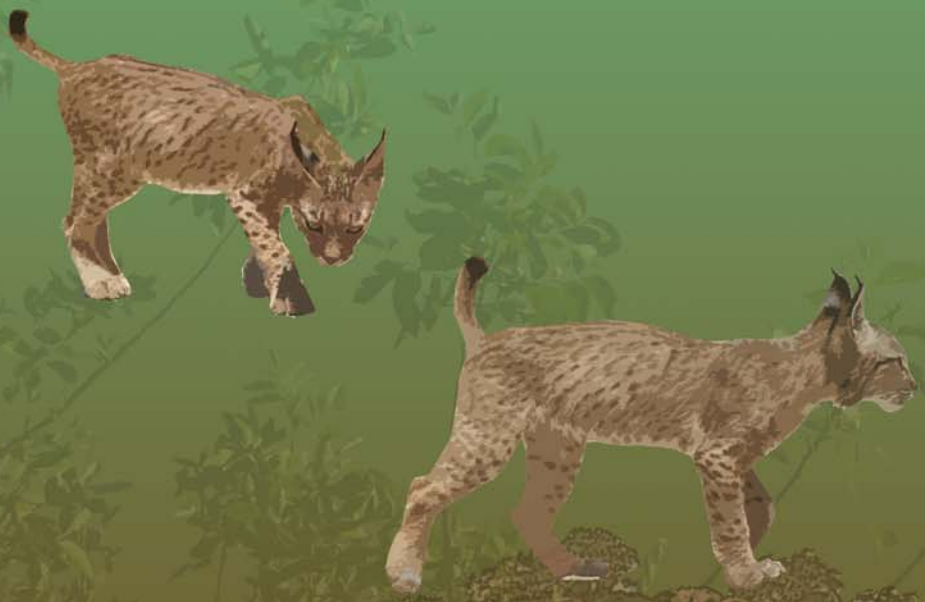
Proceedings of the

IV Iberian lynx conservation seminar

November 10-11, 2010



LINCE

Life

UNIVERSIDAD D CÓRDOBA

JUNTA DE ANDALUCIA

Proceedings of the

IV Iberian Lynx Conservation Seminar

UNIVERSIDAD D CÓRDOBA

November 10th-11th 2010, Cordova (Spain)

How to cite these proceedings: Iberian lynx LIFE conservation project. 2010. **Proceedings of the IV Iberian Lynx Conservation Seminar.** Universidad de Córdoba, Córdoba, Spain.

Block A: "Reintroduction experiences"

Block B: "Iberian lynx reintroduction programme"

Block C: "Working groups: Conclusions

* Communication not available

Block A: “Reintroduction experiences”

Genetic Restoration of the Florida Panther

Dave Onorato

Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission dave.onorato@myfwc.com

566 Commercial Boulevard, Naples, FL 34104, USA.

By the early 1990s, the endangered Florida panther (*Puma concolor coryi*) had reached a critical juncture. The combined impacts of habitat loss and isolation over the previous century had led to an inbred population that was being negatively impacted by a loss of genetic variation and associated health issues. In 1994, the Florida Fish and Wildlife Conservation Commission (FWC) and other cooperating agencies (National Park Service, U.S. Fish and Wildlife Service) along with academics in the fields of puma management and conservation genetics met to develop "A Plan for Genetic Restoration" (Plan). The objectives of the Plan included (1) reduce the occurrence of inbreeding in the Florida panther, (2) restore genetic variability and vitality of offspring and (3) restore the level of genetic diversity to levels comparable with that of western puma populations.

The conservation geneticists agreed that the level of introgression needed to reverse the effects of inbreeding and the loss of genetic variation in the remaining 30-50 Florida panthers was 20%, which equated to introducing 6-10 individuals from another puma population. Plan developers agreed genetic restoration should involve the release of 8 female Texas pumas (*Puma concolor stanleyana*) into the wilds of South Florida in 1995, a tactic that would essentially mimic historic genetic exchange between the two subspecies and give remaining Florida panthers the best chance of averting extinction. The intent of this management initiative was not to replace the panther's gene pool but to create a healthier, more resilient population that would be more similar to the historic population and more apt to successfully recover from its endangered status.

Following the release of the 8 female Texas pumas in 1995, the Plan dictated that the level of genetic admixture in the population was to be assessed by 3 methods: (1) a pedigree analysis, (2) analysis of molecular genetic markers (microsatellites) to identify alleles characteristic of Florida panthers and Texas pumas and delineate heterozygosity levels (genetic variation), and (3) analysis of morphological characteristics (e.g., tail kinks, cowlicks, pelage, cryptorchidism, spermatozoal traits, atrial septal defects).

A compilation of results that used these methods to assess the success of the genetic restoration project was recently published in the journal Science (329:1641-1645). Genetic analyses were aided substantially by microsatellite alleles unique to the introduced Texas pumas. The pedigree analysis verified successful pairings between admixed (i.e., panther-puma crosses and back crosses) and canonical (pre-restoration) panthers. It also revealed how cryptorchidism and atrial septal defects were associated with specific familial lineages that originated during the pre-introgression period as a result of inbreeding and small population size. The pedigree also demonstrated that instances of inbreeding continued to occur to some extent in the post-restoration period, although not at levels observed prior to 1995.

Microsatellites used as markers to delineate the level of heterozygosity in the population showed that admixed panthers had higher levels of genetic variation than canonical

panthers. The increased level of genetic variation resulting from genetic restoration had an obvious impact on the prevalence of several morphological defects associated with inbreeding depression (Table 1). Admixed Florida panthers exhibited fewer un-descended testicles and a higher percentage of normal sperm. Additionally, admixed panthers displayed fewer cases of atrial septal defects, kinked tails, and cowlicks.

			Cryptorchidism		
Heritage Group	N	Average Heterozygosity	Avg. # Testicles	Prevalence in Males	Atrial Septal Defects
Canonical	116	0.167 ± 0.01 (109)^{A}	1.3 ± 0.07^{A}	0.66 ± 0.06^{A}	0.17 ± 0.05^{A}
Everglades	17	0.282±0.02 (17)^{B}	2.0 ± 0^{B}	0^{B}	0^{A}
Texas	5	0.318±0.02 (5)^{B}	2.0 ± 0$^{\S B}$	0$^{\S B}$	0^{A}
Admixed 1995 – 2007	143	0.244 ± 0.01^{B}	1.9 ± 0.03^{B}	0.10 ± 0.04^{B}	0.08 ± 0.03^{A}

Table 1. Compilation of data related to levels of heterozygosity and correlates of inbreeding in the Florida panther for different heritages groups. Canonical panthers represent individuals that comprised the majority of the highly inbred population in the early 1990s. Admixed panthers have resulted from breeding events between canonical panthers, the female pumas from Texas, and their subsequent offspring since 1995. Column values with different superscript letters are significantly different ($P < 0.05$). See Johnson et al. (*Science* 329:1641-1645) for additional details.

A population that benefits from increased genetic variation should theoretically increase in size. The genetic vigor of the admixed panthers has undoubtedly helped the panther population to expand to the > 100 panthers thought to reside in South Florida today, a more than three-fold increase from 1995 (Figure 1). While genetic restoration of the Florida panther can be deemed a success with regards to some of our initial objectives (i.e., improved levels of genetic variation, reduction in the level of inbreeding), it remains imperative that FWC and our partners continue to be vigilant in monitoring varied demographic and fitness parameters of this population. Florida panthers remain isolated and ultimately will be impacted again by genetic drift and inbreeding over time, as noted in the Plan. This may eventually result in the need to release additional pumas in Florida to prevent genetic variation from declining to levels that are not compatible with the long term survival of the panther population.

FWC and our collaborators at the University of Florida are in the midst of finalizing a variety of analyses that will provide additional insight into the effects of genetic restoration on several demographic variables including (1) reproductive rates, (2) litter sizes and litter sex ratios, and (3) kitten, subadult, and adult annual survival rates.

These findings, along with a population viability analysis which is under development, will assist FWC in directing research and management initiatives to promote the continued recovery of the Florida panther. As we move forward, the greatest hurdle to panther recovery remains the preservation of sufficient habitat to allow the population to continue expanding to a level that is more viable in the long term. An understanding of how genetic restoration served as a tool to improve fitness and subsequently increcase the population size will not only help future efforts to expand the panther population but will also prove useful to other conservation projects worldwide that are increasingly dealing with small, inbred, isolated populations.

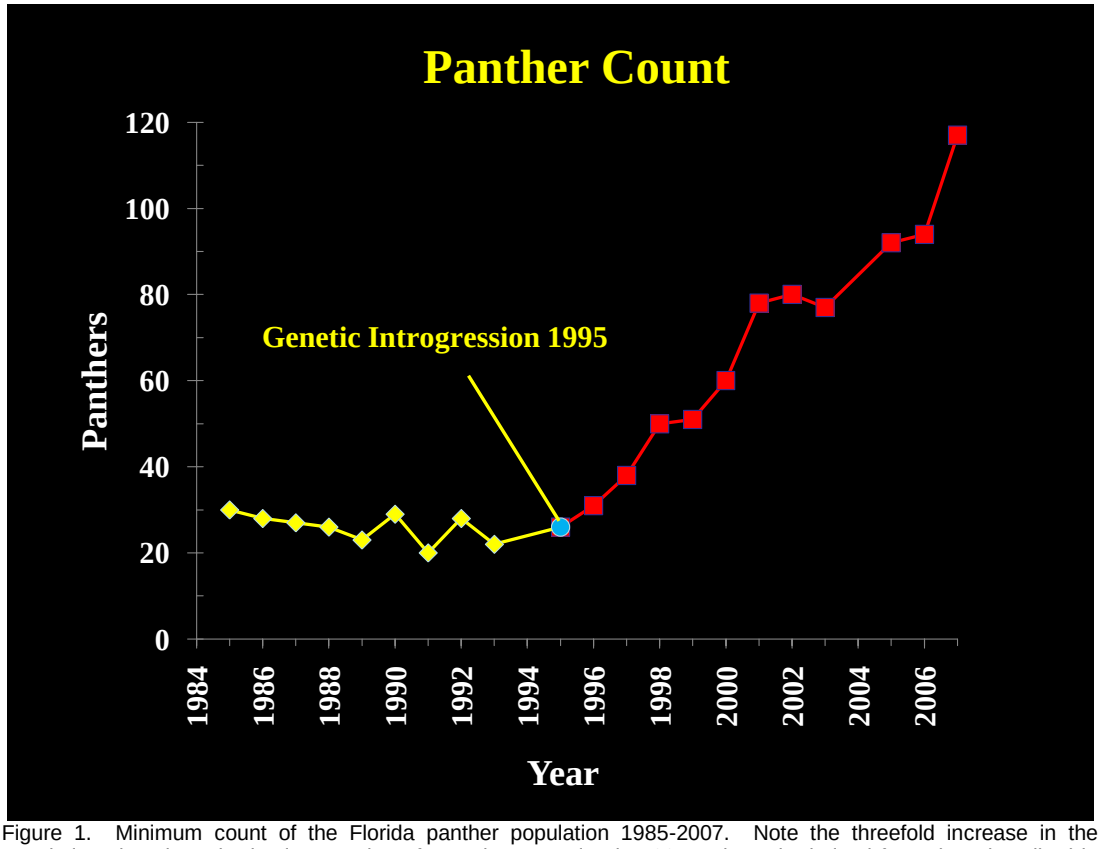


Figure 1. Minimum count of the Florida panther population 1985-2007. Note the threefold increase in the population size since the implementation of genetic restoration in 1995. Figure is derived from data described in detail in McBride et al. (Southeastern Naturalist 7:381-400)

Evaluating re-introduction success in a social carnivore, the African wild dog (*Lycaon pictus*)

Markus Gusset

Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, Kingdom markus.gusset@waza.org

Tubney, Abingdon OX13 5QL, United Kingdom.

To provide a framework for assessing re-introduction success in carnivores, I evaluated one of the most extensive endangered species re-introduction efforts to date, namely the establishment of an actively managed meta-population of African wild dogs (*Lycaon pictus*) in South Africa. This intensive management approach involves the re-introduction of wild dogs into suitable conservation areas and periodic translocations among them. Analyses of individual survival, breeding success and population viability suggested that the crucial factor influencing wild dog re-introduction success is dispersal behaviour (natural or artificial) and the resulting formation (natural or artificial) of new packs, given the dependency of wild dogs to living in cohesive social groups for successful reproduction. This case study provides several lessons for re-introduction biologists. (1) It illustrates the virtue of defining criteria with which to gauge re-introduction success. (2) It outlines two potential modelling approaches for assessing short- and long-term re-introduction success. (3) It highlights how re-introduction success may be related to unanticipated factors. (4) It proposes future avenues for investigation specifically targeted at improving re-introduction success. (5) Perhaps most importantly, this study demonstrates the importance of monitoring and evaluation in re-introduction programmes.

Grey wolf (*Canis lupus*) reintroduction in Yellowstone National Park

Edward E. Bangs

U.S. Fish and Wildlife Service Ed_Bangs@fws.gov

585 Shepard Way, Helena, Montana, 59601, USA.

Gray wolf (*Canis lupus*) populations were deliberately eliminated from the northern Rocky Mountains (NRM) of the northwestern United States by 1930. Naturally dispersing wolves from Canada first denned in Montana in 1986. In 1995 and 1996 sixty-six wolves from 2 areas in western Canada were reintroduced to central Idaho (hard release) and Yellowstone National Park, Wyoming (soft release) to accelerate recovery. By December 2009, over 1,706 wolves in 242 packs were being managed in the NRM by state fish and game agencies, Native American Tribes, and the U.S. Fish and Wildlife Service (Service). Wolves occupy over 110,000 square miles in the NRM and have saturated suitable habitat. The NRM meta-population is highly genetically diverse and well connected to >12,000 wolves in western Canada. Wolf restoration proceeded rapidly with more benefits (public viewing and restoration of ecological processes), and fewer problems (livestock and pet depredation and impacts to wild ungulate populations) than predicted. However, from 1987-2009, a minimum of 1,301 cattle, 2,854 sheep, 142 dogs, 31 goats, 25 llamas, and 10 horses were confirmed killed by wolves. Actual damage could be up to seven times higher than is confirmed. Nearly $2,000,000 has been paid by private and state wolf damage compensation funds since 1987. In addition to a wide variety of non-lethal tools, the Service and its cooperators relocated wolves 117 times and killed >1,259 to reduce conflicts. The States of Montana and Idaho held fair-chase wolf hunts in 2009. In addition to a record 270 problem wolves being killed by management agencies, hunters harvested 72 wolves in Montana and 134 in Idaho. The wolf population still grew by 4%. The controversy, emotion, and litigation typically associated with wolves and wolf management will continue as the American public debates its relationship with wolves and wildness. Science is a poor tool to resolve the complex legal, policy, and human values that are being debated symbolically through wolves.

Block B: "Iberian lynx reintroduction programme"

Iberian lynx (*Lynx pardinus*) reintroduction in Andalusia

Miguel Ángel Simón

Iberian lynx LIFE conservation project. Consejería de Medio Ambiente, Junta de Andalucía. Miguelangel.simon@juntadeandalucia.es

c/ Fuente del Serbo, 3. 23071. Jaén

Two consecutive LIFE projects for the conservation of the Iberian lynx (*Lynx pardinus*) (herafter ILLP) have been conducted in Andalusia between 2002 and 2011, and a third one is expected to be carried out between 2011 and 2016. The overall goals of these projects are to increase carrying capacity and decrease threats by means of finding common grounds among all affected parties. To achieve these goals, conservation actions performed in ILLP include (1) prey base restoration in lynx areas, (2) increase of safe permeability of roads, (3) outreach and surveillance programs to avoid poaching, (4) sanitary control to avoid disease otbreaks, (5) genetic management to avoid negative effects of inbreeding and (6) a reintroduction programme. After nine years of management, the Iberian lynx population increased both numerically (from 93 to 252 individuals) and in occupied surface area (from 29,300 to 70,300 ha). Moreover, the genetic diversity of the smaller Doñana-Aljarafe population is increasing and the reintroduction programme has begun to create a new population nucleus in an area of recent extirpation of the species (Guadalmellato Valley, Cordova, Spain; Fig. 1). In general, these positive results are likely attributed to habitat and rabbit restoration and an increase in survival throughout the population.

The reintroduction programme began in 2004, with the selection process of suitable areas for reintroduction. Given that this is the first reintroduction ever performed with the Iberian lynx, all the steps has relied on caution and have been performed on the basis of the scientific knowledge of the Iberian lynx. As a result of all previous work, an "Iberian Lynx Reintroduction Plan in Andalusia" was approved in an international seminar in November 2008. Once completed all previous steps, six Iberian lynxes (3M:3F) were soft-released in Guadalmellato Valley by December 2009. After one year, mortality has been lower than expected (observed 14% vs expected 50%) and one female raised two offspring (see Fig. 2). Of the six individuals released, only one male has died, due to a non-infectious disease. The rest of the individuals seem to have settled in the area (See Fig. 1), and reproduction events are expected for the next season. As part of the ILLP reintroduction programme, a new reintroduction experience is going to be started in Guarrizas Valley (Jaén, Spain), where five individuals (2M:3F) will be soft-released next December, 2010. As a novel event, two of these individuals will be the first captive-bred Iberian lynxes ever reintroduced. These captive individuals have been under a specific training program since they were born.

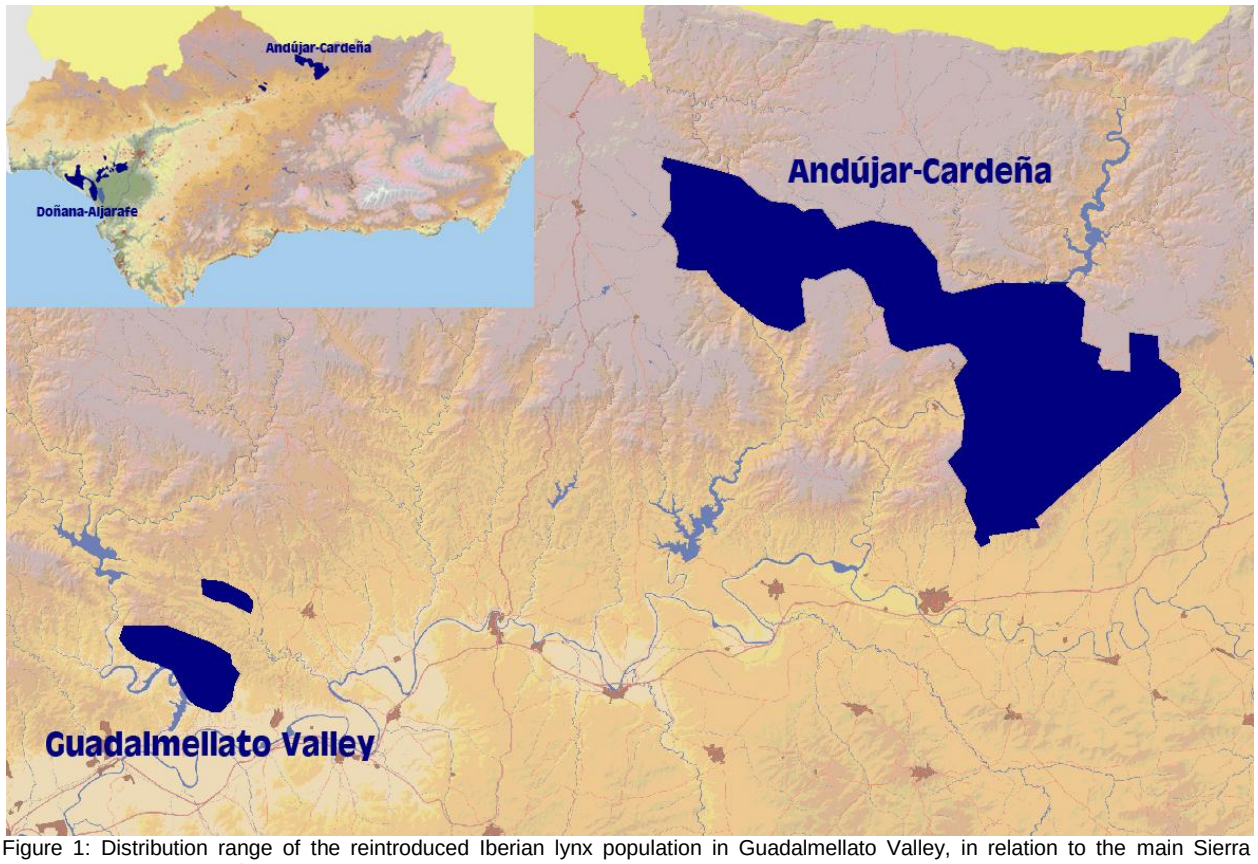


Figure 1: Distribution range of the reintroduced Iberian lynx population in Guadalmellato Valley, in relation to the main Sierra Morena population (Andújar-Cardeña). The Guadalmellato population is currently composed of seven individuals (three breeding-aged females).

Figure 2: Photo-capture of the first wild-born litter in Guadalmellato reintroduction area, in October 2010.

Block c: “Working groups: Conclusions”

Group 1: Medium and long term strategy and objectives

It is deemed necessary to follow the basic approaches listed below as prior considerations to any reintroduction project:

a) The consideration and application of the "IUCN Re-introduction Guide" (http://www.iucnsscrsg.org/download/Spanish.pdf) is essential in re-introduction projects which are to be undertaken on the Iberian Peninsula.

b) It is deemed essential to draft an Iberian re-introduction plan which develops the content of the Iberian Lynx Conservation Strategy, Spain (2007) and the Action Plan for the Conservation of the Iberian lynx, Portugal (2008).

c) The ultimate objective of any any re-introduction is to create long-term viable and selfsustainable populations, in the form of a metapopulation.

d) As a general strategy, the initiation of various re-introduction projects simultaneously is deemed suitable, taking into account the provisions of the Breeding Programme and the situation of the species in its current area of distribution, without having to achieve all the objectives for the creation of a new population or metapopulation, as a prerequisite, in the re-introduction areas indicated.

Conclusions:

1. For the purposes of the distribution areas and with a view to the habitat analysis for the selection of potential areas and re-introduction, the Mediterranean biogeographical region of the Iberian Peninsula should be considered as an historical area of distribution.

2. As a first step, the selection of potential habitats should be carried out, taking consideration of parameters such as habitat, threats, etc. by means of geographical information system (GIS) analysis, which should be complemented by an analysis on the land of the basic biological requirements for the species. Areas of a minimum of 10,000 will be considered for these purposes.

3. Those areas selected according to point 2 will be prioritised for the purposes of eventual selection taking into consideration at least the following characteristics:

3.7. Connectivity compared to areas with viable populations: for which the possibilities for the creation of a metapopulation will be considered, for which purpose these territories must have a minimum capacity for 6 territorial females with the development of a PVA)

3.8. Areas without connectivity compared to nuclei of viable populations: These areas must have a minimum capacity for the creation of a new population of 30 territorial females (with the development of a PVA) and an area in excess of 20,000 has.

3.9. Genetic aspects: re-introductions must be made with the aim of achieving at least 85% maintenance of the naturally present genetic variation. Therefore it is

essential that lynx from captive breeding supplemented, as the case may be, with lynx from current populations.

3.10. Rabbit densities: The minimum density must be 4 rabbits/ha in Spring or 1.5 in Autumn as established by the Strategy (Spain) and the Action Plan (Portugal). In order to standardise criteria on census methods, an Iberian Rabbit Census Protocol should be established in accordance with the conclusions of the Rabbit Management Seminar.

3.11. Threats: The known threats to the viability of a lynx population should be evaluated in order to control or minimise them. In addition, those threats related to common illnesses and those from other carnivores, the possibility of being knocked down, the occurrence of poaching and the use of illegal methods.

3.12. Permeability: the permeability of the re-introduction areas with their surrounding areas and the nearby settlements must be guaranteed against the presence of the species in accordance with points 3.1 and 3.2.

4. Socio-economic support: there must be guarantees in place for social, political and budgetary support prior to initiation of the re-introduction projects.

5. Publication of results: it is essential that there is a permanent commitment to publishing and that the results of the re-introduction experiences are disclosed at a general and scientific level.

6. Coordination: Those coordination mechanisms which exist at an Iberian level must be activated, strengthening, simplifying and clarifying the current functions, especially the Iberian Lynx Working Group and the Scientific-Technical Committee, which should form one single coordinating group.

Group 2: Release systems and protocols.

General conclusions for re-introduction projects:

1. The preliminary results of the soft release trials carried out in Andalusia were positive and although they are preliminary they may be applicable to experiences with the species; in this sense, the use of a first stage of the re-introduction programmes is recommended, with the fundamental aim of establishing resident lynx.

2. Due to logistical limitations and given the availability of lynx, in accordance with the provisions of the captive breeding programme, a second stage is recommended in the re-introduction programmes with hard release; these must be designed on the basis of preliminary tests and experiences.

Specific conclusions for the programme initiated in Andalusia:

A. Recommendations for the Guadalmellato area:

1. Due to the current presence of territorial lynx from the releases carried out in 2009, the continuation of soft releases is not recommended.

2. It is recommended that a hard release trial be started with Andújar-Cardeña wild lynx, belonging to the 2010 cohort due to limited availability of lynx of other ages.

3. It is recommended that the hard releases mentioned in the previous point are carried out directly, following quarantine, and after the rutting season (February 2011) in order to avoid unfavourable interactions with the resident lynx.

4. The release of 10-15 lynx is recommended in twos, at approximately one month intervals, with a sex-ratio in favour of females (1:2).

5. All lynx must be monitored daily using GPS-GSM radio tracking, with direct VHF support by the tracking teams.

B. Recommendations for the Guarrizas area:

1. It is recommended that the same steps are followed as in Guadalmellato, so as to reduce the number of experiments whilst reducing cases of failure in order to avoid negative effects on a very sensitive public opinion.

2. For 2010, it is recommended that a pair of adult lynx be released into one of the two enclosures and, specifically, that a pre-adaptation trial and/or training of captive breeding lynx; particularly the two pre-adapted females from Olivilla, with the possibility of adding an available wild male to the enclosure in 2010 on the basis of the preliminary results. It is recommended that this action be taken as soon as possible.

3. In the case of the positive pre-adaptation of the cubs described in point 2, it is recommended that they be released before the adults in order to compensate for foreseeable adaptive disadvantage.

Group 3: Pre-adaptation protocols for lynx from captive breeding

1. An "inter-situ" technical group will be created with regular meetings in order to promote, as an immediate objective (1 March 2011), the tailoring of the "Protocol for the Management of the release of captive-bred Iberian Lynx into the natural environment". The group will comprise, among others, experts from the captive breeding centre and experts on the conservation of the species in the natural environment.

2. The group will work on fostering and gathering decision making and results, as well as proposing solutions for the objectives sought within the framework of the preparation of cubs for reintroduction.

3. The following aims shall be pursued:

3.7. Genetic criteria should take precedence in the selection of the parents seeking suitability for the receiving population.

3.8. Contact between the lynx and humans must be kept to a minimum.

3.9. Avoid the association of food with the carer.

3.10. Foster exploratory behaviour using live prey (wild rabbit and other

prey).

3.11. Foster exploratory behaviour by increasing available space and structural complexity of the installations, attempting to mimic the natural habitat of the lynx. For this purpose the design of specific infrastructures for the pre-adaptation work is needed.

3.12. Foster social conduct and behaviour typical of the species (territorialism, intraspecies interaction, competition for food,...).

4. The process will be carried out in line with a methodology which allows for the permanent evaluation of the results in the short, medium and long term.

5. All breeding centres will have specific installations which allow:

5.3. Candidate litters to develop in a sufficiently spacious enclosure that, in so far as is possible, it recreates the optimum habitat of the lynx in the wild.

5.4. Management to be defined and different to that employed for the population that will remain in captivity.

Group 4: Communication plan and public awareness

"The more people in favour of re-introduction, the better the results".

(Tanya Shenk)

1. The performance of a socio-economic study taking the following objectives into consideration:

e) Find out the opinion on reintroduction (positive-negative). And the corresponding reasons.

f) Find out the opinion of the groups directly involved with the re-introduction.

g) Identify the target public.

h) Identify conflicts.

Methodology: participative with as much contact as possible with the local population

2. Preparation of specific communication proceedings programmes for each reintroduction area. (With regular evaluations and reviews).

3. Establish discussion tables with local organisations and attend meetings.

4. Take advantage of forums established by local organisations (meetings, fairs, agenda 21s…).

5. Establish networked information channels between the different organisations involved.

6. Prioritise contact with media. Generating greater expectation and achieving more impact.

7. Develop active proceedings which favour the participation of the general and target public.

8. Define a protocol for the flow of information between the different organisations involved in the project.

9. Involvement of universities and the Educational Administration.

10. Bear the conclusions of the 3rd Seminar on the conservation of the lynx and the Internal communication workshop and the contributions made in the 4th Seminar in mind. Also, explain how animal rights are ensured. Take advantage of the scientific support for communication (i.e., the Florida panther), clarity, sincerity and impartiality of the message of re-introduction, humbly explaining that reintroductions may turn out bad forming part of the learning process, make efforts to recognise unrelated successes and own failures, take care using the word Education with certain sectors as it creates a hierarchy.