\***

*Objectives:* To assess current conservation status of African wild dog populations in Mozambique and promote conservation efforts.

*Implementation details:* Little is known of the distribution and status of the wild dog in Mozambique, with no information published since the account by Smithers and Lobão-Tello (1976). Mozambique's is potentially a key population since it would link Tanzanian wild dogs with those occurring in Zimbabwe and north-eastern South Africa.

Collect and analyse baseline ecological information on distribution and relative abundance of the African wild dogs, habitat availability, prey and competitor species (lion and spotted hyaena) and people's attitudes to dogs. Provide training on complementary skills, research results and recommendations to state authorities and research institutions responsible for the conservation of wild dogs and other large carnivores in Mozambique. This project will seek to clarify, through a series of mail questionnaires and subsequent presence/absence field surveys in selected locations, the current distribution and status of all three species.

*Annual budget:* III

*Time frame:* 6–12 months

*Contact:* Claudio Sillero-Zubiri, claudio.sillero@zoo.ox.ac.uk

### **18.15 [Project] Status, distribution, and ecology of an unprotected wild dog population in north-eastern Kenya\***

*Objectives:* To provide baseline data on status and distribution, predator-prey relationships with special reference to the Critically Endangered hirola (*Beatragus hunteri*) and domestic livestock, habitat utilisation, disease, and human/wild dog interactions, and promote community-based conservation efforts.

*Implementation details:* Nothing is known about the conservation status of wild dogs in the Ijara/Garissa Districts of north-eastern Kenya. This population may provide an important link with wild dogs in the Horn

of Africa. The project will be conducted in partnership with a locally-based environmental organisation. Baseline information will be collected and analysed from reported sightings, playback surveys, and routine monitoring of radio-collared packs. Community participants will be trained in applied field research including monitoring techniques and data collection. Ongoing assessment of local attitudes and concerns is an integral part of this project.

*Annual budget:* IV

*Time frame:* 3–5 years

*Contact:* Kim McCreery and Bob Robbins,  
lycaonpictus@earthlink.net

### **18.16 [Project] Status of African wild dog populations in West Africa**

*Objectives:* To assess current conservation status of African wild dog populations in West Africa and promote conservation efforts.

*Implementation details:* Collect and analyse baseline ecological information on distribution and relative abundance of the African wild dog, habitat availability, prey and competitor species (lion and spotted hyaena) and people's attitudes to dogs. Particular attention will be paid to monitoring wild dog status in and around Niokola-Koba National Park, Sénégal, which holds the only potentially viable wild dog population known in West Africa.

Provide training on complementary skills, research results and recommendations to state authorities and research institutions responsible for the conservation of wild dogs and other large carnivores.

This project will seek to clarify, through a series of mail questionnaires and subsequent presence/absence field surveys in selected locations, the current distribution and status of African wild dogs.

*Annual budget:* II

*Time frame:* 1–2 years

*Contact:* Canid Specialist Group (Sub-Saharan Africa Regional Section), canids@zoo.ox.ac.uk

### **18.17 [Project] Establish distribution and status of wild dogs in southern Sudan**

*Objectives:* To determine the status and distribution of wild dogs in southern Sudan, a potentially important area where a significant population may remain

*Implementation details:* Initial surveys would be carried out by interviewing people in and around Boma, Dinder and Southern National Parks and the Bengagai Game Reserve. Additional interviews would be carried out in other areas, particularly the Nile floodplain. Interviewing could be targeted using remotely sensed data to identify areas where wild dogs might persist.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Sub-Saharan Africa Regional Section), canids@zoo.ox.ac.uk

### **18.18 [Project] Establish distribution and status of wild dogs in central Africa**

*Objectives:* To assess the distribution and status of wild dogs in central Africa, where important populations may remain.

*Implementation details:* Interviews to:

- i) add to Breuer's (2003) survey of wild dog distribution and status in Cameroon;
- ii) confirm the status of the populations in and around Manovo-Gounda-St Floris and Bamingui-Bangoran National Parks (Central African Republic); and
- iii) confirm the status of the populations in and around Ouadi-Rimé-Ouadi-Achim and Siniaka-Minim Game Reserves (Chad).

*Annual budget:* II

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Sub-Saharan Africa Regional Section), canids@zoo.ox.ac.uk

### **18.19 [Project] Determine status of wild dogs in Teffedest Mountains, Algeria**

*Objectives:* To determine whether wild dogs are present in the Teffedest Mountains, Algeria.

*Implementation details:* Wild dogs have been reported as present in the Teffedest Mountains, Algeria, but this has never been confirmed. If wild dogs are present here they are almost certainly both genetically and ecologically highly distinct from all other populations and have a high conservation value. A preliminary survey would require interviewing local people. If wild dogs are still reported, interviews could be followed up with surveys for tracks, scats and other signs of wild dog presence.

*Annual budget:* II

*Time frame:* 1 year

*Contact:* Canid Specialist Group (North Africa and Middle East Regional Section), canids@zoo.ox.ac.uk

### **18.20 [Project] Develop low-tech methods for surveying and monitoring wild dogs**

*Objectives:* To develop methods for surveying and monitoring wild dogs that can be used extensively and inexpensively.

*Implementation details:* Because wild dogs never occur at high densities, it is difficult to monitor their numbers. In many areas, wild dog extinctions were unknown for several years after the fact. Techniques are, therefore, needed to monitor wild dogs in 'sentinel' areas. Because these techniques need to be used over large and often remote areas, they need to be inexpensive. Techniques based on track surveys have been developed in the

past, which is of value in flat, rather homogeneous environments but may be less applicable areas with a variety of substrates. Tracking might be supplemented by the use of domestic dogs trained to recognise and locate wild dog sign and faeces. Both approaches could be adopted in areas of known wild dog density, used to calibrate density estimates derived from other areas.

*Annual budget:* II

*Time frame:* 2 years

*Contact:* Megan Parker, mnparker@igc.org

### **18.21 [Action] Establish a second wild dog population in South Africa by setting up a series of smaller populations and managing them as a metapopulation\***

*Objectives:* There is presently no protected area in South Africa large enough to contain a second viable wild dog population. There are several fenced areas in suitable habitat large enough to contain one or two packs, but without corridors between them. A strategy to manage and conserve wild dogs in these reserves is being developed.

*Implementation details:* Wild dogs are being introduced into these reserves. The various subpopulations in each reserve are being monitored and managed as part of a single metapopulation by simulating the natural processes of immigration and emigration in natural populations.

*Annual budget:* I

*Time frame:* 10 years

*Contact:* Gus Mills, gusm@sanparks.org

### **18.22 [Action] Development of a viable community conservation programme in Zimbabwe\***

*Objectives:* To demonstrate that wild dogs can have value other than through ecotourism, but that is not appropriate in many areas of the species' range. It is intended this project will enable rural communities to benefit from having an active research and conservation programme in their region, and consequently see the dogs as 'their' flagship species.

*Implementation details:* Building of a conservation education and environmentally friendly crafts centre where all stakeholders can participate and appreciate conservation as well as gain educational and developmental skills. Building of a children's bush camp with a conservation curriculum that highlights the ecological value and links between all species and in particular top predators that are most often targets of prejudice and misconception. This programme will see a throughput of 80 local children per week.

*Annual budget:* IV (establishment), II (running)

*Time frame:* Indefinite

*Contact:* Gregory Rasmussen phdr@mweb.co.zw

## **North Africa and the Middle East [Chapter 7]**

### **19. Desert canid community**

Since most canid species in North Africa and the Middle East live in the desert, where resources are limited, studying the interaction between species can be valuable for conservation purposes. Disturbance by people (e.g., agriculture, hunting) may easily change the canid community by allowing the larger species to invade and exclude the smaller ones. The initial processes can be local, but will spread out in time and with development.

#### **19.1 [Project] Natural history, distribution and status of the pale fox, Rüppell's fox and fennec fox**

*Objectives:* To study basic biology and ecological requirements of three African desert foxes, the pale, Rüppell's and fennec foxes; to conduct presence/absence surveys in key parts of their range to map their distribution and evaluate species status.

*Implementation details:* Although widespread, the desert foxes are arguably the least-known canid species in the world. Detailed information on population abundance or status is missing. This project will seek to clarify, through a series of mail questionnaires and subsequent presence/absence field surveys in selected locations, the current distribution and status of all three species. Survey techniques will be carefully designed to avoid confusion between sympatric species. Biological samples for morphological and genetic studies will also be collected where possible.

*Annual budget:* II

*Time frame:* 2–3 years

*Contact:* Canid Specialist Group (North Africa and Middle East Regional Section), canids@zoo.ox.ac.uk

#### **19.2 [Project] Distribution and status of Rüppell's fox and Blanford's fox in south-west Saudi Arabia, Yemen and Oman**

*Objectives:* To undertake surveys of the distribution of two desert foxes in the southern sector of the Arabian Peninsula in order to determine range and conservation status.

*Implementation details:* Both foxes are widespread in this area, but with a few localised exceptions nothing is known of either population abundance or conservation status. This project will serve to establish the current distribution and status of the two species through field surveys in selected locations. Apart from direct observations methods to be used would include: recording of tracks and other signs, camera traps, box traps, and scent posts.

*Annual budget:* II

*Time frame:* 6 months

*Contact:* Chris and Tilde Stuart, aawrc@yebo.co.za

### **19.3 [Project] Survey of canid species in the central Sahara Desert**

*Objectives:* To survey areas of the central Sahara Desert (e.g., Hagggar Mountains) for canids and other carnivores.

*Implementation details:* Several reports of unidentified canids have been received from this region, where there has been very little research. Field surveys in suitable locations will use spoor tracking, scent posts, camera and box traps to record presence.

*Annual budget:* II

*Time frame:* 2 months

*Contact:* Canid Specialist Group, (North Africa and Middle East Regional Section), canids@zoo.ox.ac.uk

## **20. Blanford's fox [VU]**

### **20.1 [Project] Distribution and status of the Blanford's fox in Egypt, Sudan and the Horn of Africa**

*Objectives:* This species was considered one of the rarest mammals in Asia and was discovered in the Middle East only 20 years ago, and more recently in Egypt. The project seeks to map the distribution of this species in Africa.

*Implementation details:* The proposed survey will provide knowledge on the distribution and status of the species in north-eastern Africa. Potential habitat in eastern Egypt, eastern Sudan, Eritrea and Ethiopia will be scanned for tracks, and automated cameras and box traps will be used to record presence. DNA will be sampled from trapped individuals, skins, and other remains. The data will be later use to assess radiation patterns and population subdivision.

*Annual budget:* II

*Time frame:* 2 years

*Contact:* Canid Specialist Group (North Africa and Middle East Regional Section), canids@zoo.ox.ac.uk

## **21. Rüppell's fox [DD]**

### **21.1 [Project] Causes for local extinction of Rüppell's fox in Israel**

*Objectives:* To study whether competitive exclusion by red foxes is the main cause for local extinction of the Rüppell's fox in Israel.

*Implementation details:* The Rüppell's fox was the most abundant fox species in the Negev Desert up until the 1960s. Thereafter an increase in human presence and agriculture has allowed red foxes to follow and settle in those arid regions. A sharp decrease in the population of Rüppell's fox was documented in the following years. The project composes two parts: an extensive survey of red and Rüppell's foxes over the Negev

Desert, and a study on the interaction between these two species. The results have conservation implications for other regions where both species coexist.

*Annual budget:* III

*Time frame:* 2–3 years (ongoing, but needs more funding)

*Contact:* Eli Geffen and Reuven Hefner, geffene@ccsg.tau.ac.il

## **22. Grey wolf [LC]**

Compiled by the Wolf Specialist Group

### **22.1 [Project] Status of little known populations of the grey wolf in Iran, Iraq and Syria**

*Objectives:* To determine the status of the grey wolf in Iran, Iraq and Syria

*Implementation details:* The grey wolf is under intense hunting pressure in many Middle-Eastern countries, where no legal protection for this vulnerable species is provided. Iran previously had a large wolf population, but there are concerns that numbers have declined. The current status of wolves in Iran, Iraq and Syria is unknown and field surveys in suitable locations where wolves were known to occur are urgently needed.

*Annual budget:* II

*Time frame:* 2–3 years

*Contact:* Wolf Specialist Group, mechx002@tc.umn.edu

### **22.2 [Project] Status of populations of the grey wolf in the southern Arabian Peninsula**

*Objectives:* To determine the distribution and conservation status of the grey wolf in southern Saudi Arabia, Oman and Yemen

*Implementation details:* The grey wolf is under serious threat in the southern Arabian Peninsula and virtually no recent information is available on the region's largest canid. Hunting pressure on the wolf and other large carnivores in the area is considerable and no effective conservation measures are in place anywhere in the region. Field surveys to be undertaken in selected locations where wolves most recently reported.

*Annual budget:* II

*Time frame:* 6 months

*Contact:* Wolf Specialist Group, mechx002@tc.umn.edu

### **22.3 [Project] Status and taxonomic elucidation of *Canis aureus lupaster***

*Objectives:* To survey the population of *Canis aureus lupaster* in southern Egypt; map its distribution, evaluate status and determine taxonomic affiliations.

*Implementation details:* It has been argued that *C. a. lupaster* is actually a small wolf, rather than a large jackal, and it might represent a distinct canid form. It has been reported in Egypt and Libya, but its distribution

and status is unknown. A field expedition will compile information on population range and abundance. Biological samples will be collected, from the field and museum specimens, for morphological and molecular studies to elucidate taxonomic affiliation.

*Annual budget:* II

*Time frame:* 6 months

*Contact:* Canid Specialist Group (North Africa and Middle East Regional Section), [canids@zoo.ox.ac.uk](mailto:canids@zoo.ox.ac.uk)

## South Asia, South of the Himalaya [Chapter 8]

### 23. Dhole [VU]

Compiled by the CSG Dhole Working Group (Simon Hedges, Leon Durbin, Arun Venkataraman, A. J. T. Johnsingh, Will Duckworth, Martin Tyson and Arati Iyengar)

#### 23.1 [Project] Development and evaluation of survey methods

*Objectives:* To evaluate and adapt survey methods for detecting dhole presence and estimating abundance.

*Implementation details:* The feasibility of the following methods for detecting dhole presence and estimating abundance needs to be evaluated and further adapted:

- i) camera trap-based survey methods;
- ii) track identification based methods for indicating dhole presence;
- iii) track count-based methods for the production of indices of relative abundance (paying particular attention to the problem of domestic and feral dogs);
- iv) use of faecal genetics (i.e., genetic fingerprinting individual dholes from their scats to census pack and population size);
- v) call-based survey methods, i.e. calling-up packs of dholes using playback of whistle calls, pup sounds, and prey sounds for detecting and counting dhole packs (additional information could be gained by video filming any dholes that approach close enough); and
- vi) production of a short illustrated identification guide showing dhole footprints, scats, and the animals (could be given to reserve managers, surveyors, etc.).

*Annual budget:* II

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Dhole Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)

#### 23.2 [Project] Genetic studies

*Objectives:* To assess genetic variability within and between populations and to identify appropriate conservation/management units.

*Implementation details:* Genetic studies focused on determining levels of genetic variability within and between populations are needed to assess appropriate conservation/management units and help set priorities. These studies should also aim to assess the validity of current taxonomic groupings and determine whether there exist hybrid forms within regions of mainland Asia. Information is also needed about the effects of fragmentation and levels of inbreeding. A study addressing many of these issues is currently underway at the University of Southampton.

*Annual budget:* III

*Time frame:* 2 years

*Contact:* Canid Specialist Group (Dhole Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)

#### 23.3 [Project] Ecological and behavioural studies

*Objectives:* Promotion of ecological and behavioural studies focussed on developing conservation strategies for the species.

*Implementation details:* Little is known of dhole behaviour and ecology. Conservation of the species requires a greater understanding of the population dynamics and the likely significance of kleptoparasitism and intra-guild predation and competition (e.g., the likely consequences of the tiger's decline on dhole population abundance and the significance of competition between dholes and feral/domestic dogs). Ongoing genetic work being conducted at the University of Southampton should contribute to understanding of dhole population dynamics by providing information on population structure, levels of gene flow and rates of dispersal. Once this project is complete, we will need to reassess gaps in knowledge, and determine what additional data need to be collected in order to design and implement an appropriate conservation strategy for dholes.

Predator-prey interactions are also in need of study (e.g., likely prey base sizes necessary to support viable numbers of packs). In addition, we need to investigate the likely minimum reserve size and quality (e.g., prey abundance, habitat quality) for population viability.

Any studies involving the capture and immobilisation of dholes should use the opportunity to screen animals caught for diseases. All dhole carcasses should be necropsied and screened for disease. Standard protocols should be distributed to field workers in areas with dholes. Domestic and feral dogs and other carnivores living in and around dhole habitat should be screened for disease wherever possible.

*Annual budget:* IV

*Time frame:* 5 years

*Contact:* Canid Specialist Group (Dhole Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)

### **23.4 [Action] Surveys and monitoring**

*Objectives:* The accurate delineation of present dhole distribution within its speculated range through the use of questionnaires and targeted field surveys

*Implementation details:* Establishing the presence or likely absence of dholes (particularly in protected areas) throughout much of their range is a high priority. Current information is often anecdotal, vague or of poor resolution. There is presently little information on population trends. A way of tackling this is through better coordination between surveyors and their respective organisations and the CSG Dhole Working Group. However, targeted surveys for estimating relative abundance in potential sites and monitoring programmes of both dhole and prey abundance within key populations are still required. These areas are being identified as part of Dhole Action Plan (DAP) process.

*Annual budget:* IV

*Time frame:* 2 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.5 [Action] Prioritisation of populations for conservation action**

*Objectives:* The development of a framework for prioritising dhole populations and conservation action within populations.

*Implementation details:* An assessment and review of the relative merits of genetic approaches versus more ecology-based approaches in setting priorities is needed. For example, would it be a good idea to modify the Tiger Conservation Unit approach of Dinerstein *et al.* (1997) and use it for dholes? There is also a need to discuss whether one should prioritise for protection those populations that are fragile or disappearing or those that are more robust. Appropriate priority setting requires information on dhole abundance and distribution, prey base, habitat utilisation and habitat integrity, levels of persecution, human abundance in surrounding areas and socio-political background. It is also necessary to evaluate how feasible, important, and useful such an exercise would be. Consequent to the prioritisation of populations there is a need to rank conservation action within sites in accordance to their importance, cost of implementation, political problems within target sites, and approximate time to achieve the projects' goals.

*Annual budget:* II

*Time frame:* 2 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.6 [Action] Understanding the epidemiology of disease in dholes**

*Objectives:* Studying the epidemiology and effect of diseases and their control in dhole populations.

*Implementation details:* Disease has often been said to play a major role in dhole population dynamics, but as most 'evidence' is anecdotal a study is long overdue. An important component of such a study is a survey to investigate the status of domestic and feral dogs within the dhole's range and their role as disease reservoirs and vectors. Studies to assess the value of vaccinating domestic dogs and other reservoir hosts are needed. The possibility of (and likely value of) establishing vaccinated buffer zones around important dhole populations should be investigated. Elimination of feral dogs within protected areas should be carried out wherever possible, since feral dogs are both a source of disease and a source of interspecific competition for prey species. We also need pre-emptive studies of the feasibility of vaccinating dholes against rabies. Appropriate vaccination protocols need to be developed (many lessons can be learnt from the work on the African wild dog and Ethiopian wolf). The threat posed by canine distemper virus and other diseases need to be assessed too.

*Annual budget:* IV

*Time frame:* 5 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.7 [Action] Protection of dholes and their habitat**

*Objectives:* Identify threats to dholes and promote actions that both reduce direct persecution of dholes and protect their habitat and prey bases.

*Implementation details:* It is quite evident that dholes require complete protection from persecution, initially within designated protected areas but eventually outside the protected area network. In many cases, this will mean enforcement of existing legislation. There is a need to identify those countries or regions where dholes are most at risk from direct persecution and initiate measures to reduce persecution. Reasons for persecution need to be identified and education campaigns initiated where necessary and appropriate. Protection of the dholes' prey base is a priority (in many areas the work would best be done in conjunction with other programmes). The protection of dens, which are often seriously persecuted by humans in some areas, is a high priority. Den sites need to be identified and patrolling increased in these areas. An additional tactic could be enforcing penalties for entering marked exclusion zones around den sites. Other strategies need to be discussed. Methods to reduce indirect killing (e.g., road kills and snares) should be developed. Actions such as increasing linkage between parks, creation of buffer zones, and encouraging land use favourable to wildlife around parks, need to be addressed on a case-by-case basis. These actions will often be best addressed in

collaboration with existing conservation projects and thus a list of existing and relevant projects throughout the range of the species needs to be compiled.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.8 [Action] Management of the prey base**

*Objectives:* Augmenting dhole prey base through management and protection.

*Implementation details:* In areas where dholes are threatened by low prey abundance, habitat management to boost prey numbers is required. In addition to the obvious need to protect prey species from poaching and disturbance, other projects could include elimination of feral dogs living in dhole habitat, the creation of artificial water sources, and the regular burning of grassland areas and scrub clearance to boost prey carrying capacity. Such projects need careful management as they may cause problems for other species, but conversely, they may also be of value in their own right if specific prey species themselves are of conservation concern. In some parts of the dhole's range, notably India, many conservationists and wildlife managers strongly believe that exotic weed infestation is reducing the carrying capacity of prey species' habitat. There is a possibility that as a result of this infestation, dhole foraging patterns have changed, but this has to be scientifically substantiated. A thorough scientific investigation which could, if necessary, lead to a weed management/habitat improvement programme, is needed.

*Annual budget:* IV

*Time frame:* 3 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.9 [Action] Conflict with people**

*Objectives:* Identifying patterns and levels of conflict within range states and designing policy and actions to mitigate conflicts.

*Implementation details:* A survey is needed to identify levels of conflict between people and dholes in all range states. This work should be linked to ecological field studies wherever possible to allow us to investigate under what circumstances dholes kill livestock. A policy is needed (in all range states) for dealing with stock predation. Attitudes to dholes need to be evaluated to determine whether peoples' perception of problems reflects the real situation. The relative merits and the feasibility of compensation and insurance schemes need to be evaluated for each country or region. Domestic animal husbandry techniques need to be assessed for potential modifications that would reduce losses to dholes and

other predators. Surveys of domestic and feral dogs will also be useful to help assess likely culprits in cases of stock predation.

*Annual budget:* III

*Time frame:* 3 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.10 [Action] Conflict with other threatened species**

*Objectives:* Formulation of a policy for dealing with predation of dholes by other threatened predators. Similarly, policies for dealing with dhole predation on threatened prey species need to be developed.

*Implementation details:* Predation of dholes by tigers needs to be studied to assess its prevalence. More generally, discussion is needed to develop suitable protocols for dealing with the problems caused if dholes are found to be preying on important populations of threatened prey species at unsustainable rates.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.11 [Action] Captive breeding of dholes**

*Objectives:* A review of the status of the existing captive populations.

*Implementation details:* The role of captive breeding as part of a dhole conservation strategy (ongoing DAP process) should be evaluated. Particular emphasis should be given to the issue of hybridisation between dholes belonging to different subspecies. The promotion of zoo exhibits such as the highly educational African wild dog exhibit in the Brookfield Zoo in Chicago should be a high priority.

*Annual budget:* II

*Time frame:* 2 years

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.12 [Action] Reintroduction and translocation of dholes**

*Objectives:* An assessment of the necessity and feasibility of reintroducing or translocating dholes.

*Implementation details:* Potential sites where dholes once existed or where present populations are threatened through genetic isolation or small population sizes need to be identified. The desirability and possibility of re-establishing or augmenting such populations needs to be assessed.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Dhole Working Group),  
canids@zoo.ac.uk

### **23.13 [Action] Legislative issues affecting dhole conservation**

*Objectives:* A review of the current legal protection for dholes within in their range states, with a view to recommending further legal protection if necessary.

*Implementation details:* The legal protection conferred on dholes throughout their range needs to be reviewed (ongoing as part of the DAP process), and where necessary measures should be taken to improve protection afforded under national laws. Other issues which need to be addressed include: mechanisms for enhancing enforcement of legal protection and strategies through which governments can be persuaded to provide legal protection where absent, or increase existing protection if it is found to be lacking. The feasibility of restricting the availability of poisons needs to be assessed in countries like India where poisons such as strychnine are easily available over the counter.

*Annual budget:* I

*Time frame:* 1 year

*Contact:* Canid Specialist Group (Dhole Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)

## **Australia and Oceania [Chapter 9]**

### **24. Dingo [VU]**

#### **24.1 [Project] Status and taxonomic elucidation of New Guinea singing dog**

*Objectives:* To conduct presence/absence surveys for remnant populations of singing dogs in mountain areas of Papua New Guinea, including Dokfuma, Mt. Capella, Star Mountains, Sanduan Province and Mt. Keriokambu, Morobe Province; to collect whenever possible droppings of wild canid and domestic dogs from near villages for eventual molecular analysis in order to elucidate the taxonomy of this canid and whether it hybridises with domestic dogs; to interview local people for information on historical and current distribution of singing dogs and collate traditional stories concerning the dogs.

*Implementation details:* There is no recent evidence for the persistence of any wild populations of dingoes (or singing dogs) in New Guinea, although residents of remote mountain areas report seeing or hearing wild dogs at the higher elevations. This project will seek to determine the presence of wild dogs in those areas and hopefully elucidate their taxonomic provenance. From local reports and past literature reports, two remote areas have been selected as likely to harbour wild dogs. Field personnel will visit each area and look for positive sign of dog presence and visit the nearest villages to gather information and domestic dog samples.

*Annual budget:* II

*Time frame:* 6 months

*Contact:* Canid Specialist Group (South Asia and Australasia Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk), New Guinea Singing Dog Conservation Society, Lehr Brisbin, [brisbin@srel.edu](mailto:brisbin@srel.edu), or Janice Koler-Matznick, [jkoler@ccountry.com](mailto:jkoler@ccountry.com)

#### **24.2 [Action] Identify suitable reference material to assess dingo genetic introgression**

*Objectives:* To study the levels of introgression between dingoes and domestic dogs throughout the species range.

*Implementation details:* There is a need to assess the genetic make-up of dingo populations throughout their distribution in order to identify the prevalence of hybrid forms and inform dingo conservation planning. Careful attention needs to be given to the provenance of reference material. Recent studies have used modern dingoes as reference material (i.e., material sampled in recent decades from captive populations that are known – from skull measurements and coat colour – to be hybrid or have a high potential to be hybrid). Arguably a better source for reference material could be obtained from fossils and cave deposits in Australia that are dated 200–3,000 years BP, pre-dating European settlement (and hence domestic dogs). Locations and catalogue numbers of some material are indicated by Corbett (2003).

*Annual budget:* II–III

*Time frame:* 1–2 years

*Contact:* Canid Specialist Group (South Asia and Australasia Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)

#### **24.3 [Project] Assess the conservation implications of dingo genetic introgression**

*Objectives:* To study the behavioural ecology of dingo-dog hybrids in Australia and compare their ecological role with that of pure dingoes.

*Implementation details:* Field studies are needed in south-eastern Australia to assess whether the ecological role of dingo-dog hybrids is similar to dingoes. There are differences in breeding behaviour between dingoes and hybrids – such as biannual oestrous cycling in hybrid bitches and thus the potential for hybrids to raise two litters per year or to whelp pups in the summer. This may have implications on conservation of rare or threatened species, as well as for sheep and cattle farmers where there is increased stock killing by canids. Also, if dingo populations are replaced by hybrids (as is the case in eastern Australia), then arguably the conservation of dingo-like hybrids can only be justified if their ecological role is similar to dingoes (see Daniels and Corbett 2003).

*Annual budget:* IV–V

*Time frame:* 3 years

*Contact:* Canid Specialist Group (South Asia and Australasia Working Group), [canids@zoo.ac.uk](mailto:canids@zoo.ac.uk)