Invasive Species Specialist Group of the IUCN Species Survival Commission

ALIENS

Number 18 2003

SPECIAL ISSUE ON INVASIVE ALIEN SPECIES IN EUROPE AND NEIGHBOURING REGIONS

Bio-invasions on the Balearic Islands

The Balearic Islands were populated by humans sometime between the second and fourth millennium BC. Palaeontology research shows that most of the current terrestrial vertebrates have been introduced and that almost all non-flying pre-human vertebrates are extinct, either through human predation or, in most cases, through impacts from introduced fauna. All terrestrial mammals (a small endemic bovid with continuously growing incisors, *Myotragus* – a giant dormouse, *Hypnomys* and a giant shrew, *Nesiotites)* disappeared a few centuries after the arrival of humans. Very few other vertebrates have survived. The endemic lizard from Mallorca and Minorca, *Podarcis lilfordi*, has been extirpated from the main islands and only survives on islets that have remained free of snakes and carnivores. In addition, the Mallorcan midwife toad, (*Alytes muletensis)* only survives in the few karst canyons.

The list of species that were introduced in prehistoric or historic times is very long and includes: snakes, green toads, green frogs, geckos, turtles, tortoises, hedgehogs, rodents, rabbits and hares, goats, genets, pine martens, weasels, etc. Many of these species have been on the Balearic Islands for centuries or even millennia, and form the present ecosystem. As a result, it would be impossible to reconstitute the original (pre-introductions) biodiversity. What is more, some introduced species have developed endemic subspecies that without doubt are of scientific (genetic) interest. Other species, for instance tortoises, green toads or hedgehogs, have a conservation value because of their emblematic and popular appeal.

The problem of bio-invasions presents itself differently in the islands with very ancient human presence where there are introduced species that have been integrated into island ecosystems and that have evolutionary value, compared to islands where introductions are relatively more recent and where it is still possible to completely or partially restore local biodiversity. Oceanic islands, inhabited by Europeans since only a few centuries are currently suffering from the same processes that affected the Mediterranean islands during the Greek or Phoenician times. Where the logbooks of Captain Cook or of the Spanish and Portuguese navigators record then introduction of goats on the discovered islands, for the Mediterranean the story of a similar process, often irreversible by now is told by the toponymy of Mediterranean islands – names related to these herbivores (goats) or to rabbits are repeated over and over in this Sea.

However, bio-invasion on the Mediterranean islands should not be considered as nothing but an ancient and irreversible process in all cases. Species that have been introduced on the islands, even in ancient times, can continue to pose serious threats that must be addressed. This is the case for instance of the viperine grass snake *(Natrix maura*), probably introduced in Roman times

(ctd page 3)

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CONTENTS

PUBLICATIONS

Invasive Species, Vectors and Management Strategies

Editor: Gregory M. Ruiz, James T. Carlton, Paperback , 484 Pages, Publisher: Island Press, 2003, Price: $40.00 (US), ISBN: 1-55963-903-2

Invasive Species presents extensive information and new analyses on mechanisms of species transfer, or vectors, as a contribution from the Global Invasive Species Programme (GISP). Contributors assess invasion vectors and vector management in terrestrial, freshwater, and marine ecosystems for major taxonomic groups in a variety of regions around the world. The book:

· examines invasion causes, routes, and vectors in space and time

· highlights current approaches and challenges to preventing new invasions, both from a geographic and taxonomic point of view

· explores strategies, benefits, and limitations of risk assessment

· offers a synthesis of many facets of vector science and management

· presents recommendations for action

Chapter authors review fungi, plants, invertebrates, and vertebrates, with geographic assessments covering New Zealand, Australia, South Africa, and the United States. Invasive Species brings together in a single volume new information from leading scientists around the world on approaches to controlling and managing invasion vectors.

Source: publishers

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FROM THE CHAIR

I have only recently realized that the SSC/IUCN Invasive Species Specialist Group has now been in existence for 10 years! In that time awareness of the impacts of invasive alien species on biodiversity and human livelihoods has grown greatly. Information on the topic has burgeoned, invasion biology has become a recognized science and local actions and international agreements against IAS have increased. Members of ISSG have contributed to all of these advances and we should feel proud of this.

For the latter part of 2003 I was on research and study leave in the UK. Whilst I was in Europe, I met a number of ISSG members and saw at first hand some programmes against invasive species. An early highlight for me was a visit in July to the Uists (Outer Hebrides, Scotland) where I discussed the programme to eradicate hedgehogs from this archipelago. Another highlight was attending the European Pest Management Conference at Cremona (Italy) and meeting with the leader of the European Scection of ISSG, Piero Genovesi. Piero and Clare Shine (another ISSG member), were jointly responsible for drafting the European Strategy on Invasive Species, under the auspices of the Bern Convention. The Strategy was adopted by the Council of Europe in early December 2003 and is a major advance in the battle against invasive species in Europe.

In September 2003 Maj De Poorter attended the World Parks Congress in Durban (South AFrica) where she co-organised a workshop on IAS in Protected Areas. In November 2003, Michael Browne and muyself attended the 7th International Conference on Ecology and Management of Alien Plant Invasions, organized jointly by the Ecological Society of America and the Weed Society, at Ft Lauderdale, Florida, USA. This was a large meeting, attended by many ISSG members from the USA and elsewhere. I was invited by Carla D'Antonio to give a plenary paper on 'international initiatives against invasive species' and I took the opportunity to highlight the international work of GISP IUCN and ISSG. The conference brought together scientists and those concerned with the practical business of managing invasive aliens. This is a vital alliance.

For myself and the other Auckland-based members of ISSG, the year ended with a summer celebration at my home, to thank everyone for another very full year in the never-ending battle against invasive species.

Mick Clout

Chair, ISSG

BIO-INVASIONS ON THE BALEARIC ISLANDS (ctdfrom page 1)

in Majorca and Minorca, which constitutes a threat of extinction to the Mallorcan midwife toad in those islands. The restoration plan for this species includes systematic control of the snake. Equally serious is the threat posed by rats or cats to the colonies of the Balearic shearwater (*Puffinus mauretanicus).* In this case eradication is carried out, especially on the non-inhabited islets where the possibility for restoration of the original biota is higher. In some cases public opinion can be a major issue. For instance in the case of the eradication of the genet from the Cabrera National Park (where they were introduced in 1902 and where they prey on endemic lizards and contributed to the extirpation of local shearwater colonies): the project has to be carried out as a live-capture of genets followed by translocation to Mallorca (where they are also introduced but don't seem to cause such serious problems).

It goes without saying that the introduction of species is a continuing and present problem and not just an historical one. A dramatic example of this is the pine procession moth, *Thaumetopoea pityocampa,* which reached the Balearic Islands in the 1950's and which requires very large resources for control. Another example is the seaweed *Caulerpa taxifolia,* which colonised the Mallorca east coast - it has not been possible to eradicate it in spite of •500,000 spent on this between 1992 and 2002. With regards to other species, there is concern about the proliferation of the monk parakeet (*Myiopsitta monachus),* introduced fish, South African plants like *Carpobrotus,* the butterfly *Carcyreus marshalli,* etc. To face bio-invasion, it is crucial that a number of legal, prevention and rapid response measures are implemented, the importance of which has only recently started to be recognised. It is to be hoped that efforts and resources will be sufficient in the future, and will result in successes with regards to this serious problem which is particularly insidious on islands.

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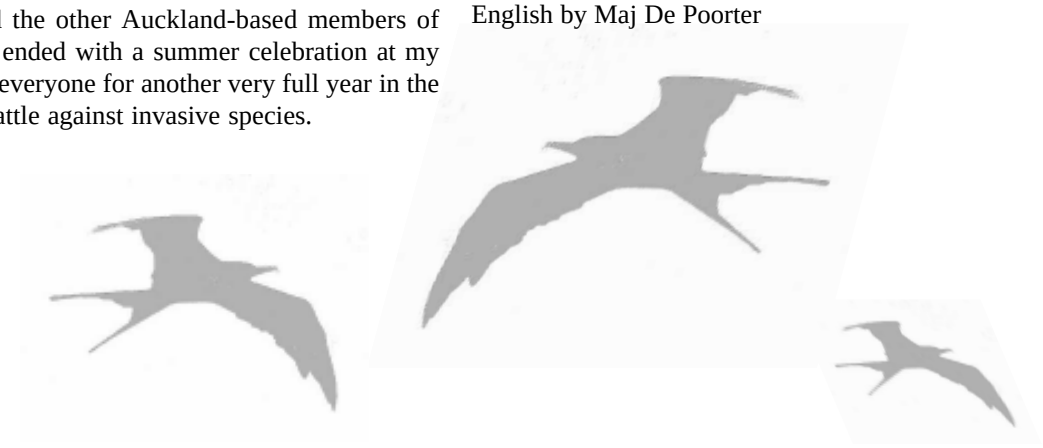
Original provided in French and Spanish – translated into English by Maj De Poorter



ECONOMIC IMPACTS CAUSED BY THE COYPU IN ITALY
Lessons for the Iberian Peninsula

The coypu (*Myocastor coypus*), a Latin American rodent largely used for fur farming, has been introduced in many regions of the world during the last century, causing in some cases severe impacts to the local economy and biological diversity.

In Italy, the coypu is now widespread in the north and central areas of the country and is expanding southward. It causes damage to crops and weakens riverbanks through digging, and is considered a concurrent cause of several floods that occurred in northern Italy in recent years. For these reasons the coypu is heavily controlled through trapping and shooting in many areas of the country. In order to estimate the losses caused by the coypu in Italy, we started a survey in 2002 based on questionnaires sent to all the authorities responsible for wildlife management, compensation of damage to agriculture and for riverbanks recovery. The survey covered a six-year period from 1996 to 2000.

We considered only the tangible economic losses related to the presence and management of the coypu (compensations paid for damage to crops, costs of trapping and shooting, costs of banks recovery, etc.), but the survey did not cover the indirect economic losses (e.g. non compensated damage to crops, impacts on wild species, impact on river ecosystems, etc.).

The results, which will be published in the near future, show a rapid growth of the damage. In the year 2000 damage to crops compensated by public administrations almost reached Eu300,000 and costs caused by digging of riverbanks exceeded Eu1,500,000. In total, in 2000 Italy spent over Eu3,500,000 for compensating or remedying damage caused by coypus and for controlling the species in order to mitigate these impacts. Over 60,000 coypus were killed in trying to control their population. The total costs suffered during the 6 years covered by the survey (over Eu14 Million) already greatly exceed the cost of the successful 11 years eradication in East Anglia (Eu5 Million), which was considered very expensive at the time. Furthermore, since the Italian suitable habitat for the coypu is 2.5-3.3 times wider than the present range, it is very likely that the ongoing expansion will cause an increase of economic losses up to 9-12 Million Eu/yr in the future.

The results of the survey confirm that early eradication of alien species, even if very costly, is by far the best option if the long term costs of management are considered. Unfortunately, national authorities in many cases do not respond effectively to new invasions until it is too late. An example of this general trend is that of the coypu in Spain; the coypu, has naturally arrived to the Iberian peninsula from France, where it is widespread. At present the range in Spain is still limited to a few spots in the North, and the total population size is likely around a few hundred individuals. No control program has been started so far, although it is evident that at this stage an eradication is easily achievable and could prevent immense economic losses as well as huge impacts to wetlands in the long term.

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PUBLICATIONS

Introduced Mammals of the World: Their History, Distribution and Influence

By: J L Long. This reference work presents information on the wide range of mammals that have been introduced by humans. It also provides an indication of any adverse consequences to the local fauna or flora which have resulted. The book includes details of the dates of introductions, the person or agency responsible, the source populations, the locations of release, the fate of the introductions and the impact if known, for over 300 species of mammal.
Further information: *http://www.cabi-publishing.org/bookshop/book_detail.asp?isbn=0851997368*

COUNCIL OF EUROPE IAS SRATEGY ADOPTED!!!!

Convention on the Conservation of European Wildlife and Natural Habitats:
Recommendation No. 99 (2003) of the Standing Committee, adopted on 4 December 2003, on the European Strategy on Invasive Alien Species:

«Wishing to contribute to improve the control of the introduction of alien species, and the mitigation of the effects of invasive alien species on the native flora, fauna and natural habitats;
Noting substantial progress on regulation, management and eradication of invasive alien species has been achieved in Europe in the last years;
Referring to the measures proposed in the "European Strategy on Invasive Alien Species", [document T-PVS(2003) 7];
Recommends that Contracting Parties:

1) draw and implement national strategies on invasive alien species taking into account the European Strategy on Invasive Alien Species mentioned above;

2) co-operate, as appropriate, with other Contracting Parties and Observer States in the prevention of introduction of invasive alien species, the mitigation of their impacts on native flora and fauna and natural habitats, and their eradication or containment where feasible and practical, *inter alia* by exchanging information, collaborating in European projects and paying particular attention to invasive alien species in trade and transboundary areas;

3) keep the Standing Committee informed of the measures taken to implement this recommendation.

Invites Observer States to take note of this recommendation and implement it as appropriate.»

Source : Document: T-PVS (2003) Mics 2 rec

Editorial note: more information will be provided in a future Aliens

FRENCH ALIEN MAMMAL ERADICATION ATTEMPTS IN PROTECTED AREAS: MAJOR CONSEQUENCES FOR THE NATIVE FAUNA

Among the nineteen French vertebrate eradication attempts that are recorded, 7 took place in protected areas (Tab. 1), all insular Natural Reserve belonging to 3 biogeographical areas (oceanic temperate, Mediterranean and tropical).

The target species were 4 alien mammal species: the Norwegian rat (*Rattus norvegicus*), the ship rat (*R. rattus*), the house mouse (*Mus musculus*) and the Javanese mongoose (*Herpestes javanicus*). The techniques used were life-trapping or poisoning alone and a combination of two eradication techniques, life-trapping then anticoagulant toxin, this last process shortening by more than 90 % the toxic flow into the ecosystem food-chain.

Among these attempts, one failed without identified reason: the eradication attempt of the ship rat from Fajou Island off Guadeloupe (covered by110 ha of mangrove and 10 ha of dry forest).

Among these 7 attempts, 6 followed a global strategy that provided data assessment of the impact of the disappearance the alien species on several native fauna species. These impacts never were detrimental. Those quoted in Table 2 are restricted to those species where the populations reacted significantly to the eradication of the alien species. These impacts relate to one mammal (the Lesser white-toothed shrew, *Crocidura suaveolens*), 4 terrestrial birds (the endemic *Rallus longirostris* from the

G. ruricola

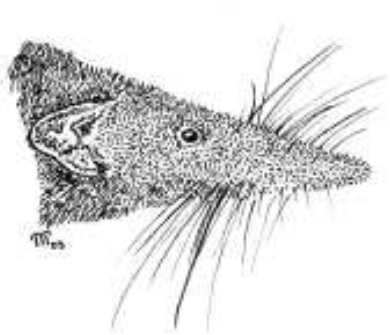
A. petrosus

Table 1 French Alien Vertebrate eradication attempts. S(ha) = size (in hectares); Tech = Technique (P: Poison; T: Trapping).

	Archipelago	Island	S. (ha)	Target species	Year	Tech.	Success
Oceanic temperate	Sept-Îles	Rouzic	3,3	*R. norvegicus*	1951	P	yes
		Bono	22	*R. norvegicus*	1994	TP	yes
		île aux Moines	9	*R. norvegicus*	1994	TP	yes
		île Plate	5	*R. norvegicus*	1994	TP	yes
		île aux Rats	0,2	*R. norvegicus*	1994	TP	yes
	Molène	Trielen	17	*R. norvegicus*	1996	TP	yes
		Enez ar C'hrizienn	1,3	*R. norvegicus*	1996	TP	yes
	Houat	île aux Chevaux	2,5	*R. norvegicus*	2002	TP	yes
Mediterraneanne	Lavezzi	Lavezzu +	73	*R. rattus*	2000	TP	yes
		18 islets	17	*R. rattus*	2000	TP	yes
	Cerbicales	Toro	0,9	*R. rattus*	1990/91	P	yes
Tropical	Martinique	Burgaux	0,49	*R. rattus*	1999/01/02	TP	yes
		Percé	0,54	*R. rattus*	1999	TP	yes
		Hardy	2,63	*R. rattus*	1999/01/02	TP	yes
		Poirier	2,1	*R. rattus*	1999/2002	TP	yes
	Guadeloupe	Fajou	120	*R. rattus*	2001/2002	TP	no
		Fajou	120	*M. musculus*	2001	TP	yes?
		Fajou	120	*H. javanicus*	2001	T	yes

Caribbean; the rock pipit, *Anthus petrosus*; the dunnock, *Prunella modularis*; the wren, *Troglodytes troglodytes*) and 5 marine birds (*Hydrobates pelagicus*; the Audubon's shearwater, *Puffinus lherminieri*; the brown noddy, *Anous stolidus*; the bridled tern, *Sterna anaethetus*; the Cory's shearwater, *Calonectris diomedea*), one reptile (the Hawksbill Turtle, *Eretmochelys imbricata*) and one terrestrial crab (*Gecarcinus ruricola*).

The consequence of the alien disappearance that were recorded for 2 of the native species above (*C. suaveolens* and *G. ruricola*) had been unpredicted. This result put in light



C.suaveolens

the poverty of natural history knowledge for several taxa, the flimsiness of the empty niche concept that is often used to delay or prevent any action again an alien species and the advantage to proceed in protected areas that offer long-term monitoring possibilities.

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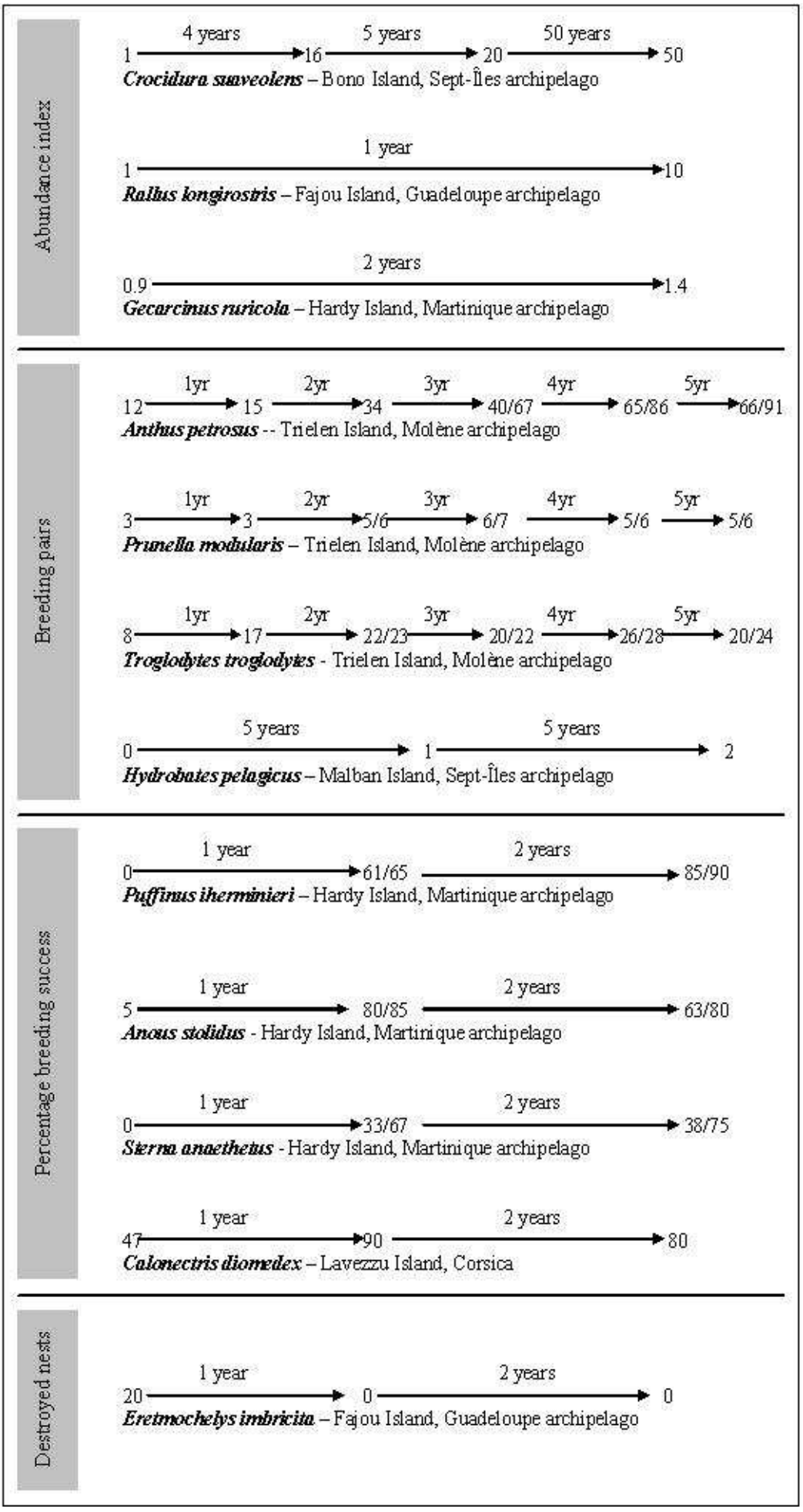
Drawings by Pierre-Yves Pascal

Table 2 (Next Page) Recorded impacts of the alien eradications on native species.
Abundance index : number of animals caught per unit effort (trapping)
Breeding pairs : number of breeding pairs during the season of reproduction
Breeding success : ratio of the number of fledging chick against the number of eggs
Destroyed nests : number of turtle nests destroyed during the breeding season by the Javanese mongoose.
Arrows indicate the change from before eradication to a number of years after eradication.

For example : for *C. suaveolens* the number of trapped shrews for the same trapping effort increased from one during the year of eradication to 16 trapped shrews 4 years after eradication, 20 shrews trapped 6 years after and 50 shrews trapped 50 years after eradication.


Abundance index
4 years
5 years
50 years
1
16
20
50
Crocidura suaveolens – Bono Island, Sept-Îles archipelago
1 year
1
10
Rallus longirostris – Fajou Island, Guadeloupe archipelago
2 years
0.9
1.4
Gecarcinus ruricola – Hardy Island, Martinique archipelago
Breeding pairs
1yr
2yr
3yr
4yr
5yr
12
15
34
40/67
65/86
66/91
Anthus petrosus -- Trielen Island, Molène archipelago
3
3
5/6
6/7
5/6
5/6
Prunella modularis – Trielen Island, Molène archipelago
8
17
22/23
20/22
26/28
20/24
Troglodytes troglodytes - Trielen Island, Molène archipelago
5 years
0
1
2
Hydrobates pelagicus – Malban Island, Sept-Îles archipelago
Percentage breeding success
1 year
2 years
0
61/65
85/90
Puffinus iherminieri – Hardy Island, Martinique archipelago
5
80/85
63/80
Anous stolidus - Hardy Island, Martinique archipelago
0
33/67
38/75
Sterna anaethetus - Hardy Island, Martinique archipelago
47
90
80
Calonectris diomedea – Lavezzu Island, Corsica
Destroyed nests
20
0
Eretmochelys imbricita – Fajou Island, Guadeloupe archipelago

PUBLICATIONS

INVASIVE PLANT SPECIES OF THE WORLD
A REFERENCE GUIDE TO ENVIRONMENTAL WEEDS

Author: E. Weber, Geobotanical Institute, Swiss Federal Institute of Technology, Zurich, Switzerland

The problem of invasive species is increasingly being recognized around the world. Invasive alien species can cause severe disruption to both natural and managed ecosystems. This 560-page book provides a reference guide to 450 major invasive plant species (with more than 140 references) that are harmful to natural areas. Each species has an entry providing information covering lifeform, synonyms and commercial use, geographic distribution, habitats invaded, description of morphology, ecology and control. Key references to each species are also provided. The book will appeal to researchers involved in plant ecology, conservation, weed science and biogeography.

In Hal Mooney's forward he writes:

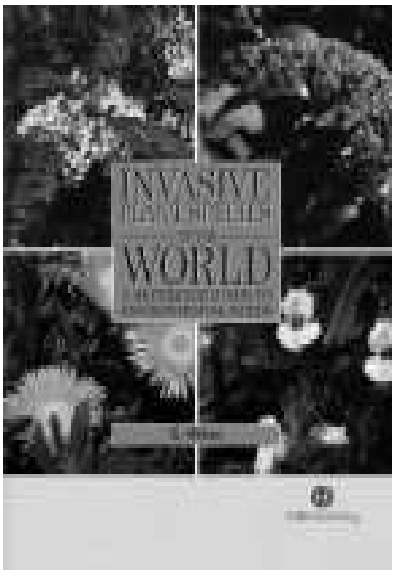
"*The great merit and value of the book is in the uniform treatment of each of the species covered in a one-page compact form, information is noted on the growth form, synonomy, commercial use, global distribution (both natural and introduced), the kinds of habitats invaded and the ecology and control methods for the species, as well as the primary references relevant to the plant. The information is compact but comprehensive and, thus, very useful. The literature covered is extensive and can lead the reader to more detailed information if needed.*

Weber no doubt struggled over which species to include in this monumental effort. But what is included represents many significant invaders and an important foundation for whatever follows….

An important analysis in the book is the notation of economic uses of plants that subsequently became invasive, utilising a database of over 700 species. This analysis builds on others that have shown that ornamental species are the largest pool for species that subsequently become invasive. Hopefully these studies will bring a more precautionary approach to importation of new and untested ornamentals in various regions of the world."

Published: September 2003
No pages: 560
ISBN 0 85199 695 7
Price (hardback) : 75.00 UKL
If you would like to find out how to purchase the book, please visit:
http://www.cabi-publishing.org/bookshop

Source: CABI Publishing



PUBLICATIONS

CENTRAL EUROPEAN BIOLOGICAL INVASIONS

Biologische Invasionen: Neophyten und Neozoen in Mitteleuropa ('Biological invasions: alien plants and animals in central Europe') by Katharina Dehnen-Schmutz and Mark Williamson is now available. Cost is •69.90. In German.

"The study of biological invasions is increasing strongly but the literature is dominated by the English-speaking world, particularly American, Australasian and British studies. Here is a book firmly based in mainland Europe and building on the strong tradition of invasion studies there."

It gives a wide overview over biological invasions (both plants and animals) in central Europe and detailed accounts on the most prominent invaders here.

Source: message on *Aliens-L* listserver (November 2003) by
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THE BEAUTY AND THE BEAST – THE TWO FACES OF A PLANT

Giant hogweed (*Heracleum mantegazzianum*) is a beautiful beast. Like many other invasive plants, it was introduced into parks and gardens for its beauty. However, it does not fit well with the rule that one characteristic of alien weeds is that they inhabit large tracts in their area of origin, thus being pre-adapted to a wide range of abiotic factors.

But let's start at the beginning: giant hogweed is naturally occurring in a restricted area, the Western Caucasus comprising the northern slopes which are in Russia and the southern slopes which are part of Georgia. It is found mainly along rivers from about the timber-line down into the flat areas bordering the mountain chain. The plant was introduced to Europe in the 19th century and widely planted. It spread from gardens and parks into natural areas with wet soil. There it often overgrows the native vegetation and creates communities with a reduced plant diversity. The same attributes of beauty which make them attractive to humans, its decorative growth pattern, 3-4 m tall, with huge flower heads of 50cm diameter, overwhelm the native vegetation and render the species a beast in its new environment. In addition to these detrimental effects on flora and fauna, giant hogweed is a danger to human health. The plant produces large volumes of furanocumarins in its sap, which in contact with skin and exposure to sunlight, cause severe phototoxic irritation and painful blistering. One of the grave concerns is the attractiveness of the plant to children, whose health can be seriously damaged, e.g. by using the hollow stems as peashooters.

In January 2002 an EU-funded project was commenced involving eight partners in six countries to develop an integrated management strategy that comprises effective, practicable and sustainable means of controlling an alien non-agricultural weed. Thus, the project not only aims at a management solution for giant hogweed but also is intended to serve as a model for other weed projects in Europe. Therefore the different partners are investigating the genetics, taxonomy and biology of the weed, modelling the invasion process, gathering information about best mechanical and chemical control methods, assessing the potential for biological control with natural insect and pathogen agents, and integrating the results into best practice guidelines.

An international team led by scientists from the Russian Academy of Science visited the northern Caucasus several times in the last two years to investigate the biology of giant hogweed and its natural enemies in its area of origin. On these expeditions it became clear that *H. mantegazzianum* is naturally occurring along rivers and in forest gaps, but in areas of abandoned fields the plant can also produce very dense stands, since giant hogweed grows vigorously on nutrient-rich soil. The same can be observed in parts of Europe, where a change of agricultural practice can produce large infested areas. Thus, in the case of giant hogweed abandoning fields in the original distribution as well as in its introduced area is one major factor leading to invasiveness of the plant.

Currently, *H. mantegazzianum* is exponentially spreading in many parts of Europe. However, in most parts of Central Europe many isolated patches of giant hogweed exist, where it is still possible to control and even eradicate the environmental weed with mechanical methods. The most-promising methods are grazing with cheep and cattle, frequent mowing to deplete the nutrients stored in the roots, cutting the flower heads between flowering and see-ding, and killing the plant by cutting it about 10cm below the soil surface to destroy the growing point. The latter is very effective in soft soil, less so in places where the plant grows under rocky conditions. Another important task is to inform the public about its danger to human health to change the public attitude towards the plants in gardens. However, in countries with large infested areas, mechanical control will not be sufficient to control the weed, here it is hoped to find a suitable biological control agent to stop the spreading of the invasive plant.

Coming back to the invasiveness rule mentioned in the first paragraph, examples like *H. mantegazzianum* stress the importance of the close interaction between traits of the species, the status of the recipient area, and the human dimensions in determining the success of an invader. The origin of *H mantegazzianum* is of limited extension, but its attractiveness for humans introduced the plant repeatedly in many places.

Since exotic ornamental plants are so readily available, e.g. ordered over the Internet, it is only a question of time, until the next beauty turns into a beast.

For more information on the project, its partners, control methods and first results, please visit:
http://www.flec.kvl.dk/giant-alien

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Bottom: Harry Evans, a pathologist from CABI UK in a population of *H. antegazzianum* near Lago-Naki - Russian Caucasus, 7 July 2003. Top: *Heracleum mantegazzianum* plant. (Photos: R. Wittenberg)

THE HEBRIDEAN MINK PROJECT

The mink on the Western Isles

The American mink *(Mustela vison)* threatens global biodiversity. This generalist, adaptable, semi aquatic species became invasive over much of Europe as individuals from fur farms established feral populations (Cuthbert, 1973). On the Western Isles (Hebrides), an archipelago 15km off the North West Coast of Scotland, feral mink were first discovered in the 1960s having escaped from 2 fur farms set up in the 1950s on Lewis. Since that time the species has spread steadily southwards and has now colonised almost all of the 195km long island chain (Hudson & Cox, 1988) (Fig.1).

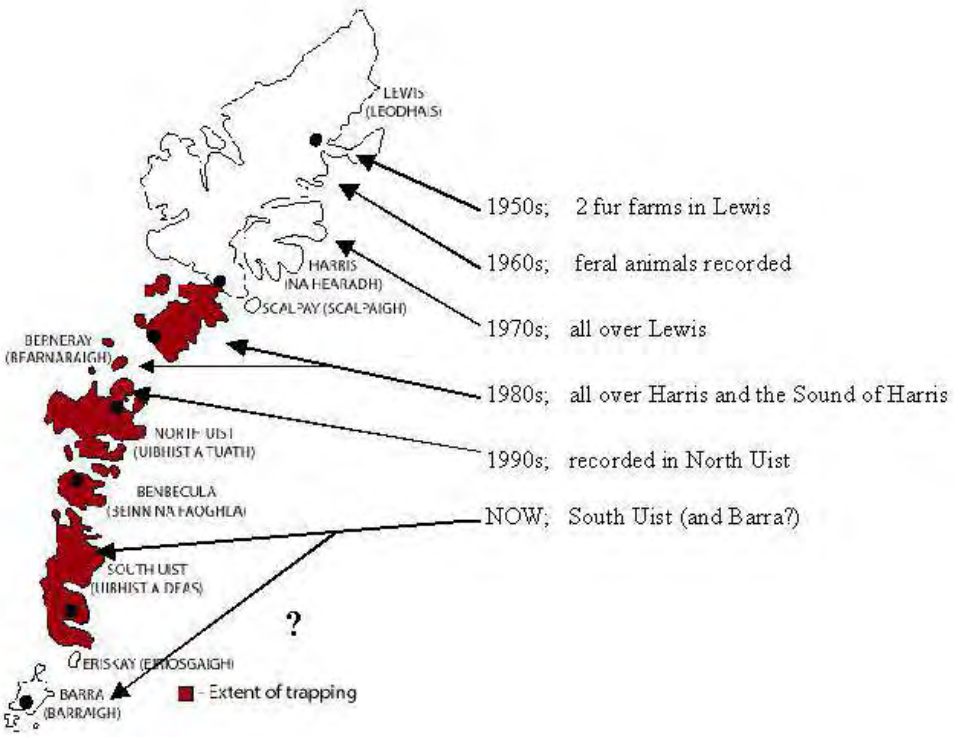

Fig.1 The spread of mink across the Western Isles

Setting up the Hebridean Mink Project

The Hebrides have internationally important populations of ground-nesting birds, farmland birds, waders and waterfowl. As a result several areas, especially in the Uists, are designated as Special Protected Areas. The islands also have internationally important populations of wild salmonids, *Salmo salar* and *S. trutta.* The mink pose a threat to these species, which is detrimental to both the biodiversity of the region, and the associated economy. Many tourists visit the region for its wildlife value. Other local industries affected by mink are the inland and coastal fish farms, shooting and fishing, and local production of free-range poultry. As a result it has been estimated that the species could be affecting the local economy by several million pounds annually (Fig. 2).

Due to the local impacts of mink, there have been several attempts to control the species. Most of these have been small-scale trapping on hunting estates and fish farms. In the early 1990s a project was set up by SNH to control the species in South Harris in an effort to prevent the colonisation across the Sound of Harris to the bird rich areas of the Uists (Angus, 1992). This effort failed.

In November 2001 The Hebridean Mink project was set up. Funded by a consortium of local and National NGOs and Government Agencies and Departments and the EU LIFE Nature Programme, the project has a staff of 8 trappers, 2 foremen and a coordinator, 4 vehicles, 2 boats, 2500 traps and also funds a PhD study. The aim of the project is to eradicate mink from the Uists and reduce their numbers on Harris to prevent recolonisation of the Uists. The total control area is 1100km^2. As well as protecting local bird populations, control techniques are being developed and refined. The project also aims to study the population ecology of mink and the effect of mink removal on seabird colonies, a positive effect that is being found elsewhere (Nordstrom *et al.*, 2003). Much of the information is being incorporated into a management model, which will be used to assess the resource requirements and optimal methods for future control over the entire Western Isles archipelago (2,800km^2).

Methods

The project is carried out mostly by trapping with live capture traps (Fig. 3). These are baited with fish and dug into the ground at between 300 and 400m intervals along

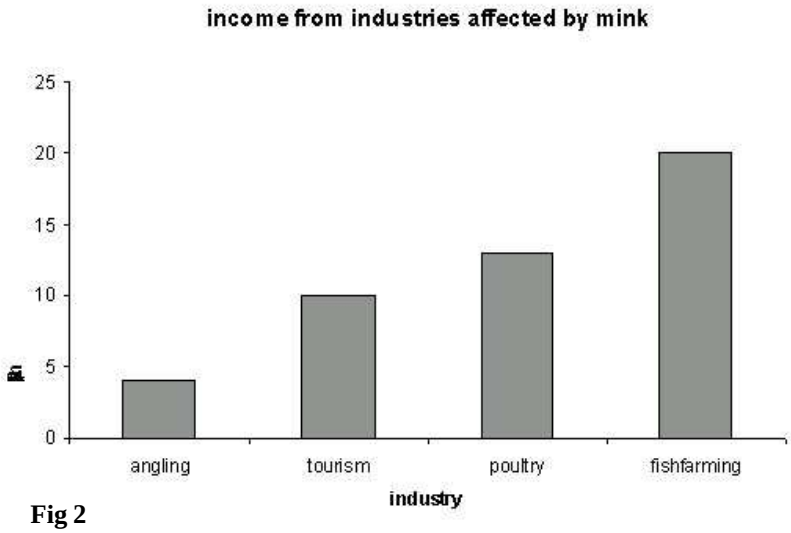

Fig 2

coastlines and inland waterways. Set traps are checked daily, and individual trappers are able to check between 30 and 50 traps daily. Each trap line is checked for a 2-3 week period.

From May to July traditional trapping is ineffective as females are confined to regions around breeding dens. During this period, alternative strategies have been adopted. We are currently training and using dogs, (pointers and spaniels) to locate den sites. Traps are set near den sites, females are captured and the den is excavated. All animals are humanely dispatched using air pistols. This has proved to be very effective during 2003.

Fig 3

Results

The project to date has caught 420 mink. Sex ratios remain close to 1:1, although are male biased in areas that were heavily trapped prior to the start of the project. Captures of both sexes peak during the summer dispersal period (July-September) and the spring rut (March) (Fig.4.).

Developing the project further

Due to the success of the trapping at breeding den sites in the summer of 2003, a study is being carried out looking at habitat features associated with dens. These are being amalgamated and a GIS system is being used to forecast denning hotspot areas for 2004.

We are also carrying out studies on scent marking and mating behaviour of collared mink in order to highlight preferred habitat types, mating patterns and movement patterns in order to synchronise our control measures with seasonal behavioural changes in the mink. This will be incorporated into the trapping regime and help us to both control and understand this devastating invader.

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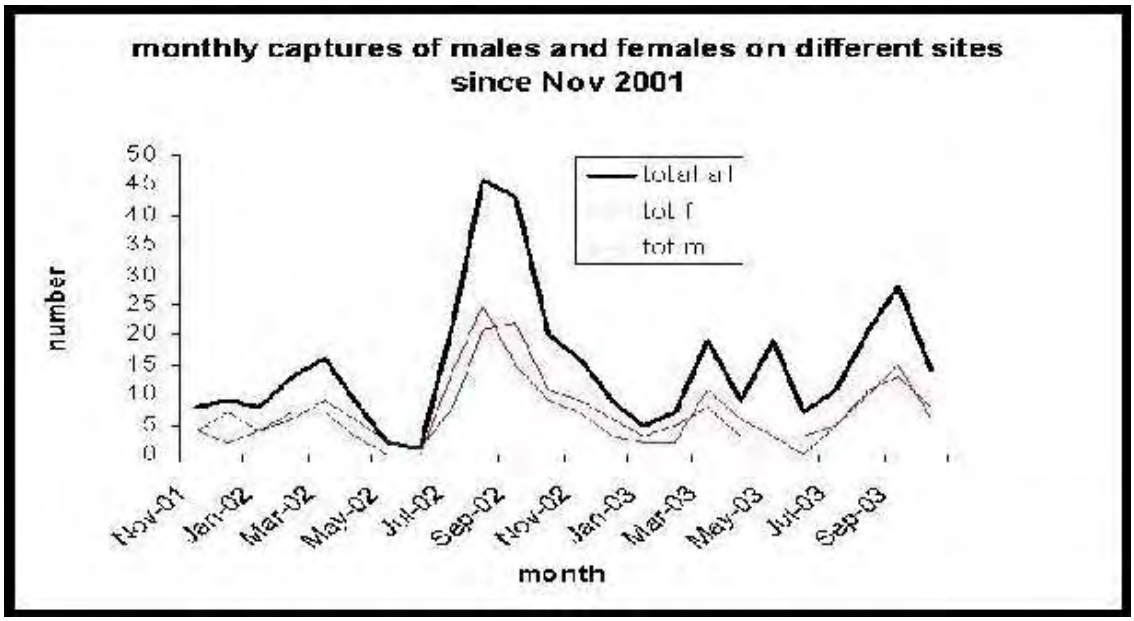
Fig 4



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SPANISH ACTION PLAN ON INVASIVE ALIEN SPECIES

The Spanish Ministry of Environment has recently contracted a team of specialists to elaborate the National Action Plan on Invasive Alien Species (IAS). The initiative has been promoted by the above mentioned institution to address the problem of biological invasions in Spain. The plan, intended to become a useful toolkit to manage IAS, will be elaborated during the next two years.

The plan, designed according to the international and European guidelines and regulations, will approach the following items:

• Definitions of IAS (including a trilingual glossary) and criteria for their identification.
• A description of the situation of IAS in Spain including some examples belonging to different taxonomic groups.
• A list of IAS in Spain.
• Economic and ecological consequences of biological invasions.
• Pathways of introduction and measures to avoid unintentional introductions of IAS.
• A list of IAS whose introduction in Spain should not be authorized.
• Procedures to carry out risks analysis for the import of alien species.
• A list of alien species that should be submitted to a risk analysis before their introduction.
• Mitigation measures (eradication and control) for IAS already established in Spain.
• A list of IAS with high priority of eradication.
• A list of other IAS that should be eradicated or controlled.
• Technical and management co-ordination measures.
• References.
• Processes concerning IAS according to the precautionary approach.

The plan is also targeted to those sectors responsible of the introduction of potential invasive alien species to minimise the risk of harmful introductions in Spain and to develop codes of best practice.

Contributions and suggestions are welcome:

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PUBLICATIONS

MANAGING ALIEN SPECIES IN THE EUROPEAN UNION

A new report "*Alien species and nature conservation in the EU: the role of the LIFE program*", by Scalera R., and D. Zaghi. Published by the European Commission in 2004.

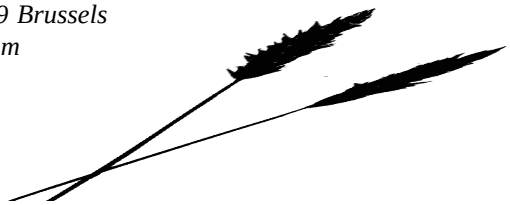
Considering the dimension of the problem posed by alien species, which represents one of the greatest threats to the EU biodiversity, the Commission decided to collect and analyse information on actions being carried out to face the problem within the LIFE program, the main EU fund directed at nature conservation.

The report shows that the problem of alien species has been tackled successfully within many *Natura 2000* sites, the EU network of protected areas aimed at protecting and conserving wildlife and habitats considered of Community importance. In particular, from 1992 to 2002, out of a total of 715 projects financed through the LIFE Nature program, the financial instrument aimed at the development of the *Natura 2000* network, more than 100 include actions dealing with the management of exotic species. The total budget spent for implementing these projects amounts to more than 27 million Euros. These figures show that, notwithstanding the underestimation by the general public and by policy makers, wildlife managers perceive exotic species as a major conservation concern. LIFE proved to be a well suited instrument to respond in an efficient way to the precise needs of wildlife managers.

LIFE Nature in particular has provided major investment to support activities in this area. The project financed provided the opportunity to learn a number of very important lessons directly from the field, so as to contribute to the identification of the actions to be envisaged within future projects dealing with alien species and to develop a EU strategy based on the Convention on Biological Diversity guiding principles.

The report is available :*http://europa.eu.int/comm/environment/life/infoproducts/publicationsgeneral.htm*
Paper copies can be requested, free of charge, from the European Commission at the following address:

European Commission
Environment DG
Information Centre
BU-9 0/11
B-1049 Brussels
Belgium



THE IPPC STANDARD ON ENVIRONMENTAL RISKS OF PLANT PESTS

Pest risk analysis (PRA) is a core element of phytosanitary systems established within the framework of the IPPC (International Plant Protection Convention) and the main tool for the identification of measures against the introduction and spread of plant pests. In April 2003 the IPPC standard on PRA for Quarantine Pests (ISPM 11) has been revised by the supplement on environmental risks of plant pests, which is the result of many discussions on invasive alien species in all fora of the IPPC since 1999 (see *www.ippc.int* → ISPM 11 rev1).

With the adoption of the supplement (=rev1) it is clarified, that the full range of pests covered by the IPPC extends beyond pests directly affecting cultivated plants only. Firstly it covers weeds or invasive plants and also other species that have indirect effects on plants. Secondly the scope of the IPPC covers also the protection of wild flora or in the terminology of the standard uncultivated/unmanaged plants.

In order to clarify which types of pests may fall under the scope of the IPPC some examples of plant pests are given in the supplement. For weeds or invasive plants, which affect plants primarily by processes such as competition, Canada thistle (*Cirsium arvense*) as a weed of agricultural crops and purple loosestrife (*Lythrum salicaria*) as a competitor with uncultivated/unmanaged plants in natural and semi-natural habitats is mentioned. In addition pests that indirectly affect plants through effects on other organisms are included. Examples include parasites of beneficial organisms, such as biological control agents (See Tab1).

The most important elements of the supplement that are new to the PRA standard are:

- The intentional introduction of organisms potentially harmful to plants is clearly included. The differentiation between the categories "intended" and "unintended" habitat is the basis for the application of the PRA scheme to this situation.
- Specific examples for the consideration of direct pest effects on plants and/or their environmental consequences are given. These include the reduction of keystone plant species, of plant species that are major components of ecosystems or of endangered native plant species and the significant reduction, displace-ment or elimination of other plant species.
- Specific examples for the consideration of indirect environmental consequences are given. These include: significant effects on plant communities or on designated environmentally sensitive or protected areas, a significant change in ecological processes and in the structure, stability or processes of an ecosystem (including further effects on plant species, erosion, water table changes, increased fire hazard, nutrient cycling, etc.), effects on human use (e.g. water quality, recreational uses, tourism, animal grazing, hunting, fishing) and costs of environmental restoration.
- Some specific guidance on the quantitative evaluation of Non-commercial and environmental consequences of effects on uncultivated/ unmanaged plant species is provided which includes examples of Non-use values like option value (value for use at a later date), existence value (knowledge that an element of the environment exists) and bequest value (knowledge that an element of the environment is available for future generations).

The standard makes clear, that the full range of IPPC tools to restrict the movement and trade of plants, plant products and any other potential pathways (e.g. packing materials, conveyances, travellers and their luggage) may be applied also where there is an environmental risk identified and considered to be unacceptable in the PRA process. Countries may also decide that in particular for the intentional introduction of plants, where there is a high level of uncertainty regarding pest risk, not to take phytosanitary measures at import, but only to apply surveillance or other procedures after entry (e.g. by or under the supervision of the National Plant Protection Organisation).

Tab 1

Direct pest (pathogen, parasite, herbivore)	
	Cultivated plants e.g. *Ralstonia solanaceanum* (potato brown rot)
	Non-cultivated plants e.g. *Ophiostoma novo-ulmi* (Dutch elm disease)
Indirect pest, level 1 (plant weed, potentially invasive plant)	
	Cultivated plants e.g. *Cyperus esculentus* (weed of agricultural crops)
	Non-cultivated plants e.g. *Reynoutria japonica* (competitor in natural/semi-natural habitats)
Indirect pest, level 2 (other organisms)	
	Cultivated plants e.g. *Arthurdendyus triangulatus* (earthworm predator)
	Non-cultivated plants e.g. *Varroa jacobsoni* (pest pollinators)

Finally IPPC member countries declare with the adoption of the supplement (see Annex 1 of ISPM 11 rev.1) that in order to protect the environment and biological diversity without creating disguised barriers to trade, environmental risks and risks to biological diversity should be analyzed in a Pest Risk Analysis in accordance with this standard.
In Europe historically weeds or invasive plants have very rarely been subjected to phytosanitary measures, up to now the EPPO guidelines and European Unions regulations almost excusively address risks posed by pests that directly affect host plants such as pathogens or insects. Also risks of plant pests to the environment and biological diversity have been less likely to be evaluated, regulated and/

or placed under official control if not at the same time major commercial consequences have been forseen. It is now be expected that in future more countries will address these gaps in the PRA and apply their established phytosanitary systems more widely in order to the protect the environment and biological diversity from risks posed by plant pests.

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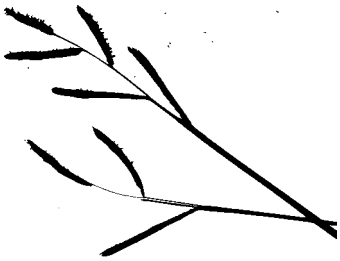

NOTES

The 14th Australian Weeds Conference, 6th – 9th September 2004

The Conference is being hosted by the Charles Sturt University in Wagga Wagga, New South Wales, Australia and is supported by the Council of Australian Weed Science Societies.

The conference program will consist of invited speakers, submitted papers (with selected plenary and concurrent session oral presentations), posters and field tours. Tradedisplays will also be present.

For general queries about the conference and registration of interest, contact Ray Farnham at:
Australian Weeds Conference Secretariat, *eventsww@csu.edu.au,* or visit the website: *www.csu.edu.au/special/weedsconference* which will be regularly updated with conference information.

NEW WORKING PROGRAMME OF THE EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION ON INVASIVE ALIEN SPECIES

The European and Mediterranean Plant Protection Organisation (EPPO) has started a new working programme on invasive alien species (IAS) as a reaction to the activities on IAS in the framework of the International Plant Protection Convention (IPPC). In 2002, the EPPO-Council adopted a resolution, declaring that IAS which have an effect on plants are quarantine pests (definition: see ISPM 2002) under the IPPC, and that National Plant Protection Organisations should consider their responsibilities for the management of such species, in cooperation with the environmental and nature conservation authorities. To launch and escort the new working programme, an expert panel on IAS was established, which will work on different aspects on invasive alien species harmful to plants. Specified tasks of this panel are to

- discuss and find solutions for terminology and definitions,
- collect data on IAS in the EPPO region, particularly of invasive alien plants
- collect information on official control measures existing in the EPPO region for invasive alien plants
- conduct pilot studies on pest risk assessment and pest risk management of specific IAS
- conduct pilot studies on possible recommendations to EPPO members on suppression and containment of invasive alien plants
- develop a common approach to weeds as quarantine pests or regulated non-quarantine pests (ISPM 2002), in relation to invasive alien plants as appropriate and
- establish further EPPO information services on IAS.

Another important task is the adaptation of the EPPO-Pest Risk Analysis (PRA) schemes to the IPPC-Standards for Phytosanitary Measures ISPM No. 11 and its revision (ISPM No. 11 rev. 1) in cooperation with the EPPO panel on PRA, also taking criteria of the Convention on Biological Diversity (CBD) into consideration, especially the CBD-Guiding Principles for the prevention, introduction and mitigation of impacts of alien species that threaten ecosystems, habitats or species (EPPO, 1997; EPPO 2000; ISPM, 2001; ISPM, 2003; CBD, 2002).

The assessment and management of risks of intentionally introduced alien plants, especially ornamental plants, is a new concept for EPPO. As a first project in this framework, a questionnaire has been sent to all EPPO member countries, asking for alien plants which are invasive or potentially invasive in their territories. The replies included more than 2000 species. After a pre-selection by EPPO, about 400 species were subjected to a more detailed selection by the IAS panel, identifying about 40 species for further studies (Table 1) for the beginning (the list is not conclusive). A second questionnaire was developed by the IAS panel, asking of impact, pathway, control measures etc. of these 40 species in the EPPO member countries. In reaction to the replies, the IAS panel proposed the conduction of PRAs for 15 species. Depending on the results of the PRAs, all or some of these species will be put on the (already existing) EPPO A2 list (EPPO 2003 a) containing recommended quarantine pests, which are of limited distribution in the EPPO region, if there is a risk of further spread of these species.

Already in an earlier stage (if a risk of phytosanitary significance is indicated), selected alien plant species may be put on the EPPO alert list (EPPO 2003 b),

to warn member states concerning the introduction and spread of these species. Up to now, this alert list had only been used for direct plant pests (pathogens, insects etc.).

As a next step, plant species will be identified which are not yet present in the EPPO region but pose a certain risk. For these species, PRAs will be done and it is intended to put them - as far as appropriate - on the EPPO A1 list (EPPO 2003 a), which contains recommended quarantine pests absent in the EPPO region.

References:

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Table 1 Invasive plants selected for further study within EPPO

Terrestrial plants	Aquatic plants
Abutilon theophrasti	*Azolla filiculoides*
Acer negundo	*Crassula helmsii*
Acroptilon repens	*Egeria densa*
Ailanthus altissima	*Elodea spp.*
Ambrosia artemisiifolia	*Eichhornia crassipes*
Amelanchier spicata	*Hydrocotyle ranunculoides*
Bidens frondosa	*Lagarosiphon major*
Cenchrus incertus	*Lemna minuta, L. turionifera*
Cyperus esculentus	*Ludwigia peploides, L. uruguayensis*
Fallopia japonica, F. sachalinensis, F. x bohemica	*Myriophyllum aquaticum*
Galinsoga ciliata, G. Parviflora	*Salvinia molesta*
Helianthus tuberosus	
Heracleum mantegazzianum, H. Sosnowskyi	
Impatiens glandulifera, I. parviflora	
Lupinus polyphyllus	
Panicum spp.	
Prunus serotina	
Rhododendron ponticum	
Senecio inaequidens	
Solanum elaeagnifolium	
Solidago canadensis, S. Gigantea	
Sorghum halepense *Spartina anglica*	

A BRIEF REPORT ON THE INVASIVE FLORA OF PORTUGAL

The expansion of sub-spontaneous or exotic invasive plants is threatening the Portuguese native flora and becoming a serious environmental problem (Almeida and Freitas 2001, Campelo 2001, Marchante 2001). In the last two centuries, and especially in recent decades, the number of introduced plant species increased extensively with aliens representing nowadays more than 15 % of the Portuguese vascular flora, which includes a total of ca. 3200 species and subspecies, both native and sub-spontaneous (Franco 1971, 1984, 1994, 1998, Almeida 1999).

Sub-spontaneous plants occurring in Portugal were essentially introduced by man, although their success does not require human intervention. Many were introduced for their economic interest, food, gardening, forestry, sand stabilization or industrial purposes (Almeida and Freitas 2001). Some of these species have overtaken the native plants in competition, replacing them, and becoming invasive. This replacement can be partial or total, depending on the propagating capacities of the invasive plants, and the more or less effective isolation of the populations of indigenous species. Some of the worst examples of species responsible for the eradication of Portuguese native flora are given by species of the genus *Acacia* (Marchante *et al.* 2003), *Hakea* and *Carpobrotus* (Souto Cruz *et al.* 1983, Pinto da Silva *et al.* 1989, Campelo 2001).

Trends

A report on the exotic flora of Portugal (Almeida 1999), other opinions (Greuter 2002) and the author's own experience in the field, show that the presence of exotic plants in Portugal has increased probably more than 1000 % during the last two centuries (from 33 known sub-spontaneous species in 1800), reaching nowadays the very preoccupying figure of about 500 species (considering the dimension of the country). Almost 40 % of the listed 500 species are actually or potentially invasive, including agricultural weeds and invaders of natural habitats alike (Greuter 2002), and ca. 7% are in fact considered dangerous invaders in Portuguese territory. The actual invasive species causing major problems belong to *Magnoliopsida* (*Dicotyledones*), *Leguminosae* and *Asteraceae* being the families providing the largest numbers of problematic species. Australia and Tasmania, although not the origin of the higher number of species, seem to provide the most dangerous and aggressive invaders in Portugal, including several *Acacia* species, *Hakea* and *Pittosporum* (Almeida 1999).

Legislation

Recently, Portuguese legislation has recognised the problem of invasive species (*dec.- lei 565/99)*, providing a list of the exotic species introduced, identifying the invasive ones, and forbidding the introduction of new exotic species unless proven not harmful. Although this list of species does not include all the species introduced and despite the fact that there are exceptions allowed for forestry and agricultural purposes, it is a good start to control the introduction of new invasive species. The legislative process is still being implemented and will apply penalties to the use of listed invasive species.

Presence of Invasive Plants in Portugal

In a recent work, Almeida and Freitas (2003) selected some of the exotic invasive vascular plants living in continental Portugal and which are considered to be particularly dangerous and aggressive. We have added some other species to the list and made a brief characterization of the introduction purpose and invaded habitats for each species – this is shown in Table I.

Some other exotic species present in Portugal that showed invasive behaviour elsewhere (but not yet in the country) are shown in Table II.

It is worth remembering, "*Portugal has the reputation of being particularly "rich" in aggressive alien plants and that reputation is fully confirmed[]. From Eucalyptus to Carpobrotus, many naturalised exotics work together in putting the country's rich native flora at risk*" (Greuter 2002).

Unfortunately, many of the Portuguese unique ecosystems are being invaded by exotic species and some of the native species are threatened. The size of the country should be of some help in the containment of new introductions.

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Table I. Some of the worst and more aggressive invasive plant species present in Portugal

	Purpose of introduction	Habitats invaded
Aizoaceae		
Carpobrotus edulis (L.) N.E. Br. (South Africa)	introduced as ornamental and planted to fix sand dunes and slopes	spreading mainly in coastal sand dunes, capes and next to slopes where it was planted
Apiaceae (Umbelliferae)		
Eryngium pandanifolium Cham. & Schlecht. (South America)	introduced as ornamental probably in the Botanical Garden of Coimbra	common near waterlines in the low Mondego Basin
Asteraceae (Compositae)		
Aster squamatus (Spreng.) Hieron. (America)	accidental introduction	ruderal weed, spread mainly on urban areas and in road sides
Conyza canadensis (L.) Cronq. (North America)	accidental introduction long time ago	ruderal weed, spread mainly in urban areas and on road sides
Conyza bonariensis (L.) Cronq. (South America)	accidental introduction	ruderal weed, spread mainly in urban areas and on road sides
Cactaceae		
Opuntia ficus-indica (L.) Miller (America)	introduced as ornamental and due to edible fruits	with invasive behaviour in urban areas close to places where it was planted
Commelinaceae		
Tradescantia fluminensis Velloso (South America)	introduced as ornamental	areas with some shadow and humidity; very common in the understory of managed woods
Convolvulaceae		
Ipomoea acuminata (Vahl) Roemer & Schultes (Tropical regions)	introduced as ornamental	invades by making large carpets in disturbed habitats and slopes
Haloragaceae		
Myriophyllum aquaticum (Velloso) Verdc. (South America)	accidental introduction	aquatic habitats
Leguminosae		
Acacia dealbata Link (SE Australia and Tasmania)	to stabilise slopes and as ornamental	mountain areas, roads and river margins; one of the worst invasive plant species in Portugal nowadays
Acacia melanoxylon R. Br. (SE Australia and Tasmania)	as ornamental and cultivated for forestry, as ornamental and for shadow	along roads, and mountain areas adjacent to where it was planted
Acacia longifolia (Andrews) Willd (New South Wales - Australia)	to stop coastal erosion and as ornamental	mainly in coastal areas (sand dunes and some capes) and along rivers
Robinia pseudoacacia L. (eastern North America)	introduced for forestry, as ornamental and to soil stabilization	near rivers and roads; pinewoods and disturbed lands
Oxalidaceae		
Oxalis pes-caprae L. (South Africa)	probably introduced as ornamental	spreads all over the country, specially in loamy soil
Pittosporaceae		
Pittosporum undulatum Vent. (Australia)	introduced as an ornamental tree and for shelter	managed areas where it was initially planted as ornamental

Tabl ct	Purpose of introduction	Habitats invaded
Poaceae (Gramineae)		
Cortaderia selloana (Schultes & Schultes fil.) Ascherson & Graebner (South America - Argentina, Brazil and Uruguay)	introduced as ornamental	spreading in some dune systems and along highways
Pontederiaceae		
Eichhornia crassipes (C.F.P. Mart.) Solms-Laub. (Tropical South America – Amazon River basin)	introduced as ornamental	water-courses and lagoons
Proteaceae		
Hakea sericea Schrad. (Eastern Australia)	as ornamental and used to form quickset hedges	pinewoods and disturbed lands; occasionally isolated individuals in relatively well preserved places
Hakea salicifolia (Vent.) B.L. Burtt (SE Australia and Tasmania)	as ornamental and used as wind break especially near the coast	mainly in coastal areas (sand dunes), in some mountain areas where it was planted and in disturbed lands
Simaroubaceae		
Ailanthus altissima (Miller) Swingle (China)	introduced as ornamental	spread mainly in urban areas and in road sides

Table II. Examples of species considered invasive in other countries but not yet in Portugal although they have been introduced.

Verbenaceae		
Lantana camara L. (America)	Introduced as ornamental	occasionally escaped from gardens where it was planted
Leguminosae		
Sesbania punicea (Cav.) Benth. (South America)	Recently introduced as ornamental	observed germinating spontaneously in some places near cultivation
Myrtaceae		
Eucalyptus globules Labill (Australia)	Introduced for forestry	observed germinating spontaneously in some places near cultivation

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Recalcitrant rats - or how administrative cooperation could kill rats

Chafarinas islands (35º20'N, 2º25'W) are an important reserve for several seabirds: Audouin's gull and Cory's shearwater in Western Mediterranean. Although a few nautic miles offshore Morocco coast they're administrated by the Spanish government. The whole area is a special protection area for birds, but the inhabited island, Isabel II (15 ha) lacks the interest of the two others: Congreso, the biggest (20 ha) and most separated and Rey Francisco, the smallest (12 ha) and very close to Isabel (scarcely 80 m at the narrowest point). Isabel holds a military base and frequent weasels and big size helicopters arrived to bring food items, construction materials and staff.

Rats are the main cause of reproductive failure to shearwaters during the first days of chicks' life, but the impact on gulls is unknown; probalbyit is smaller due to parental deffensive behaviour.

Congreso and Rey have been subject of rat control campaigns. Those operations where very extensive to avoid any non-target or secondary poisoning. Very small quantities of second generation anticoagulants (brodifacoum and flocoumafen) have been used (less than 1 kg/ha) following a pulsed baiting approach, to ensure that minimum amounts of poison are circulating at every moment. At Rey, highest densities of baiting stations (16/ha) and more accesibility to clifs have been determining factors in achieving eracitation in 1992. For more than two years, no signs of rats were recorded, confirming that rats were eradicated.

However, after this period, rats reappeared, very likely due to a reinvasion from the nearby Isabel Island. In 1999, another succesful attempt was made, and rats disappeared for almost four years. No rats were discovered even though different detection methods were used (tracks, anual trapping events, baiting in covered stations, regular sighting turns,...). After this period a dead rat was detected floating between Isabel and Rey at the end of summer 2003; tracks reappeared and in few days rats became very evident and easy to see. Reinvasions had already occured.

Future management should include also the neighbour Isabel II island. The strategy to follow should be to eradicate on both islands at the same time. In Rey, eradication is quite easy to achieve, but reinvasion into Isabel is very likely due to the cargo arrival both by ships and helicopters.

The cooperation between the two administrations (Environment and Defense) is needed, because the reinvasion of Isabel should be avoided: cargos should be inspected at the origin and on arrival; helicopters and ships should carry baiting stations permanently; commitment of both administrations should be achieved to build and maintain exclusion barriers.

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Isabel and rey Islands.
Photo: J Orueta

CONTROL PROGRAMME FOR ALIEN DUCKS IN MOROCCO

In October 2003 the IUCN Centre for Mediterranean Cooperation convened experts from Morocco, France, Spain and the UK to design a plan to eliminate North American Ruddy Ducks from Morocco. This species has spread south from the UK where it was introduced after the Second World War, to hybridise with globally threatened White headed Ducks occurring in southern Spain and North Africa. SEO/Birdlife and the Moroccan National Wetland Centre organised the meeting in collaboration with the IUCN National Committee. The UK has already killed over 2600 ducks, France 250 ducks, and Spain 100 aliens and 58 hybrids using a variety of techniques including trapping, shooting with shotguns and expert marksmen using high powered rifles. The **IUCN Threatened Waterfowl Specialist Group**, which has been leading the science on this programme over the last 10 years, laid out the international commitments made under international conventions to deal with this issue. Morocco now seeks to join the international effort to protect its own small population of White headed ducks, and those in Spain. The workshop drew up the outlines of an action plan that can build Moroccan capacity to deal with this issue, supported by the experience already gained in UK, Spain and France. The action plan envisages the development of an enabling legal environment, gathering of baseline data and information on distribution and behaviour, and the implementation of a test phase to assess how control techniques used elsewhere can be used in Morocco. The situation in this country is further complicated by the significant presence of three rare species (crested coot, marbled duck, white headed duck) which requires the use of extremely selective and rigorous control methods.

Taken from IUCN Mediterranean Office website (October 2003):
http://www.iucn.org/places/medoffice/Noticias/ruddyduck_news_en.htm

See also next pages

RUDDY DUCK CONTROL IN EUROPE AND NORTH AFRICA

The number of countries taking action against Ruddy Ducks (*Oxyura jamaicensis*) has increased significantly in recent years. By 2002, at least 12 countries in the Western Palearctic (excluding the UK) had taken some action to control Ruddy Ducks (see country accounts below). This compares with only six countries in 1999. At least 333 Ruddy Ducks and hybrids have now been controlled in five countries excluding the UK (France - 113, Iceland - 3, Morocco - 2, Portugal - 3, and Spain - 212) and a further two countries have indicated that attempts will be made to shoot birds if they occur (Hungary, Italy). Concerted eradication programmes are in operation in four countries (France, Portugal, Spain, and the UK) and one is planned in Morocco (*see page 19*).

Belgium

There are 10-20 records of Ruddy Ducks annually in Belgium, mainly relating to wintering birds in Flanders. There have been no recent breeding records and only four in total (all in Wallonia before 1993). In November 2002, the Institute of Nature Conservation produced a report on the management of naturalised waterbirds in Flanders. This recommended that:

· All captive Ruddy Ducks should be individually marked and the numbers and locations of all birds should be recorded in a centralised database.

· Trade should be discouraged and a 'list' system established for governing keeping and trade.

France

There have been up to 120 wintering birds at Lac de Grand Lieu in northern France since 1995/96. The number of Ruddy Ducks occurring in France is still increasing annually, although numbers of breeding birds are still low, with breeding records from only three sites between 1996 and 2000. A Ruddy Duck Working Group was established in 1994 and a national eradication strategy is now in place. So far, a total of 113 birds have been controlled.

Hungary

Although there are only a few records of Ruddy Ducks in Hungary, the Hungarian Government has undertaken to control birds which attempt to breed.

Iceland

Ruddy Duck numbers in Iceland are monitored closely (very few records in recent years). In September 2002, the Icelandic Institute of Natural History shot three Ruddy Ducks. It is illegal to keep Ruddy Ducks in captivity in Iceland.

Ireland

Numbers of Ruddy Ducks are thought to be increasing in Ireland. This has prompted the Irish Government to add the Ruddy Duck to the list of huntable species, with an open season from 1st September to 31st January.

Italy

The Italian Government conservation body Istituto Nazionale per la Fauna Selvatica is working with local administrations to try to control any Ruddy Ducks which appear in Italy.

Morocco

Ruddy Ducks have been resident in small numbers (up to 17) in Morocco since 1992, breeding was first recorded in 1994 and hybrids have been observed annually since 1999. Two Ruddy Ducks were shot in Morocco in 1994. In October 2002, the Moroccan Ministère des Eaux et Forêts requested that the IUCN Centre for Mediterranean Cooperation assist in the design and implementation of an appropriate control strategy for Ruddy Ducks and hybrids. A workshop on this issue was held in October 2003.

The Netherlands

Around 80 Ruddy Ducks winter in The Netherlands with most birds then dispersing in spring probably back to the UK (as there are only 4-7 breeding records per year). In 1996, the Ruddy Duck was placed under Article 54 of the Dutch Hunting Law which permits Ruddy Duck control, although no birds have yet been shot. In September 2001, the Dutch government decided to start the process of Ruddy Duck control. Initial actions are: consultation with reserve managers and provincial governments concerning Ruddy Duck shooting; and starting a consultation process with keepers of waterfowl collections on measures to control Ruddy Ducks. The aim of the control programme in The Netherlands will be to prevent the species becoming established as a regular breeding species.

Portugal

A national eradication strategy is in place and a control team operational. One Ruddy Duck and two hybrids were shot between 1995 and 2000.

Spain

Spain has a national White-headed Duck Working Group, a national eradication strategy is in place and a control team is operational. At least 123 pure Ruddy Ducks and 89 hybrids have been controlled to date.

Sweden

In Sweden, a change in legislation in July 2001 means the Ruddy Duck can now be shot all year round and their nests destroyed. The Ruddy Duck is the only bird species in Sweden that can be hunted irrespective of situation in which it occurs.

Switzerland

Although Ruddy Ducks are not yet controlled in Switzerland, the Swiss Ornithological Institute and SVS – BirdLife Switzerland have produced a proposed strategy on introduced bird species. This was to be discussed with the federal authorities in 2002. It is proposed that all Ruddy Ducks occurring in Switzerland should be killed by hunting guards of the Cantons, but that other waterbirds, especially on nationally and internationally important sites and IBAs, should not be disturbed.

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RUDDY DUCK ERADICATION PROGRAMME IN THE UK

The North American ruddy duck (*Oxyura jamaicensis*) is a native of North and South America, where it has secure conservation status. It was introduced to wildfowl collections in the United Kingdom (UK) in the 1940s, and a small number escaped from captivity and began to breed in the wild. Since then numbers have risen to over 4,000 birds (January 2003.)

As the UK population of wild ruddy ducks has risen, so has the number of ruddy ducks recorded on the European mainland. The ruddy duck hybridises readily with the globally threatened white-headed duck (*Oxyura leucocephala*); following an extensive and successful programme of work in Spain to protect the main breeding and wintering areas of the white-headed duck, this hybridisation is widely recognised as the most significant threat to the white-headed duck's long-term survival.

The UK holds the majority of the European ruddy duck population and we have a special responsibility to take action. However we have also been working with European partners to ensure complementary action is taken throughout Europe. Since the 1970s the Spanish Government and non-governmental organisations have committed major resources to the conservation of the white-headed duck. This has resulted in the protection of the majority of the Spanish wetlands used by the white-headed duck, and the banning of hunting and of the import and keeping of stiff-tailed ducks in captivity. The West European population of white-headed ducks in Spain is now estimated at around 2,600 birds.

The UK Government commissioned the Central Science Laboratory (CSL) to carry out a control trial, between 1999 and 2002, to determine the feasibility of reducing ruddy duck numbers. Three main regions were selected to represent different challenges, representative of the national situation.

Anglesey, Wales: control took place all year round, with the aim of reducing the breeding population by the maximum possible, and by a minimum of 70% within the 3-year trial. The original breeding population was reduced by over 70% within the first 12 months, and by an estimated 93% within 16 months.

West Midlands, England: control took place all year round, with the aim of reducing the immediate pre-breeding population by the maximum amount possible. Counts showed a reduction of 28% in the first 12 months, and a further 54% reduction in the second year of the trial. This represents an overall reduction of 66% in two years.

Fife, Scotland: control took place in autumn and winter, with the aim of killing the maximum number of the post-breeding population. A total of 216 ruddy ducks were killed during the 3 years.

Limited control work also took place on waters in Avon, Leicestershire, Northamptonshire and Gloucestershire.

CSL sought permission to carry out the control work on a voluntary basis, and this was granted in 52% of the 153 sites identified. Effective control by shooting proved feasible on breeding sites and on a range of sizes of post-breeding and wintering sites. Trapping was found not to be an efficient means of control – 750 staff hours spent on construction and checking of traps resulted in only 17 ruddy ducks being trapped.

The report, published in July 2002, concluded that eradication of ruddy ducks from the UK was feasible within ten years. The Government announced in February 2003 that it agreed in principle to the eradication of ruddy ducks from the UK. Since then it has commissioned further research to determine more efficient techniques of control. The results of this research will be available next spring and will inform an eradication strategy, and help to provide a more accurate picture of the timescale that would be involved.

Although control by shooting has been shown to be effective, there are sites where shooting is impossible due to public safety concerns or where permission cannot be obtained from the landowner. In these cases it may be possible to use an alternative means of control, by dipping eggs in liquid paraffin. This is 100% effective in preventing hatching, but necessarily uses considerable staff time. Further work is to be undertaken to find out whether egg pricking is a more cost effective method

In addition to this control work, and in recognition of the commitment to remove any protection of the ruddy duck under domestic legislation, the control of ruddy duck by landowners and occupiers is now permitted in England, following the issue of a general licence under section 16 of the Wildlife and Countryside Act 1981.

An update on the future eradication programme will follow in due course.

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Photo: Javier Calzada

PREVENTING A SEA CHANGE: AN ACTION PLAN CONCERNING SPECIES INTRODUCTIONS AND INVASIVE SPECIES IN THE MEDITERRANEAN SEA

Covering less than 1% of the world's oceans and hosting 7.5% of the world's known marine animal taxa and 18% of the world's known marine flora, the Mediterranean is one of the richest seas for biodiversity in the world with a high rate of endemism. Although the Mediterranean has experienced major changes in its biodiversity composition throughout its history, the increase in alien species in this sea in the recent decades is beginning to give cause for alarm.

Alien and invasive species have recently been highlighted by most Mediterranean countries as a major threat to marine biodiversity and some countries have proposed National Action Plans to prevent and control species introductions. On the regional level, it is acknowledged by the UNEP Mediterranean Action Plan that this is a major issue in the Mediterranean. The Protocol for Specially Protected Areas and Biological Diversity of the Barcelona Convention (SPA protocol) addresses the issue in one of its articles. (Barcelona Convention = Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean)

The increase of the alien species introduction rate, particularly the Erythrean invasions the opening through the Suez Canal and the severe impacts that some invasive species such as *Caulerpa taxifolia* have caused to Mediterranean native fauna and flora raised enormous awareness and concern among the Mediterranean countries. Recently, the Contracting Parties to the Barcelona Convention recommended that a Mediterranean Action Plan aiming at strengthening the Mediterranean countries' capacities to prevent and control the introduction of species into the Mediterranean Sea, and to coordinate their efforts on the subject, be elaborated.

In accordance with this recommendation a draft Action Plan has been elaborated by RAC/SPA[3] in collaboration with a group of experts representing the Mediterranean countries and several International Organisations (IMO, IUCN, etc.). It was designed to constitute a Mediterranean strategy to face up, in the short-term, the problems posed by the introduction of non-indigenous marine species. It was approved by the focal points of the SPA protocol and by the focal point of the UNEP Mediterranean Action plan in their last meetings and is likely to be adopted by the next meeting of Contracting Parties of the Barcelona (November 2003, Cattania-Italy). Its implementation is expected to start by January 2004.

This Action Plan sets up and identifies priority actions on both the National and Regional level. It highlights the lack of the data and knowledge necessary for risk assessment and the implementation of preventive and control actions, and therefore priority actions at national level are mainly directed to improve knowledge and provide information on non-indigenous marine species.

As for the regional level, considering the breadth and complexity of the problem posed by non-indigenous species introduction and considering the Mediterranean Sea as an ecological unit, the priorities of this Action Plan focus on the coordination among the countries and compiling information on a Mediterranean-wide level.

Information about marine non-indigenous and invasive species is critical and needed as a first step to plan and prioritise management responses. Within the framework of the Action Plan, a regional workshop is expected to be held to (i) take stock of available knowledge and expertise, (ii) identify gaps relative to information on marine non-indigenous species in the Mediterranean and (iii) develop guidelines for control of species introductions and a guide for risk analysis to assess possible impacts of introductions. Given the global character of the issue, these guidelines will be elaborated by Mediterranean experts in collaboration with relevant International organisations, and taking into account the provisions of the pertinent international treaties and guidelines and codes adopted on the subject within the context of international organisations.

The busy and rapidly growing maritime traffic, the growing aquaculture activities, the possible widening and deepening of the Suez Canal coupled with strong political and socio-economic pressures make a very challenging framework in which the Mediterranean countries have to deal with invasive species. This Action Plan is one of the first regional initiatives to implement WSSD recommendation to "Strengthen national, regional and international efforts to control invasive alien species, which are one of the main causes of biodiversity loss, and encourage the development of effective work programme on invasive alien species at levels".

IUCN has always stressed the need for cooperation at all levels to secure the conditions needed to prevent or minimise the risks from introductions of potentially alien invasive species and stands ready to engage with the Mediterranean countries in this challenging enterprise.

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THE PROSPECTS FOR BIOINVASION MANAGEMENT IN THE MEDITERRANEAN SEA

Alien macrophytes, invertebrates and fish are found in most coastal habitats in the Mediterranean Sea. Some invasive species have out-competed or replaced native species locally; some are considered pests or cause nuisance, whereas other invaders are of commercial value. The rate of marine bioinvasions has increased in recent decades; collectively they have significant ecological and economic impacts in the Mediterranean. Most of the alien species, originate in the tropical Indo-Pacific or tropical Atlantic (*www.ciesm.org/atlas*), and should global warming affect Mediterranean sea-water temperature, then such invasive species would gain a distinct advantage over the native biota.

The principal vectors of introduction are, in descending order of importance, passage through the Suez Canal, mariculture and shipping.

Suez Canal

The draft of the Suez Canal in 1869 was 7.0 m and its width 22 m, and it traversed a series of shallow lakes, the waters of which ranged from brackish to hyper saline. Deepened and widened several times the canal is at present between 300 and 365 m wide and its maximum permissible draught is 58 ft (*www.imsalex.com/suez_canal*). The recently announced plans by the Egyptian government to increase the canal width to 400 m and the permissible draught of ships to 72 ft by 2010 are of grave importance. An increase in canal depth will allow invasion of species whose upper depth range (as adults or larvae) did not permit passage until now, and cohorts of new invaders will gain admittance to the Levantine Sea. Unless a salinity barrier (such as an hyper saline lock) is installed in the Suez Canal, the Eastern Mediterranean countries would find their marine biota fundamentally changed. One would expect that in an age of heightened environmental concern plans to deepen the Suez Canal, which had served as a conduit for over 80% of the known alien taxa in the Mediterranean, would raise a great deal of attention, controversy and a discussion on "environmental accountancy".

Mariculture

Market-driven demands for exotic fish and shellfish created a surge in development of mariculture farming along the shores of the Mediterranean in the last twenty years. Oyster production at Thau lagoon in the Gulf of Leon is estimated at 15,600 MT (metric tons) and Manila clam production in the Venice lagoon and the Po delta was 42,000 MT in 1999. Other sources estimate mari-culture production has increased from 14,650 MT in 1992 to 82,850 MT in 1999 (*www.lifesciences.napier.ac.uk/maraqua)*. Unrestricted transport of commercially important alien oysters has also resulted in numerous unintentional introductions of alien species: 44 species of marine macrophytes alone were introduced into the Mediterranean by way of oyster farming. The past decade saw the introduction of European Union and national regulations aiming to control the deliberate importation of aliens and to limit their dispersal. However, mariculture "policies, administration and legislation are very diverse…. With a lack of specific aquaculture policy in most areas….a lack of a centralized administrative framework…..and overlapping between authorities (e.g. involvement of 11 ministries in Turkey)" (*www.lifesciences.napier.ac.uk/maraqua*).

Shipping

Over the past 20 years shipping volume has increased greatly – 33,000 vessels entered in the Mediterranean in 2001 - and it is expected to grow 3 or 4-fold in the next 20 years, providing alien species with many opportunities for shipping-mediated invasion and secondary dispersal. Fouling on ship hulls was held in check in the past 30 years by the application of toxic tributyltin-based (TBT) anti-fouling paints. With the TBT ban and increased shipping and recreational boating we chance a higher potential of inoculation and spread of alien organisms, at least till efficient alternative antifoulants are widely utilized. The urgent need to control ballast-mediated invasions following the damages caused by several economically disastrous ballast-mediated invasions prompted the maritime industry and the legislators to adopt open-ocean ballast water exchange (OOE). However, following reservations raised concerning the effectiveness of removal of harmful organisms, the Ballast Water Working Group, Marine Environment Protection Committee (MEPC) of IMO agreed that "Ballast Water Exchange should be regarded as an interim solution and that the aim is to produce safe and more effective alternative ballast water treatment options that will replace Ballast Water Exchange" (MEPC 46/3 2000). IMO is working towards the adoption of an International Convention for the

Sargocentron rubrum (Red soldier fish). Photo: B. Galil

Control and Management of Ships' Ballast Water and Sediments which would include treatment and effectiveness standards, but it will be years before it is implemented.

The Plan of implementation of the World Summit on Sustainable Development adopted in Johannesburg 2002, asks to "Strengthen national, regional and international efforts to control invasive alien species…and encourage the development of effective work programme on invasive alien species at levels". The Contracting Parties to the Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean) recommended that a Mediterranean Action Plan be adopted to strengthen the Mediterranean countries' capacities to prevent and control the introduction of species, and to coordinate their efforts. The Draft Action Plan document prepared by the UNEP-MAP Regional Activity Centre for Specially Protected Areas highlights the dearth of data needed for risk assessment and for the implementation of preventive and control actions (UNEP, RAC/SPA, 2002).

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FIRST NATIONAL CONFERENCE ON INVASIVE ALIEN SPECIES LEÓN, SPAIN. 4-7 JUNE 2003

Organised by G.E.I. Grupo Especies Invasoras with the collaboration of the University of León.

The first national conference on invasive alien species in Spain took place in León between the 4th and 7th of June 2003, under the patronage of the Global Invasive Species Programme (GISP), the Invasive Species Specialist Group of the IUCN Species Survival Commission (ISSG) and the Council of Europe. One of the goals of the conference was to launch a call for action to involve and encourage the participation of all the stakeholders (scientific community, NGOs, industries, public administrations) which could play a relevant role in relation to invasive alien species and their management.

Approximately 160 people from different Spanish universities, NGOs and public administration partici-pated in the conference, together with international experts. Throughout the conference a total of 88 papers were presented (11 main talks, 29 short communications and 48 posters).

The conference was divided into six sections:

- IAS ecology and behaviour.
- Ecological consequences of the IAS on ecosystems, habitats and species.
- Management of IAS (prevention, early detection, isolation, control, mitigation and eradication).

- Institutional and legal frame-works related to IAS.
- IAS as indicators of pathogenic agents.
- Economic impact of the IAS.

The majority of the papers fell into the first three sections, very few in the following two and none in the section of economic impact, pointing to the urgent need of carrying out more research on this subject.

IAS species discussed included: *Dreissena polymorpha, Procambarus clarkii, Linepithema humile, Oxyura jamaicensis* and *Trachemys scripta elegans.* In the case of the flora many papers concerned the management of invasive plants (eradication and control) such as *Ailanthus altisima, Carpobrotus edulis, Carpobrotus acinamiformis, Senecio mikanioides* and *Baccharis halimifolia*. The Port of Barcelona presented two interesting papers about management of ballast water, including the strategy they are using to tackle the problem. Some of the papers related to the management of IAS in islands.

Workshop participants drew up general conclusions and recom-mendations for adressing the threats posed by IAS in Spain.

The results of "EEI 2003" encouraged the organization to plan a new conference on IAS in 2005.

Workshops

In addition to the plenary sessions, 3 simltaneous workshops were held with a focus on management and on action: Prioritisation of actions to be taken in order to build up a management strategy for the IAS between Spain and neighbouring countries, Prioritisation of actions to be taken to control IAS in the Spanish islands, Criteria to evaluate the impact of IAS.

Outputs

Outputs from the congress can be downloaded at *http://lapaginaweb.de/gei* and include:
"*Contribuciones al conocimiento de las Especies Exóticas Invasoras en España*" (book of extended abstracts, almost all in Spanish, 271 pp)
"*Anexos: Conclusiones generales y grupos de trabajo*" (in Spanish, but one of the workshop also in English, 88 pp) - contains the general conclusions of the conference as well as the reports, conclusions and recommendations from the three workshops.
In addition, some selected papers will be published in Biological Invasions very soon.

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SPANISH-PORTUGUESE COOPERATION ON INVASIVE SPECIES MANAGEMENT: A MANUAL ON THE CONTROL OF INVASIVE VERTEBRATES

Spain and Portugal hold several archipelagos with complex and characteristic biotas. In the Mediterranean, the Balearic islands are the westernmost big archipelago in this sea. In the Atlantic Ocean, Açores, Madeira and Canary Islands form the Macaronesian region, a group of oceanic archipelagos.

Humans were absent from Macaronesian islands until the 15th century, with the exception of the Canary Islands that were inhabited by northafrican tribes milleniums before the arrival of European settlers. All the four archipelagos hold unique faunas and, overall, floras. For example, half of the rich endemic Spanish flora (by far the richest in endemics in Europe) is found in the Canary islands. The Balearic Islands are of continental origin and have been frequented by navigants at least since the Bronze Age. As in the rest of Mediterranean archipelagos, its endemic fauna was extinghished in prehistoric times, but early vertebrate introductions have evolved into subspecies or belong to ancient domestic breeds.

In all four archipelagos another wave of introductions occurred in more recent times, especially in the Macaronesian region, since the colonisation by Europeans.

Lately, with the developpment of long distance transport and the tourism boom, the introduction rate has increased very quickly (pets, zoos, exotic gardens, ...).

To face this menace, the four insular regional governments (Açores, Balearic, Canary and Madeira) have cooperated in a project to obtain financial support from "LIFE" funds (European Union cofinancing with national and regional administrations or privates).

The project called "Invasive vertebrate control in Spanish and Portuguese Islands" obtained support *(LIFE2002NAT/CP/E/000014) and the following activities were developped:*

· To organise a "Symposium on Invasive vertebrate control in Spanish and Portuguese Islands". It took place in Santa Cruz de Tenerife (Canary islands) in february 2003. The information about this meeting can be seen at *http://www.gobcan.es/medioambiente/biodiversidad/ceplam/vidasilvestre/life14-simposio.html#simposio* in Spanish with some documents in English.

· To stablish a permanent network to monitor vertebrate invasions and to exchange information among the different administrations.

· To design a environmental education program that could be easily adapted to other contexts and circumstances, in order to sensibilise people and stakeholders about the invasive species problem

· To edit a "Manual on invasive vertebrate management".

· To edit a videotape on biological invasives on islands.

To obtain further information about this issue, you can consult *http://www.gobcan.es/medioambiente/biodiversidad/ceplam/vidasilvestre/life14.html*

The Manual on invasive vertebrate management was finished in october 2003 and edited in Spanish and Portuguese in paper and electronic versions.. There are three sections in this work:
The first section is a general introduction on invasive vertebrates, their effects and factors affecting or increasing invasiveness. The factors to consider when embarking on an eradication and a decision making tool are also included. T*he second section* is a review of all the exotic and invasive species and groups of species that have been detected on islands in Spain and Portugal, but taking into account the whole Mediterranean and Atlantic context. For every species, a text on general features, problematic and control measures is given. T*he third section* deals on methods used to control and to eradicate those groups of species,.

More than 800 references are quoted, many of them dowloadable from the *www* for easy consultation. The digital version allows easy consultation thanks to links inside and outside the text. The paper version consist of a series of sheets that can be changed to be updated easily.

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EXOTIC FLORA IN A MEDITERRANEAN CONTEXT. THE CASE OF BALEARIC ISLANDS (SPAIN)

The invasions of exotic species is one of the most important current threats regarding the loss of biodiversity, especially in island environments. However, situations vary widely, depending on the geographical region where the islands are situated as well as on the different habitats that can be affected by these species.

The Balearic Islands is an archipelago situated in the western basin of the Mediterranean Sea; it is made up of four main islands, the largest of which is Mallorca (3,640 km^2). The human occupation of these islands dates from many centuries before Christ, which makes it very difficult to determine exactly which is the "pre-human" authochthonous flora. However, the presence of both species of other continents as well as Mediterranean species with recent arrival on the island, makes it possible to identify a part of the flora which is unmistakably of allochthonous origin.

In recent years, and as part of a wider European research project (EPIDEMIE. EVK2-CT-2000-00074) we have focused our effort on classifying and characterising the naturalised and sub-spontaneous exotic flora on Balearic Islands. We ~~e~~have also tried out indices to value the degree of threat caused by each of these species, and the invasion-sensitivity of the islands' main habitats.

A little more than the 14% of Mallorca's whole flora is naturalised or sub-spontaneous species, but only 8.8 % could be considered as naturalised in a very broad sense, with only 1.9% being invaders in the wide sense. Nevertheless, some "dangerous" species have been detected in our flora (e.g. *Lantana tamara, Cortaderia selloana, Pennisetum* spp., *Parkinsonia aculeata*, *Abutilon theophrasti*) which could become invaders in the future. This figure is rather lower than expected and smaller than what is found on other islands, especially in oceanic ones. On one hand, it could indicate a greater resistance of Mediterranean ecosystems to the invasion of exotic species. But, on the other hand, it is also likely that there is a certain undervaluation of these species since many of them, of Mediterranean origin, could have been introduced by the humans in very ancient times (archaeophytes). At this moment we are not able to discriminate such species from those that were present before human arrival.

Phanerophytes (trees, bushes, large herbaceous plants) are the most common life form (in Raunkiaer's classification) of these allochthonous species (33.7%), followed by the annual herbaceous species (terophytes) (27.3 %). This pattern is very different compared with that of the authochthonous flora which is characterised precisely by the scarcity of phanerophytes (8.4%), especially trees, and a major proportion of terophytes (41.3%). This shows that exotic flora has not arisen from a group of plants taken at random from a wider source of Mediterranean origin, but rather that selective forces have favoured some life forms above others. Trees and other large species were likely introduced for a specific use (ornamental, medicinal, forestal), while the annual species probably arrived as contaminants of crop seeds.

There is no general morphological pattern to the allochthonous species on our island, but there is rather a whole range of forms that preferentially colonise some environment or other.

The environments most sensitive to the invasion of exotic species are, in order of importance: roadsides, dry river beds, crop fields and to a lesser extent rocky coasts, wetlands and dune systems and, unlike what happens in other island environments, very low infestation values have been found in woody communities, such as forests and shrubs. It appears that in our Mediterranean islands the most mature and stable environments seem to be exceedingly resistant to invasion, whereas the open and/or permanently disturbed habitats are the most sensitive to invasion by exotic species.

In the dry temporary streams beds, we have found a greater degree of non-native species infestation. In all probability this is due to the proximity of urban settlements to many waterways, and to the greater wetness of the soil, which makes it easier for species not belonging to the Mediterranean region to spread. It may also be due to an irregular water system regime, so typical of the Mediterranean climate, which brings about constant changes. A lot of trees in these habitat are naturalized (*Platanus* spp, *Ailanthus altissima, Populus* spp.), but climbing species (*Ipomea indica, Tropaeolum majus*) or herbaceous plants (*Mirabilis jalapa, Paspalum disticum*) are common, too.

The environments where the invading species can mean the greatest risk to the local biodiversity, are the rocky coasts and the cliffs and, to a lesser extent, the dune systems. These habitats are rich in endemisms and threatened species and have, at the same time, a very open structure, where exotic species could settle in. These environments are invaded by perennial succulent exotic species specifically adapted to semi-arid climates: *Opuntia* spp., *Agave americana, Aloe* spp. and *Carpobrotus* spp. Some of these species seriously affect the functionalism of plant communities and threatening the survival of the endemic species exclusive to these areas. The problem generated by *Carpobrotus* spp. in our rocky coasts is so important that different initiatives are being developed for its eradication, one of them with European funds from the LIFE programme carried on by the Minorca Insular Govern.

The most disturbed environments, such as roadsides and crops are colonised by a large number of herbaceous allochthonous species; many of which are from the American continent and have an annual cycle (terophytes). Most of these species develop their biological cycle during summer and at the beginning of autumn, a time in which most of herbaceous Mediterranean flora is in a latent state

(bulbs, seeds, etc). These plants make most of the seasonal "vacuum", which is characteristic to the Mediterranean: they occupy the same area as local species but alternating in time. Many of these species belong to the *Asteraceae* familie, frequently dispersed by wind, (*Aster squamatus, Conyza bonariensis, C. sumatrensis*), *Amaranthaceae* (*Amaranthus blitoides, A. retroflexus, A. hybridus*) and *Euphorbiaceae* (*Chamaesyce postrata, Ch. serpens*, etc.). These weeds are not usually considered invaders since their capacity to colonise non-disturbed natural environments is low, and their time of flowering does not seem to impede the development of Mediterranean flora, except for some important exceptions like *Oxalis pes-caprae*, which flowers in winter and invades cereal fields.

Many of the exotic species already introduced in the Balearic Islands do not behave like invaders and have little effect on the natural environment. A few, however, cause change and degradation of the environment. For this reason, and with a view towards future management plans, we believe it is necessary to focus the effort towards three basic points:

1.- To develop a prevention plan (Early Warning System) to avoid the entrance of potentially dangerous new exotic species and the spread of potential invasive species.

2.- To draw up plans to eradicate the really dangerous invasive species and those in their first stages of expansion.

3.- To inform society about the ecological impacts that some garden plants can cause if they manage to settle in the natural environment.

For more information on the species mentioned, see:
http://herbarivirtual.uib.es
And for the research project, see:
http://www.ceh.ac.uk/epidemie/

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RHODODENDRON PONTICUM IN THE BRITISH ISLES

Rhododendron ponticum was first introduced into Britain in the late 18th Century. Its initial spread was due to the fact that it was widely planted in the 19th Century as an ornamental plant in gardens and parks and also in plantings for game cover in woodlands. Where conditions favoured establishment, *R. ponticum* subsequently spread from the initial planting sites. Today, *R. ponticum* is regarded as the most damaging alien plant in the British Isles causing problems for nature conservation, forestry and private landowners.

In 2002, a survey of nature conservation and forestry authorities, wildlife trusts and private landowners investigated the extent of the ecological and economic impacts of *R. ponticum* in the British Isles. About 9% of the sites managed by 187 respondents, totalling 52,000 ha, were affected by *R. ponticum*. The most affected group is forestry and consequently, the most affected habitat type is woodland followed by heath- and moorland. More than 30,000 ha were in nature reserves. For nearly all nature reserves, displacement of native species and habitat changes were both mentioned.

In 2001, 69 respondents controlled *R. ponticum* on 1,275 ha at a cost of £530,003. Adding the costs for restoration of habitats after the removal of *R. ponticum* and additional costs, e.g. for management plans, the total costs in that year add up to £670,924. Most control funds did not come from external sources. Respondents reported that 36% of their total costs were met from external sources like nature conservation grants or EU funding. For future control and restoration work 41 respondents stated financial needs of £4.5 million per year over the next five years. Important data are still missing for a complete analysis of costs and benefits of *R. ponticum*. In particular a valuation of the loss of biodiversity in affected habitats and the potential loss of timber production but also an answer to the question of whether *R. ponticum* offers recreational value during its flowering time.

An international conference on *R. ponticum* will be held in June 2004 in Sheffield and will report more research on the species. Topics of the conference will be, among others: ecology and genetics, conservation and management and also history and economics. For further information see the webpage (*http://www.shu.ac.uk/sybionet/confer/rhody*) or contact Ian Rotherham (*i.d.Rotherham@shu.ac.uk*).

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***Aliens* is the bi-annual newsletter of the Invasive Species Specialist Group (ISSG)**. Its role is to put researchers, managers and/or practitioners in contact with each other and to publish information and news of alien invasive species and issues. Contributions should focus on conservation issues rather than economic, health or agricultural aspects of alien invasions. News of upcoming conferences, reports, and news of publications are also welcome, especially where they are of major international relevance. Please send your contributions, marked "for consideration for *Aliens*" to *m.depoorter@auckland.ac.nz*

The New Zealand-based **Invasive Species Specialist Group (ISSG)** is a specialist group of the Species Survival Commission (SSC) of the World Conservation Union (IUCN). It is chaired by Mick Clout. The goals of the ISSG *are to reduce threats to natural ecosystems and the native species they contain - by increasing awareness of alien invasions and of ways to prevent, control or eradicate them.*

***Aliens-L* is a listserver dedicated to invasive species**. It allows users to freely seek and share information on alien invasive species and issues, and the threats posed by them to the Earth's biodiversity. To subscribe, send an email without a subject header to: *Aliens-L-join@indaba.iucn.org* OR *listadmin@indaba.iucn.org* with the message: subscribe Aliens-L. When you have subscribed you will receove a message with instructions for using the list. Most subscribers are English speaking, however, if you would like your message translated into English before posting it, please contact *m.depoorter@auckland.ac.nz* (we can currently deal with short messages in Spanish, Italian, Dutch, French and Arabic).

Cooperative Initiative on Invasive Alien Species on Islands. The aims of the Cooperative Initiative on Invasive Island Alien Species on Islands are: to enhance empowerment and capacity in key areas of invasive alien species (IAS) management on islands; to facilitate cooperation and sharing of expertise; to help enable local, national and regional entities to identify invasive alien species problems, work out solutions and implement them resulting in improvement in the conservation of island biological diversity. ISSG will undertake the facilitation of this initiative, in partnership with New Zealand (as a Party to Convention on Biological Diversity (CBD)) and under the umbrella of the Global Invasive Species Programme (GISP). This initiative is a recent development, and any interested individuals or institutions/agencies are encouraged to participate.

The Global Invasive Species Database is freely available on online at *www.issg.org/database* and mirrored at *www.invasivespecies.net/database.* The development of the database, and the provision of content for it, is ongoing. Priorities range from a focus on the some of the world's worst invasive species to a focus on areas where information and resources are comparatively scarce, including small-island developing states and other islands. The database has images and descriptions for a wide variety of invasive species. Records for these species include information on the ecology, impacts, distribution and pathways of the species, and most importantly, information on management methods as well as contact details of experts that can offer further advice. The database also provides links to numerous other sources of information. A major contribution is provided by IAS experts, researchers and managers who provide information or act as reviewers on a voluntary basis.

IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species *http://iucn.org/themes/ssc/pubs/policy/invasivesEng.htm*

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IUCN

The World Conservation Union

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