Setting priorities for threatened species recovery: a case study in the Canary Islands (Spain)

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Abstract
Species recovery is to be undertaken when a given taxon is highly threatened with extinction and one actively tries to revert the situation, by restoring populations to a level where they are self-sustaining in the wild. If the list of candidate-species for recovery is too long, the responsible Administration should adopt criteria to prioritise action and make a wise use of resources available. A Recovery Priority Index based on biological, ecological, socio-economical and management criteria is proposed. As an example of prioritisation practice, these selection criteria are applied to 18 land vertebrates catalogued or considered to be threatened in the Canary Islands. The present situation of these species is briefly commented.

Species recovery

We may know what are threatened species, but there is not such a clear idea about what species recovery means. Habitat protection and ecologically sound management of ecosystems are generally accepted as the most cost-effective approachs to preserve biodiversity in a given territory (Saunier & Meganck 1995). However, in many cases, species highly threatened with extinction require urgent measures to change their fate. This species-oriented approach to conservation involving specific protection measures and, eventually, specially oriented management activities in the field or *ex situ* are termed species recovery. Thus, species recovery must be understood as a very specific case of species conservation, and applies only when a species (subspecies or population) survival is at risk and one actively intervenes to revert the situation.

Species recovery involves assessing, planning and implementing actions in order to restore populations to a level where they are self-sustaining in the wild (Culbert & Blair 1989). These actions may extend over several years (including monitoring), and require quite an amount of human and economic resources. So, species recovery is expensive, and specialised professionals and time are usually scarce. It is a very "exclusive" activity within conservation practice. Moreover, the number of threatened species in a given country easily overruns the available resources. Therefore there is a need to adapt to existing capacity and select which species will benefit from the recovery effort. Some sort of formal or informal criteria for selection must be established.

Legal framework

Species recovery efforts improve considerably when action is assumed by specialised governmental agencies and there is national legislation providing the legal framework for protection and the necessary instruments – Species Recovery Plans, for instance– to implement recovery action. In the majority of countries, a policy and legal framework for species recovery is totally missing. National legislation for species

conservation is centred on the protection of individual specimens (capturing and exporting prohibitions, hunting and fishing regulations, etc.), but only a very few have consolidated domestic laws addressing the whole species as such (v. Machado 1997). These are Australia, Finland, Spain and the United States, who has a long experience starting in 1973 with their Endangered Species Act (the same year CITES was launched).

On the other hand, there are several international conventions (Biological Diversity, Bonn, Bern, etc.) which indicate more or less clearly the duty of contracting parties to undertake measures to avoid the extinction of particular species. Some of these dispositions are considered "soft international law", being expressed under "recommendations" or by the addition of a "where-feasible-and-appropriate" clause. Other conventions, like the European Union directives, are more compulsory, but they do not address species recovery as such; the Habitat Directive has only a habitat approach. In any case, this top level legislation rarely incorporates specific items like selection criteria for species recovery.

Nonetheless, the lack of a specific legal support has not prevented many countries from developing recovery programs either by official or by private initiatives (c.f., de Klemm & Shine 1993). Results with some species in the United Kingdom, The Netherlands or Finland are far reaching, but it is not clear how the target species were chosen.

In the cases of the United States and Spain an automatic system works. According to their domestic laws, once a species is "listed" or "catalogued", specific measures for protection are to be taken or developed. For instance, Spain's "endangered (E)" species will have a Recovery Plan; species "sensible to habitat alterations (SH)" receive a Habitat Conservation Plan; a Conservation Plan for "vulnerable" (V) and Management Plans for "Species of special interest" (Ie). The first official catalogue in 1990 was fed at once with 19 species under category «E» (which seems workable), but some 367 species in category «Ie», represents almost half of the country's vertebrate fauna.

Selection criteria

Massive listing forces the adoption of selection criteria in order to plan future recovery action on realistic grounds. That is the case in the United States, where there is a long tradition and experience in applying such type of criteria. However, the present adopted policy is to avoid being overrun by unrealistic situations. Their present "recovery waiting list" is already enormous. The responsible agency tries to control the whole process at the "listing" stage; that is to say, at the "entry door" (Reffalt 1988).

Several proposals for selection criteria can be found in specialised literature (see Table I). They are more or less coincident on the kind of criteria to be adopted, although they vary in the way they are weighted. Types of criteria normally considered are:

B i o l o g i c a l c r i t e r i a

- Level of threat (1-3) as expressed by some sort of ranking, like the conservation status categories proposed by IUCN (1996) or those established under domestic legislation. There is much literature and criticism on this issue, but it is crucial that the assessment be conducted strictly in biological terms, preventing any interference from social, economic or political factors.
- Genetic distinctness (1-0.5), considering whether a species or subspecies/ population is at stake

E c o l o g i c a l c r i t e r i a

- Ecological role of species (1-2). The so called key-stone-species should deserve preference because of their major impact on the living community they belong to.

- Endemicity level (1-3). Endemic taxa should also receive preference based on the Endemism responsibility principle, which is partially political in scope. Endemic genuses (taxonomic unique) deserves more attention than endemic species.

S o c i o – e c o n o m i c a l c r i t e r i a

- Economic importance (1). Present or clear potential economic importance of the species should be considered (medicine, industrial, game, tourism, exploitation, indicators, etc.)
- Charisma of species (0.5). Charismatic species are important to people and politicians (who approve budgets). Recovery efforts can receive more support by acting on charismatic species. Other species may benefit from that support.
- Level of conflict (- 1). Experience has shown that highly conflictive species have a serious handicap for recovery practice, or the budget must be increased considerably (education campaigns, etc.). This criteria acts negatively (subtracting points).

M a n a g e m e n t c r i t e r i a

- Inclusive benefits (1). Conservation efforts on the so-called umbrella species extend to other species that may be also threatened. In such cases, the possibility of adopting a multi-species recovery approach should to be considered.
- Recovery potential (1) or chance of good success. Species recovery has been compared to a campaign hospital during full battle. Time, resources, etc are critical and doctors must choose whom to intervene and whom to abandon because of little chances of success. It is a hard decision, indeed, but much needed for efficiency.

Table I. Some criteria for prioritisation

Holt 1987	Threat situation
Soulé 1987	Population viability analysis (PVA)
Machado 1989	Mixed set of criteria (threat, scientific, ecological role, use & legal)
Master 1991	Mixes threat with prioritisation
Whitten 1990	Threat & recovery potential + estimated budget
Mace & Lande 1991	Hierarchical approach to threat situation
De Juana 1992	*Idem* (international / national / regional)
Faith 1992	Phylogenetic index (taxonomic priority)
McIntyre 1992	Critics to threatened categories
Bañares 1992	Weightened mix of criteria (including types of use)
Mooloy & Davis 1992	Includes cultural values (e.g. Maori)
Given & Norton 1993	Multivariate approach for threat assessment
Machado 1997	Recovery priority index (threat, taxonomy, ecology, social, feasibility)
Sides 1998	Threat and ecological relevance
Charles *et al*. 1998	Uncertainty / reliability in threat data

Based on a combination of all these criteria, one of us (Machado, 1997) has proposed a Recovery priority index (slightly amended here) which gives points to each factor, up to a maximum of 10 points (see numbers in brackets above). Other equally valid combinations can be formulated (see Table II). The precision obtained by using bigger or smaller ranking scales depends on available information and on the need to

discriminate. In some cases, a rough analysis using a few ranking-numbers is enough, while in others a better tuning is needed in order to sharpen the vision of the situation at stake. The basic idea is to produce a clear ranking system using some sort of number. Once ranked, recovery efforts start top-down, adjusted to available resources. Each country or each agency may develop its owns index –different weighting– shaped to their own administrative and management culture, but the quid of any system is that it has to be applied universally and in a coherent way to a given set of species.

It is also very important that the exercise of setting priorities is not conducted by a single person. The benefits of team-work are obvious and there are proven techniques to find a solution (sometimes consensus), even in the most conflicting cases.

Table II. Criteria for setting priorities for species recovery according to Bañares 1992.

T h r e a t	
Danger of extinction	50
Vulnerable	25
Population very localised	15
S c i e n t i f i c	
Endemic monotypic genus	35
Endemic genus	25
Endemic species	20
Endemic subspecies	15
E c o l o g y	
Key species	10-30
Stenoic species	5
Non migrant species	5
Only vegetative propagation	15
U s e	
Medical use	10
As food	10
To fix slopes	5
Industrial use	5
Gardening	2
Symbolic value	5-10
L e g i s l a t i v e	
Protected at international level	4
Protected at national level	3
Protected at regional level	2

The technical aspects of recovery planning, the content of Species Recovery Plans (see example in Table III), and the implementation of such plans is widely considered in the specialised literature: Norton 1986, Culbert & Blair 1989, Machado 1989, US FWS 1990, Male 1994, Clark et al. 1994, Kareiva 1994, Ballou et al. 1995, Clark & Cragun 1996, Bowles & Whelan 1996, Machado 1997, Stephens & Maxwell 1997, etc.

Table III

Structure of a Species Recovery Plan

X - SPECIES RECOVERY PLAN

INTRODUCTION

- Context of Plan
- Territorial coverage and time frame

ANALYSIS OF THE SITUATION

LIFE HISTORY OF SPECIES

AIMS AND OBJECTIVES

GUIDELINES AND ACTIVITIES

- Species management
- Habitat management
- Research and monitoring
- Information and awareness

CO-ORDINATION /CO-OPERATION

IMPLEMENTATION & COST ESTIMATION

FOLLOW-UP AND REVIEW

MAPS AND ANNEXES

A case study in the Canary Islands

The Canary Islands are an autonomous region of Spain and can legally develop a Regional Catalogue of Threatened Species. However, this has not happened for the time being and the existing National Catalogue is applied to the whole archipelago. As previously explained (see Legal framework), the listing of species in this Catalogue implies the obligation of preparing different types of plans: Recovery plans, Conservation plans, etc. Of the land vertebrates listed in the categories of danger of extinction (E), vulnerable (V) and sensitive to habitat alteration (SHA), 16 are present in the Canary Islands (10 being endemic). For the purpose of the present exercise, we have added two recently discovered reptiles (Gallotia intermedia and Gallotia gomerana) that are in extreme risk of extinction, but not yet officially registered.

R e p t i l e s

The Giant Lizard of Hierro (Gallotia simonyi machadoi), presently occurs in a surface of less than four hectares, located in a cliff area in NW El Hierro. It has a low population density, ranging from 20 to 50 ind./ha. and the present day population is between 150-200 lizards (Pérez-Mellado et al. 1999). A recovery plan (Machado 1985) is actually being developed with the co-financing of the European Union (LIFE Programme). Actually two small captive-breed populations have been established in new localities as part of the re-introduction strategy adopted. Depredation by feral cats is one of its main threats (García-Márquez et al. 1999).

The Giant Lizard of Tenerife (Gallotia intermedia) was discovered in 1998 in a cliff area NW Tenerife (Hernández et al. in press). Its distribution area is less than 10

km2 but its density and population size is still unknown. According to these authors, the fragmented population and predation by feral cats are among its threats.

The Giant Lizard of Gomera (Gallotia gomerana) was only just discovered in June 1999 in a cliff area on La Gomera. Its distribution area is less than one hectare and it is considered as the most threatened vertebrate in the Canaries, and possibly one of the most threatened reptiles in the world (Nogales et al. 1999, Valido et al. 2000).

The Fuerteventuran Skink (Chalcides simonyi) is endemic to the Canaries. Occurs on Fuerteventura and Lobos and has been discovered recently in North Lanzarote (Nogales et al., 1998). It has a low population density and its distribution area is very restricted (Barbadillo et al. 1999).

B i r d s

The most threatened birds are mostly Canarian or Macaronesian endemic species or subspecies. The Blue Chaffinch (Fringilla teydea) is one of the six Canarian endemic bird species. It is considered at low risk: conservation dependent (IUCN, 1996). Two island races are distinguished ssp. teydea on Tenerife and ssp. polatzeki on Gran Canaria. The latter is considered the most threatened bird in the Canaries. Its population is 180-260 individuals (Moreno 1991) inhabiting the Canary-pine woods covering a small range. Problems include habitat fragmentation, scarcity of suitable habitat, lack of drinking places and predation of eggs, chicks and adults by natural and introduced predators. Since 1991, the Canarian Government is implementing a conservation programme partially supported by the European Union LIFE Programme.

The Houbara Bustard (Chlamydotis undulata furtaventurae) is entirely confined to Fuerteventura, Lanzarote and the small islet of La Graciosa. The species is not globally threatened, but the subspecies undulata is considered endangered (Tucker & Heath 1994). According to the last census conducted in 1994, the population was estimated at 527 birds, which indicates larger population sizes than previously estimated (Martín et al. 1997). The main threatening factors are loss and degradation of habitat, human disturbance and poaching. A recovery plan was drafted in 1985.

The Barbary Falcon (Falco peregrinus pelegrinoides) ranges from the Canary Islands through inland North Africa to Iraq, and probably Iran. It is not globally threatened. In the Canaries, at the end of the eighties only nine pairs were known (Tucker & Heath 1994), but recent estimations give a minimum of 51-53 pairs spread throughout all the islands and point to a slight expanding process in some islands (Delgado et al. 1997).

The Marbled Teal (Marmaronetta angustirostris) is distributed from South Spain and North Africa to extreme West China. It is considered as vulnerable by IUCN (1996) and endangered by Tucker & Heath (1994). The Canarian population was considered extinct from 1915 until 1997, when it was found breeding on Fuerteventura (Anonimous 1997).

The White-faced Storm-petrel (Pelagodroma marina hypoleuca) is a Macaronesian endemic. It nests in large numbers on the Selvagens (16000-20000 pairs). Recently, a small population found on Montaña Clara – a small islet North of Lanzarote – was estimated at not more than 10 pairs (Martín et al. 1989). The species is not globally threatened but is considered as localised by Tucker & Heath (1994).

The Dark-tailed laurel Pigeon (Columba bollii) and the White-tailed laurel Pigeon (Columba junoniae) are endemic to the laurel forest of the western Canary Islands. Both are globally considered as vulnerable (IUCN 1996, Tucker & Heath 1994). The population estimated for C. bollii is 1700 individuals and 1200-1500 for C. junoniae (Tucker & Heath 1994). Habitat fragmentation, poaching and introduced predators (rats and cats) are their main threats. Since 1995, the Canarian Government

has implemented a conservation programme partially supported by the European Union LIFE funds. New information gathered has shown that the distribution areas of both species are wider than it was initially assumed.

The Cream-colured Courser (Cursorius cursor bannermani) occurs on Lanzarote and Fuerteventura. Some authors consider that the difference with C.c cursor is not significant. The species is not globally threatened, but the small European population (200-280 pairs) is declining, mostly confined to the Canary Islands, and is therefore considered vulnerable (Tucker & Heath, 1994). It is currently threatened by loss and degradation of habitat and by human disturbance.

The Little Shearwater (Puffinus assimilis baroli) is a Macaronesian endemic. Not globally threatened, but vulnerable according to Tucker & Heath (1994). These authors consider that the population in the Canaries (400 pairs) has declined in recent decades but the causes are not well known.

The Canarian Stonechat (Saxicola dacotiae) is endemic to Fuerteventura. According to the IUCN (1996) it is at low risk; near threatened. There are no current known threats, although it is considered according to Tucker & Heath (1994) because of its small population size (650-850 pairs) and its restriction to a single island.

The Madeira Storm-petrel (Oceanodroma castro) has a world-wide distribution. Not globally threatened, but vulnerable following Tucker & Heath (1994). In the Canary Islands it is present on Tenerife and Lanzarote, and its population size has been estimated at 300 pairs (Delgado et al. 1988). Threats are not well known.

M a m m a l s

The Canarian Shrew (*Crocidura canariensis*) and the Canarian long-eared Bat (*Plecotus teneriffae*) are endemic to the Canary Islands, while the Madeiran Pipistrelle (*Pipistrellus maderensis*) is shared with Madeira. All three species are considered vulnerable (IUCN, 1996) but population sizes, densities or trends, and threats are not well known. Since 1983, the Canarian Government is developing a programme for the conservation of bats in general, which is now partially supported by the European Union.

In Table IV all 18 species are evaluated –see points in columns– according to the different criteria that are considered in the Recovery Priority Index. The total of points accumulated is registered in the last column, giving the final rank of species:

Gomeran giant Lizard > Hierro giant Lizard = Dark-tailed laurel Pigeon = White-tailed laurel Pigeon > Tenerife giant Lizard > Blue Chaffinch > Houbara Bustard = Canarian long-eared Bat, …

This result may surprise scientists who normally tend to over-emphasise the value of a species according to their taxonomical relevance or threatened situation. It is also important to notice that the valuation (1-3 points) of the conservation status of targeted populations should be conducted, if possible, independently of the “official” status of the taxon involved (National Catalogue, red-lists, etc.). Inflating lists of “threatened” species has been a common practice in the past in order to call for attention or funds. And once a more focused study is conducted, the situation of many threatened species reveals that it was not so critical as initially argued or estimated. Unfortunately, it is difficult to access enough resources to conduct such studies unless the species is considered as highly threatened. Moreover, once in, technicians may be reluctant to withdrawn those species from the official catalogues, and this may deviate financial resources from other species that need really action. As always, common sense is the best practice and prioritisation as proposed here, pays off.

References

Anonymous, 1997 – La cerceta pardilla regresa a Canarias. *La Garcilla*, 99: 6.

Ballou, J. O., Gilpin, M. & Foose, T. J. (eds.), 1995 – Population management for survival and recovery : Analytical methods and strategies in small population conservation. Columbia University Press, New York.

Bañares A. 1992 – Recuperación de la flora amenazada de los Parques Nacionales canarios. Metodología para la planificación y ejecución de planes de recuperación. In: ICONA (ed.), *I Curso de Recuperación de Especies de la Flora Amenazada*. La Laguna

Barbadillo L.J., Lacomba J.I, Pérez-Mellado V., Sancho V. & López-Jurado, L.F., 1999 Anfibios y Reptiles de la Península Ibérica. Baleares y Canarias. *Editorial Planeta S.A.*, Barcelona.

Bowles, M.L. & Whelan, C. (eds.), 1996 – Restoration of endangered species. Conceptual issues, planning and implementation. *Cambridge University Press*, Cambridge

Burgman M.A., Keith D.A., Rohlf F.J. & Todd C.R. – Probabilistic classification rules for setting conservation priorities. *Biol. Conserv*., 89: 227-231.

Clark, T. W. & Cragun, J. R., 1996 – Organizational and managerial guidelines for endangered species. In: Bowles, M. L. & Whelan, C. J. (eds.), Restoration of endangered species. Conceptual issues, planning and implementation: 9-33. *Cambridge University Press*, New York.

Clark, T. W., Reading, R. P. & Clarke, A. L. (eds.), 1994 – Endangered species recovery. Finding lessons, improving the process. *Island Press*, Washington D.C.

Culbert, R. & Blair, R., 1989 – Recovery planning and endangered species. *Endangered Species Update*, 6 (10): 2-8.

De Juana E, 1992 - Algunas prioridades en la conservación de aves en España. *Ardeola*, 39 (2): 73-83.

De Klemm C. & Shine C., 1993 – Biological diversity conservation and the law. Legal mechanisms for conserving species and ecosystems. *IUCN, Environmental Policy and Law Paper,* 29: 1-292

Delgado G, Martín A., Nogales M., Quilis V., Hernández E., Trujillo, O. & Santana F., 1989 - Nuevos datos sobre el paíño de Madeira (*Oceanodroma castro*) en las Islas Canarias (137-145 pp.). *In* C. López-Jurado (ed.). *Aves Marinas*. GIAM, Formentera, 1988.

Delgado G., Concepción D., Siverio M., Hernández E., Quilis V. & Trujillo D., 1999 – Datos sobre la distribución y biología del Halcón de Berbería (*Falco peregrinus pelegrinoides*) en las islas Canarias (Aves: Falconidae). *Vieraea*, 27: 287-298.

Faith, D.P., 1992 – Conservation evaluation and phylogenetic diversity. *Biol. Conserv*., 61: 1-10.

Faith, D.P., 1994 – Genetic diversity and taxonomic priorities for conservation. *Biol. Conserv*., 68: 69-74.

García-Márquez M., Caetano A., Bello I., López-Jurado L.F. & Mateo J.A., 1999 - Ecología del gato cimarrón en el ecosistema termófilo de El Hierro (Islas Canarias) y su impacto sobre el lagarto gigante (*Gallotia simonyi*). *Monogr. Herpetol*., 4: 207-222.

Given D.R. & Norton D.A., 1993 – A multivariate approach to assesing threat and for priority setting in threatened species conservation. *Biol. Conserv*., 64: 57-66.

Hernández E., Nogales M.& Martín A. - Discovery of a new lizard in the Canary Islands, with a multivariate analysis of *Gallotia* (Reptilia: Lacertidae). *Herpetologica* (in press).

IUCN, 1996 – 1996 IUCN Red List of Thretened Animals. *IUCN*, Gland, Switzerland.

Kareiva, P. (ed.), 1994 – Special feature. Ecological Theory and endangered species. *Ecology* 75(3) : 583-626.

Mace, G.M. & Lande, R. 1991 – Assesing extinction threats: toward a revaluation of IUCN threatened species categories. *Conserv. Biol.,* 5: 148-157

Machado A., 1985 – Sinopsis del Plan de Recuperación del Lagarto Gigante del Hierro. *Bonn. zool. Beitr.,* 36 (3-4): 471-480.

Machado A., 1989 – Planes de recuperación de especies. *Ecología,* Madrid, 3: 23-41.

Machado A. 1997 – Guidelines for action plans for animal species: planning recovery. *Council of Europe, Nature and environment,* 92: 1-76.

Male, B., 1995 – Recovery action for threatened species - an Australian perspective. *Ibis,* 132 (Supplement 1)*:* 204-208.

Martín A., Lorenzo J.A., Hernández M.A., Nogales M., Medina F., Delgado J.D., Naranjo J.J., Quilis V. & Delgado G., 1997 – Distribution, status and Conservation of the Houbara Bustard *Chlamydotis undulata fuertaventurae* Rothschild & Hartert, 1894, in the Canary Islands, November-December 1994. *Ardeola*, 44(1): 61-69.

Martín A., Delgado G., Nogales M., Quilis V., Trujillo, O., Hernández E. & Santana F., 1989 – Premières données sur la nidification du Puffin des Anglais (*Puffinus puffinus*), du Pétrel-frégate (*Pelagodroma marina*) et de la Sterne de Dougall (*Sterna dougallii*) aus iles Canaries. *L'Oiseau et R.F.O*., 59 (1): 73-83

Master L.L., 1991 – Assesing threats and setting priorities for conservation. *Conserv. Biol.*, 5 (4): 559-563.

McIntyre 1992 – McIntyre, S., 1992 - Risks associated with the setting of conservation priorities from rare plant species lists. *Biol. Conserv*., 60: 31-37.

Molloy J. & Davis A.M., 1992 – Setting priorities for the conservation fo New Zealand's plants and animals. *Department of Conservation,* Wellington.

Moreno A., 1991 – Distribución, biología y características esenciales del hábitat del pinzón azul de Gran Canaria. Gobierno de Canarias. (Unpublished report).

Nogales M., De León L. & Gómez R., 1998 – On the presence of the endemic skink *Chalcides simonyi* Steind., 1891 in Lanzarote (Canary Islands). *Amphibia-Reptilia*, 19: 1-4.

Nogales M., Valido A. Rando J.C. & Martín A., 1999. El Lagarto Gigante de La Gomera. *Medio Ambiente Canarias*, 15:9-10.

Norton, B. (ed.), 1986 – The preservation of species. The value of biological diversity.– *Princeton University Press*, New Jersey.

Pérez-Mellado V., Romero-Bevia M., De la Torre A., Vicedo M. & García-Sirvent J., 1999 – Hábitat, distribución actual y tamaño de la población de *Gallotia simonyi* en la isla de El Hierro (Islas Canarias). *Monogr. Herpetol*., 4: 27-41.

Reffalt W. C., 1988 – United States listing for endangered species. Chronicles of extinction?. *Endangered Species Update,* 5 (10): 10-13.

Saunier R. E. & Meganck R. A. (eds.), 1995 – Conservation of biodiversity and the new regional planning. *Organisation of American States, Washington D.C*.

Sides, E., 1998 – Criteria for the selection of marine species for conservation programmes under the OSPAR Convention: a report on an OSPAR workshop of technical experts in February, 1997. *Council of Europe, Environmental encounters,* 39: 101-107

Soulé M. E. (ed.), 1987 – Viable populations for conservation. *Cambridge University Press*, Cambridge.

Stephens, Sally & Maxwell S. (eds). 1997 – Back from the brink : Refining the threatened species recovery process.– *Surrey Beatty*, Australia.

Todd C.R. & Burgman M.A., 1998 - Assesment of threat and conservation priorities under realistic levels of uncertainty and reliability. *Conserv. Biol.*, 12 (5): 966-974.

Tucker, G.M. & Heath M.F., 1994 – Birds in Europe: their conservation status. Cambridge, U.K.: *BirdLife International* (BirdLife Conservation Series no. 3).

U.S. Fish and Wildlife Service, 1990 – Policy and guidelines for planning and coordinating recovery of endangered and threatened species. *United States Department of the Interior, Fish and Wildlife Service*, Washington D.C.

Valido, V., Rando J.C., Nogales M. & Martín A., 2000 - 'Fosil' lizard found alive in the Canary Islands. *Oryx*, 34 (1): 71-76.

Whitten A. J. 1990. – Recovery: A proposed programme for Breitain's protected species. *Nature Conservancy Council, CSD Report* 1089.

TABLE IV Canary islands land vertebrates included in the Spanish National catalogue of threatened species (1999)	**STATUS & COMMON NAME** E = Danger of extinction, V = Vulnerable SHA = Sensitive to habitat alteration n.r. = not yet registered		ISLANDS El **H**ierro La **P**alma **G**omera **T**enerife Gran **C**anaria **F**uerteventura **L**anzarote	**Biological criteria**		**Ecological criteria**		**Socio-economical**		**Management criteria**		**Total points**
				Level of threat (1-3)	(1-0,5) Genetic distinctness	(1-2) Species ecological role	Endemicity level (1-3)	Economic interest (1)	Charisma of species (0,5)	Inclusive benefits (1)	Recovery potential (1)	
REPTILES												
Gallotia simonyi machadoi	E	Hierro giant Lizard	H	2	1		2		0,5		1	**6,5**
Gallotia intermedia	n.r.	Tenerife giant Lizard	T	2	1		2				1	**6**
Gallotia gomerana	n.r.	Gomeran giant Lizard	G	3	1		2				1	**7**
Chalcides simonyi	SHA	Fuerteventuran Skink	F,L	1	1		2					**4**
BIRDS												
Chlamydotis undulata fuertaventurae	E	Houbara Bustard	L, F, islets	2	0,5		1		0,5		1	**5**
Fringilla teydea polatzeki	E	Blue Chaffinch	C	3	0,5		1			1		**5,5**
Falco peregrinus pelegrinoides	E	Barbary Falcon	archipelago	0	0,5							**0,5**
Marmaronetta angustirostris	E	Marbled Teal	F	1	0,5							**1,5**
Pelagodroma marina hypoleuca	E	White-faced Storm-petrel	Mña. Clara	2	0,5						1	**3,5**
Columba bollii	SHA	Dark-tailed laurel Pigeon	H,P,G,T	1	1	1	2		0,5	1		**6,5**
Columba junoniae	SHA	White-tailed laurel Pigeon	H,P,G,T	1	1	1	2		0,5	1		**6,5**
Cursorius cursor bannermani	SHA	Cream-coloured Courser	F, L	1	0,5		1					**2,5**
Puffinus assimilis	V	Little Shearwater	G,T, islets	1	0,5							**1,5**
Saxicola dacotiae	V	Canarian Stonechat	F	0	1		2					**3**
Oceanodroma castro	V	Madeira Storm-petrel	T, L, islets	1	1							**2**
MAMMALS												
Crocidura canariensis	V	Canarian Shrew	F,L	0	1		2					**3**
Pipistrellus maderensis	V	Madeiran Pipistrelle	H,P,G,T	0	1		1					**2**
Plecotus teneriffae	V	Canarian long-eared Bat	H,P,T	1	1		2				1	**5**