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CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Workshop on Invasive Alien Species on European Islands and Evolutionary Isolated Ecosystems
/
Atelier sur les Espèces invasives non indigènes dans les îles européennes et dans les écosystèmes isolés évolutivement

Horta, Azores, Portugal (10 October 2002)
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Horta, Les Açores, Portugal (10 octobre 2002)

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Proceedings
/
Actes

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The Workshop on Invasive Alien Species on European Islands and Evolutionary Isolated Ecosystems was held in Horta (Azores, Portugal) on 10 October 2002.

Participants (a list of which is enclosed as appendix 2 to this report) unanimously thanked the Portuguese conservation authority and the Regional Authorities of Azores for their warm welcome and excellent preparation of the Workshop.

The Conclusions of the Workshop are presented in the form of a draft recommendation for possible amendment by the Standing Committee to the ern Convention (page 6).

The Standing Committee:

1. is invited to thank Portuguese Government and Regional Authorities for their help and support in the preparation of the event;

2. is invited to examine and adopt, if appropriate, the draft recommendation found in page 5 of this report.

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L'atelier sur les Espèces exotiques envahissantes dans les îles européennes et dans les écosystèmes isolés évolutivement a eu lieu à Horta (Azores, Portugal) le 10 octobre 2002.

Les participants (dont une liste figure à l'annexe 2 au présent rapport) ont unanimement remercié les autorités du Gouvernement portugais et les autorités régionales des Açores pour leur hospitalité chalereuse et l'excellente préparation de l'atelier.

Les Conclusions de l'atelier sont présentées sous forme de projet de recommandation à l'attention du Comité permanent (page 9).

Le Comité permanent :

1. est invité à remercier le Gouvernement portugais et les autorités des Açores pour leur aide et leur soutien dans la la préparation de cet événement ;

2. est invité à examiner et, le cas échéant, à adopter le projet de recommandation présenté page 8 du rapport.

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PROJET DE RECOMMANDATION

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

Convention on the Conservation of
European Wildlife and Natural Habitats

Standing Committee

Recommendation No. ~… (2002) on Invasive Alien Species that threaten biological diversity in Islands and geographically and evolutionary isolated ecosystems

(to be examined by the Standing Committee on 5 December 2002)

The Standing Committee of the Convention on the Conservation of European Wildlife and Natural Habitats, in accordance with Article 14 of the Convention,

Having regard to the aim of the Convention which is notably to ensure the conservation of wild flora and fauna, by giving particular attention to species, including migratory species, which are threatened with extinction and vulnerable;

Recalling that under Article 11, paragraph 2.*b* of the Convention, each Contracting Party undertakes to strictly control the introduction of non-native species;

Bearing in mind Recommendation No. R (84) 14 of the Committee of Ministers of the Council of Europe to Member states on the introduction of non-native species, adopted on 21 June 1984;

Recalling Recommendation No. 57 (1997) on the Introduction of Organisms belonging to Non-Native Species into the Environment, and the use it makes of terms such as "native species" and "introduction", as well as to the species , subspecies or varieties to which Recommendation 57 refers to;

Recalling Recommendation No. 77 (1999) on the eradication of non-native terrestrial vertebrates;

Recalling that under Article 8.*h* of the Convention on Biological Diversity, each Party undertakes to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species;

Recalling Decision VI/23 of the 6th Conference of the Parties of the Convention on Biological Diversity, on Alien species that threaten ecosystems, habitats or species, and the definitions used in that text;

Concious of the high threat that invasive alien species cause to ecosystems, endemic species, and natural habitas in islands and in geographically or evolutionary isolated ecosystems (referred hereafter to as "islands and isolated ecosystems");

Desirous that precautions taken against the spread of invasive alien species be implemented with particular attention in islands and isolated ecosystems;

Noting that no conservation efforts are to be devoted to the protection of alien species introduced in recent historic times;

Considering that, in the case of species introduced in ancient historic times, conservation for historic and cultural reasons may be acceptable if recovery of the original ecosystems is no longer feasible, their conservation does not conflict with or preclude the primary aim of conserving and recovering the native biodiversity (impact assessment before conservation);

Noting that for these species an expansion of the range may have negative effects on native species and habitats, and should not be encouraged;

Noting substantial progress on regulation, management and eradication of invasive alien species has been achieved in Europe in the last five years;

Referring to the measures proposed in the Draft "European Strategy on Invasive Alien Species", (document T-PVS(2002) 8),

Recommends that Contracting Parties:

1. Establish special mechanisms to prohibit intentional introduction of alien species into and between islands and isolated ecosystems, without prior authorisation from a competent authority. A risk analysis and in some cases environmental impact assessment should be carried out as a part of the evaluation process;

2. Take special precautionary measures to avoid unintentional introduction of alien species to islands and isolated ecosystems, in particular through tourism, trade, travel and transport;

3. Assess the need for stricter legislation to prevent unwanted introductions between distinct regions of the same state or islands of the same archipelago;

4. Carry out a detailed inventory of alien species in insular territories, estimating, among other topics, the following:

- possible role of the alien species on native ecosystems, habitats or species,
- impact of the alien species on public health or economic activities,
- potential invasive character of the species with reference from other regions,
- time and means of arrival,
- reasons for introduction,
- distribution and trends,
- socio-economic and cultural value to people and other human-related aspects;

5: Identify, on the basis of the above information, which invasive alien species are causing severe damage to island native ecosystems, habitats or species, define priority action, and draw-up and implement plans to eradicate or control species of highest concern ; promote containment measures for those invasive alien species that cannot be technically eradicated; draw-up a precise plan for eradication of target invasive species; monitor invasive alien species and update inventories;

6. Disseminate information through appropriate networks, and national and regional clearing-house mechanisms; promote capacity building on IAS and sharing of experiences on eradication and prevention;

7. Actively support the use of native species or varieties in horticulture, afforestation, biological control, aquaculture, landscaping environmental management, erosion control, road construction and other cultural applications; consider in particular the use of incentives to increase availability of commercial stocks of native species for such purposes;

8. Collaborate with other states, bilaterally, multilaterally and through the framework of the Convention and other relevant fora, such as the IUCN ISSG islands initiative, on the issue of prevention, control and eradication of invasive alien species in islands and isolated ecosystems; inform regularly the Standing Committee on progress made on the implementation of this recommendation and of recommendations 57 (1997) and 77 (1999); promote regular exchange of information on progress or success of eradication operations;

9. Promote ecological restoration of areas adversely affected by invasive alien species in islands and isolated ecosystems, taking in consideration the need to maintain and restore ecological processes and the complex biological cycles of some species of conservation concern;

10. Promote education and public awareness on the problems that invasive alien species cause to native ecosystems, habitats and species and the need to take precautionary measures and eradication; approach relevant stakeholders in particular, horticultural, forestry, aquaculture, angling and hunter communities to look for their collaboration in the measures to avoid new introductions and in the eradication of invasive alien species; carry out specific education campaigns aimed to schools, relevant target groups and the general public; actively promote and publicise the benefits for biodiversity of preventing, controlling or eradicating IAS;

11. Promote scientific research on invasive alien species and on their role in ecological processes; improve existing databases; carry out long-term monitoring programmes;

Specific recommendations for the Macaronesian Region:

Recommends that the governments of Portugal and Spain:

12. Consider the creation of a specific framework for co-operation on Invasive Alien Species in the Macaronesian region, involving the Regional Governments of Azores, Madeira and the Canary Islands ;

13. Examine carefully the possibility to continue eradication of rabbits, rats and feral cats from small islands, islets and promote their contaiment, to avoid their impact on areas of special importance for Macaronesian endemics; examine carefully the need to reinforce actions of control and containment of plant species threatening endemic species listed in Appendix I of the convention or their natural habitats;

Recommends that Spain:

14. Take effective steps towards the eradication of the mufflon (*Ovis ammon*) from Tenerife and the Barbary sheep (*Ammotragus lervia*) from La Palma, given their high negative impact on endemic species listed in Appendix I of the Convention.

The Participants at the workshop unanimously thanked the Portuguese Conservation authorities and the Regional Authorities of Azores for their warm welcome and excellent preparation of the Seminar.

Convention relative à la conservation

de la vie sauvage et du milieu naturel de l'Europe

Comité permanent

Projet de Recommandation n° … (2002) sur les Espèces exotiques envahissantes qui menacent la diversité biologique dans les îles et dans les écosystèmes isolés sur les plans géographique et de l'évolution

Le Comité permanent de la Convention relative à la conservation de la vie sauvage et du milieu naturel de l'Europe, agissant en vertu de l'article 14 de la Convention;

Eu égard à l'objet de la Convention qui consiste notamment à assurer la conservation de la flore et de la faune sauvages, en accordant une attention particulière aux espèces, y compris les espèces migratrices, menacées d'extinction et vulnérables;

Rappelant qu'aux termes de l'article 11, paragraphe 2.*b* de la Convention, chaque Partie contractante s'engage à contrôler strictement l'introduction d'espèces non indigènes;

Ayant à l'esprit la Recommandation n° R (84) 14 du Comité des Ministres du Conseil de l'Europe aux Etats membres relative à l'introduction d'espèces non indigènes, adoptée le 21 juin 1984;

Rappelant la Recommandation n° 57 (1997) du Comité permanent relative aux introductions d'organismes appartenant à des espèces non indigènes dans l'environnement, l'utilisation qui y est faite d'expressions telles que «espèces indigènes» et «introduction», ainsi que les espèces, les sous-espèces ou les variétés auxquelles elle se réfère;

Rappelant la Recommandation n° 77 (1999) du Comité permanent relative à l'élimination de vertébrés terrestres non indigènes;

Rappelant qu'aux termes de l'article 8.*h* de la Convention sur la diversité biologique, chaque Partie empêche d'introduire, contrôle ou élimine les espèces exotiques qui menacent des écosystèmes, des habitats ou des espèces;

Rappelant la Décision VI/23 de la 6e Conférence des Parties à la Convention sur la diversité biologique, concernant «les espèces exotiques qui menacent des écosystèmes, les habitats ou les espèces» et rappelant les définitions employées dans ce texte;

Conscient de la menace grave que représentent les espèces exotiques envahissantes pour les écosystèmes, les espèces endémiques et les habitats naturels dans les îles et dans les écosystèmes isolés géographiquement et évolutivement (appelées ci-après «îles et écosystèmes isolés»);

Souhaitant qu'une attention particulière soit portée aux mesures de précaution prises contre le développement d'espèces exotiques envahissantes dans les îles et les écosystèmes isolés;

Notant qu'il n'y a pas lieu de prendre des mesures de conservation pour la protection d'espèces exotiques d'introduction récente;

Considérant que, dans le cas d'espèces d'introduction ancienne, la conservation pour des raisons historiques et culturelles peut être acceptable s'il n'est plus possible de restaurer les écosystèmes d'origine, si la conservation ne gêne pas ou n'empêche pas l'objectif premier qui est la conservation et de la restauration de la biodiversité indigène (évaluation d'impact avant la conservation);

Notant que pour ces espèces, un élargissement de l'aire de répartition peut avoir des effets négatifs sur les espèces et les habitats indigènes, et ne doit donc pas être encouragé;

Prenant acte que des progrès notables ont été accomplis en Europe depuis cinq ans concernant la réglementation, la gestion et l'éradication des espèces exotiques envahissantes;

Se référant aux mesures proposées dans le projet de «Stratégie européenne sur les espèces exotiques envahissantes» (document T-PVS (2002) 8),

Recommande aux Parties contractantes:

1. de mettre en place des mécanismes spécifiques pour interdire l'introduction intentionnelle d'espèces exotiques dans les îles et les écosystèmes isolés et entre ceux-ci sans l'autorisation préalable d'une autorité compétente. Une analyse des risques et dans certains cas une étude d'impact sur l'environnement doivent être effectuées dans le cadre de la procédure d'évaluation;

2. de prendre des mesures spéciales de précaution pour éviter d'introduire accidentellement des espèces exotiques dans les îles et les écosystèmes isolés, notamment par le biais du tourisme, des échanges commerciaux, des voyages et des transports;

3. d'évaluer le besoin d'une législation plus stricte visant à empêcher les introductions non désirables entre des régions distinctes d'un même Etat ou des îles appartenant au même archipel;

4. d'effectuer un inventaire détaillé des espèces exotiques qui se trouvent sur des territoires insulaires, en fournissant notamment les estimations suivantes pour chaque espèce concernée:

   – le rôle éventuel de l'espèce exotique sur les écosystèmes, les habitats ou les espèces indigènes,

   – l'impact de l'espèce sur la santé publique ou les activités économiques,

   – le caractère potentiellement envahissant de l'espèce avec des exemples provenant d'autres régions,

   – le moment et les moyens de l'introduction,

   – les raisons de l'introduction,

   – la diffusion et les tendances,

   – l'intérêt socioéconomique et culturel pour la population et les autres aspects concernant l'homme;

5. d'identifier, en fonction des informations évoquées précédemment, les espèces exotiques envahissantes qui causent des dommages graves aux écosystèmes, aux habitats ou aux espèces indigènes des îles, de définir les actions prioritaires et d'établir et de mettre en œuvre des programmes visant à éradiquer ou contrôler les espèces les plus préoccupantes; de promouvoir des mesures de confinement pour les espèces exotiques envahissantes qui ne peuvent être techniquement éradiquées; d'établir un plan précis pour l'éradication d'espèces envahissantes cibles, de suivre la situation des espèces exotiques envahissantes et d'actualiser régulièrement les inventaires;

6. de diffuser ces informations par le biais des réseaux appropriés ainsi que des mécanismes nationaux et régionaux d'échange d'informations; de favoriser la construction de capacités concernant les espèces exotiques envahissantes et le partage des expériences en matière d'éradication et de prévention;

7. de soutenir fermement l'emploi d'espèces ou de variétés indigènes dans l'horticulture, le reboisement, le contrôle biologique, l'aquaculture, la gestion écologique des paysages, la lutte contre l'érosion, la construction de routes et d'autres applications touchant l'environnement; d'envisager notamment le recours à des incitations pour accroître les stocks commerciaux d'espèces indigènes disponibles à ces fins;

8. de collaborer avec d'autres Etats, bilatéralement, multilatéralement et dans le cadre de la Convention et d'autres forums pertinents, tels que l'initiative du Groupe de spécialistes sur les espèces envahissantes (ISSG) de l'UICN en faveur des îles sur les problèmes de prévention, de contrôle et d'éradication des espèces exotiques envahissantes dans les îles et les écosystèmes isolés; d'informer régulièrement le Comité permanent des progrès accomplis pour la mise en œuvre de la présente

recommandation et des Recommandations 57 (1997) et 77 (1999); de promouvoir l'échange régulier d'informations sur le progrès ou le succès des opérations d'éradication;

9. de promouvoir la restauration écologique des zones d'îles et d'écosystèmes isolés endommagées par des espèces exotiques envahissantes, en prenant en compte la nécessité de conserver et de restaurer les processus écologiques et les cycles biologiques complexes de certaines espèces dont la situation de conservation est préoccupante.

10. de promouvoir l'éducation et la sensibilisation du public aux préjudices causés par les espèces exotiques envahissantes aux écosystèmes, aux habitats et aux espèces indigènes, et à la nécessité de prendre des mesures de précaution et d'éradication; de contacter les groupes directement intéressés notamment les horticulteurs, les forestiers, les aquaculteurs, les pêcheurs et les chasseurs pour rechercher leur collaboration aux mesures visant à éviter de nouvelles introductions et à éradiquer les espèces exotiques envahissantes; de mettre en œuvre des campagnes d'éducation spécifiques visant les écoles, les groupes cibles intéressés et le grand public; de promouvoir vigoureusement et de faire connaître les avantages, de la prévention, du contrôle ou de l'éradication des espèces exotiques envahissantes pour la biodiversité;

11. de promouvoir les recherches scientifiques sur les espèces exotiques envahissantes et sur leur rôle dans les processus écologiques; d'améliorer les bases de données existantes; de mettre en œuvre des programmes de surveillance à long terme;

Recommandations spécifiques concernant la Macaronésie:

Recommande aux gouvernements du Portugal et de l'Espagne:

12. d'envisager la création d'un cadre spécifique de coopération concernant les espèces exotiques envahissantes en Macaronésie, impliquant les gouvernements régionaux des Azores, de Madère et des îles Canaries;

13. d'examiner attentivement la possibilité de poursuivre l'éradication des lapins, des rats et des chats sauvages des petites îles et des îlots et de promouvoir leur confinement afin d'éviter qu'ils aient un impact sur les zones particulièrement importantes pour les espèces endémiques de la Macaronésie; d'étudier soigneusement la nécessité de renforcer les mesures de contrôle et de confinement des espèces végétales menaçant les espèces endémiques énumérées dans l'annexe I de la Convention ou les habitats naturels de ces espèces;

Recommande au gouvernement de l'Espagne:

14. de prendre des mesures effectives pour éliminer de Ténériffe le mouflon (*Ovis ammon*) et de La Palma le mouflon à manchette (*Ammotragus lervia*), étant donné les dommages très importants qu'ils causent aux espèces endémiques énumérées dans l'Annexe I à la Convention.

Les participants à l'atelier remercient unanimement les autorités de conservation portugaises et les autorités régionales des Azores pour leur accueil chaleureux et l'excellente préparation du séminaire.

II. CONTRIBUTIONS
/
INTERVENTIONS

1.

The non-flying terrestrial mammals of the Mediterranean islands: an example of the role of the biological invasion of alien species in the homogenisation of biodiversity

by
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The current diversity of Mediterranean vegetation and fauna is a result of the interactions of diverse factors, primarily the multiple biogeographical origin of the species, Pleistocene climatic changes - which produced a repeated turnover of biota - and human-induced habitat modifications, including hunting and introductions of exotic species. Effectively, the Mediterranean basin is composed of unique geographical and cultural features. There is possibly no other place in the world which has been so intensively influenced by human activity over a prolonged period as this area. Civilisations have been present continuously in this region for over 10.000 years, modifying entire landscapes, disrupting or destroying the majority of native biocenoses, and introducing many new species. Virtually no ecosystems have been left untouched. More specifically, since pre-Neolithic and early Neolithic times, the human settlers of the Mediterranean basin brought about a radical turnover between ancient and modern faunas, introducing a variety of allochthonous continental taxa. The invasion of ecosystems by exotic taxa is currently viewed as one of the most important causes of the loss of biodiversity. Although biological invasions also affected continental areas, it is above all on islands that the fossil and subfossil records offer univocal evidence of anthropogenic introductions. The fact is that on the islands the impact of extraneous elements on the unspoilt ecological system can be identified and its chronology specified with considerable precision, as a result of the evidence left and the relative rapidity of the consequences produced. The greatest result of biodiversity loss is effectively to be found on the islands, where indigenous species have often evolved in absence of strong trophic competition, parasitism or predation. As a result, introduced species also thrive in the optimal insular ecosystems which affect their plant food, competitors or animal prey. Since islands are characterised by a high rate of endemism, the impacted populations often correspond to local subspecies or even unique species. Among the most important taxa involved in the biological invasion of the islands are the non-flying terrestrial mammals. This can be seen as a consequence of the specific times and means of their natural and/or artificial distribution in insular environments.

In some respect, in the light of paleontological and zooarchaeological evidence, late Quaternary island ecosystems were quite different from adjacent continental ecosystems: the existence of endemic animal species is perhaps the most obvious example of this. Several of the fossil faunas of the Mediterranean islands differed considerably from contemporary continental faunas, and were characterised by a very low taxonomic diversity. Examples from Balearics, Corsica and Sardinia, the Tuscan archipelago, Sicily, Malta, Crete, many Aegean islands, and Cyprus are significant. Each of these mammalian compositions, even though they were represented by only a few taxa, were repeated (monotonously) on most of the islands. They, nevertheless, displayed peculiar endemic elements which differed greatly from one island to another. The most common trends of endemisation are the decrease in the size of macromammals, such as proboscideans and artiodactyls, and the increase in the size of micromammals, such as insectivores and rodents. These modifications are generally assumed to be primarily a consequence of the genetic isolation from continental populations, a quantitative and qualitative reduction in food supply, an alteration of intraspecific competition, the absence of large carnivores and, where the micromammals are concerned, also of endothermic adaptations.

Archaeological evidences hints at the appearance of allochthonous species extraneous to thePleistocene fauna in pre Neolithic-early Neolithic periods. In fact, to assess the range of the original distribution of the different species in the Mediterranean region, earlier chronologies prior to the late

Mesolithic-early Neolithic should be considered, after which improved human seafaring skills and the established commercial networks between countries enabled the artificial exportation even of wild animals, together with those already involved in the process of domestication. From this period onwards, the Mediterranean sea can be considered as a favoured route for marine penetration for the process of colonisation from the Near East towards southern Europe. It now appears sufficiently credible that up to the early Holocene, this basin increasingly represented less a barrier than a bridge, in a relatively short time promoting and multiplying the circulation of ideas, merchandise, faunal elements, and human groups, which spread into new and different environments, and, over time and in different ways, became grafted onto the authochtonous substratum. It seems that, from these times on, man began to bring with him the animals he needed as economic supplies for the colonisation of new geographical areas. Apart from Cyprus, where the appearance of wild goats has been referred to the end of the 9th-8th millennium BC, archaeological evidence for the earliest introduction of *Capra aegagrus* on Mediterranean islands exists, for example, from Crete and Youra (Northern Sporades, Aegean sea) since respectively the Pre-Pottery Neolithic and Mesolithic periods. The date of 7360+/-50 BP was recently performed by the Beta Analytic laboratory of Miami (U.S.A.) , through the C-14 dating of the goat bones provided by the lower levels of the Cave of Cyclops on Youra. Together with sheep, goats, pigs, cattle and dogs, a variety of wild species were also brought onto the Mediterranean islands, including shrews, hedgehogs, hares, mice, spiny mice, dormice, foxes, weasels, martens, badgers, cats, red and fallow deer. The introduced fauna may have then played either a direct or indirect role in the extinction of autochthonous *taxa*, producing changes to the original ecosystem which can be observed throughout the Mediterranean basin. It is not immediately apparent why man should have wanted to introduce all these animals. This phenomenon can only be explained by considering each case individually.

In the early Holocene the number of Mediterranean islands inhabited by endemic mammals was already limited to few insular complexes, including Mallorca, Corsica, Sardinia, Sicily, Crete, Armathia off the northern coast of Kasos, Tilos, and Cyprus, although there is no evidence for the occurrence of endemic fossil mammals on the Kerkennah archipelago (Tunisia).

As far as is presently known, less than a quarter of the mammalian species found in the continental Mediterranean region have been described as endemic to the area, including very peculiar elements, such as *Macaca sylvanus* L., 1758, and *Oryctolagus cuniculus* (L., 1758). The number of the endemisms drastically decreases if we consider the composition of the extant mammalian fauna on islands. And, if we look at the present non-flying terrestrial mammals of the latter territories, we can find hardly any of the endemic elements that characterised the Pleistocene faunal structures. Apart from sporadic cases, the complete absence of endemic species from the extant mammalian fauna of the Mediterranean islands is quite surprising. Recent genetic and morphometric analyses show that only a few endemic micromammals still survive on the Mediterranean islands. These refer exclusively to two species of shrew, the Sicilian white-toothed shrew, *Crocidura sicula* Miller, 1900, and the Cretan white-toothed shrew, *Crocidura zimmermanni* Wettstein, 1953, respectively dispersed on some of the circum-Sicilian islands and on Crete, and one gerbil, *Dipodillus zachariai* Cockrum, Vaughan & Vaughan, 1976, reported from the Tunisian archipelago of Kerkennah. Arguing against the formerly supposed endemicity of the Cretan and the Cypriot spiny mice, *Acomys minous* (Bate, 1906), and *Acomys nesiotes* (Bate, 1903), is the lack of any Pleistocene fossil of the genus recorded so far from the islands, whereas the genetic analyses demonstrate their vicinity to the spyny mice distributed in southwestern Asia. Thus, the Sicilian and the Cretan shrews, together with the Kerkennah gerbil are presumably the relics of the late Pleistocene endemic mammals which characterised the Mediterranean islands. Aside with these few exceptions, the extant insular fauna display virtually the same species composition. We should emphasise the fact that the repertoire of the modern species in insular Pleistocene deposits cannot be traced nor, all things considered, does it seem likely that they reached the islands by swimming, jumping onto floating logs or other so-called sweepstake routes. Today the structure of the terrestrial non-flying mammalian wild fauna of all the Mediterranean islands is balanced by the presence of carnivores. It mainly consist of an undoubtedly homogeneous composition of elements, predominantly revealing a continental origin. This is evidently influenced by the fauna of the nearest mainland and is almost exclusively dominated by continental taxa whose appearance on the islands seems to be essentially related to human intervention. Previous authors often classified many of the modern non-flying terrestrial mammals of the Mediterranean islands as subspecific geographic

forms, almost entirely on the basis of arbitrary criteria and the examination of scattered materials. Based on the data given in literature, the various subspecies are distinguished by the coat patterns, and by the size of body and skull. As is consequently understandable, this led to a multiplication of forms which now, however, demand better taxonomic and genetic definition. Throughout most of the 19th and the 20th centuries, for example, there was a widespread practice among scientific explorers of bringing home an excessive number of subspecies from their explorations of the Mediterranean islands. In this respect, we ought for example to consider the taxonomic treatment, on the part of the international scientific community, of the lagomorphs, the mustelids and the wild goats of the Aegean islands, as well as the Tyrrhenian and Cypriot mouflons, or the wild boars and the deer of Corsica and Sardinia.

The legacy of this global redefinition of the original ecological equilibrium of the Mediterranean islands performed by man since prehistoric times, and continued possibly without interruption throughout historical times, raises not inconsiderable problems of conservation and management.

First of all, in the great majority of the cases it is impossible to reconstruct the natural ecosystems of the past, eventually destroyed and lost from millennia. And in regard to the vulnerability of the ecosystems of the Mediterranean islands, it is even critical to prevent further introductions. Further on, it would be advisable, from both a scientific and a cultural point of view, to take seriously into consideration the eradication of the alien species of very recent invasion (e.g. *Myocastor coypus* in Sicily, *Mustela vison* in Sardinia). But this leaves the question of how to treat the allochthonous populations of certified ancient anthropochorous origin. These should be considered each cases individually. If, in fact, the eradication of rats, domestic goats and rabbits imported in historic times, was in many cases fundamental for the recovery of island ecosystems, several of the other anthropochorous taxa represent invaluable historic documents; images which remain fixed in time and history. Unlike the case of artistic monuments, however, here we are dealing with living organisms which interact with the environment in which they have survived since ancient times. Their protection and their study can provide an opportunity for testing a range of different evolutionary theories. While the importance of these anthropochorous populations is not comparable, from a biological point of view, to that of veritable wild populations in their natural habitat, their elevated validity as environmental entities lies in their representing singular historical and cultural documents. Nor should we overlook the fact that they constitute some of the few available points of reference for the understanding of the biological and ecological characteristics of their wild continental ancestors, by now long extinct. They therefore deserve to be protected, considering them in terms of a veritable "cultural heritage". Just as human artefacts and sites of archaeological and historical interest are subject to conservation strategies, so we must also protect the populations of animals of ancient anthropochorous origins, recognising their importance as a common heritage of humanity, the study and observation of which enable us to acquire fundamental information about the progress of man through the millennia of his process of civilisation. These populations should therefore be attributed the significance of "cultural heritage" through the application of zoological methods of research. Consequently, fundamental importance ought to be given to the results of the genetic analyses which must in any case always be assessed through a critical examination of the information derived from biogeographical and historical research. Another, and in no way secondary, aspect is the evaluation of the anthropozoological and zooethnographical importance of these populations. The latest techniques for investigating population genetics have shown, for example, that the fallow deer which still survive on the island of Rhodes (Dodecanese, Greece) are very special, being of ancient lineage distinct even from the relic populations sampled in Anatolia, the probable source of the Rhodian stock introduced in Neolithic times. The survival of this population consequently becomes charged with significance which is historic and archaeological, as well as being biological, ecological and environmental. For these reasons too, its importance has to be considered at the same level as that of a human artefact, as the dynamic testimony of ancient intervention which is still available for our evaluation and our appreciation, with all the consequences that such an estimate brings with it. We have to consider that permitting the extinction of several of the ancient anthropochorous mammalian populations of the Mediterranean islands would, from an ethical and historical point of view, effectively be tantamount to destroying an artistic or archaeological monument.

2.

Invasive Alien Species as the main threat to Azores seabirds populations

by
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The introduction, accidental or intentional, of invasive alien plants and mammals together with the intensive exploitation of natural resources as a result of colonisation, caused significant changes in the natural habitats and communities of the Azores archipelago. The chronicles of Gaspar Frutuoso dating from 1561 list 10 seabird species distributed through all the islands of the archipelago in abundant colonies. The analysis of historical chronicles from the 16th and 17th centuries indicate that the seabird populations of the Azores suffered dramatic declines following the colonisation of the islands mainly due to habitat destruction, introduction of predators and direct human exploitation. Seabird species were abundantly present in São Miguel, Santa Maria, Terceira, Graciosa, São Jorge, Flores and Corvo at the time of colonisation, namely Manx Shearwater *Puffinus puffinus* and Bulwer's Petrel *Bulweria bulwerii*. According to these historical chronicles past threats include intensive human exploitation and habitat deterioration. The significant decline in the abundance of these species in the XVI century is mentioned and related to predation by ferrets *Mustela furo*. Currently the breeding seabirds of the Azores archipelago comprise five species of Procellariiformes (Bulwers' Petrel *Bulweria bulwerii*, Cory's Shearwater *calonectris diomedea*, Manx Shearwater *Puffinus puffinus*, Little shearwater *Puffinus assimilis* and Madeiran Storm Petrel *Oceanodroma castro*), three species of Charadriiformes (Yellow-legged Gull *Larus cachinnans atlantis*, Common Tern *Sterna hirundo* and Roseate Tern *Sterna dougallii*) and one species of Pelecaniform (*Phaethon aethereus*). Although human exploitation no longer constitutes a threat to these species, habitat deterioration is a present threat and encompasses several aspects such as introduced predators. The introduction of alien mammals from continents, particularly predators has been a major factor contributing to the extinction of bird species in islands. In the Azores, the past and present occurrence of predators such as *Rattus rattus, Rattus norvegicus, Felis catus, Mustela nivalis* and *Mustela furo* has had a profound impact in the populations of seabirds, depriving ground nesting birds of using otherwise suitable breeding sites. Rats seem to be a major factor in determining the distribution of *Puffinus* sp. in the Azores. Colonies are now largely confined to precipitous cliffs and islets and it is likely that birds have either moved to such sites from more accessible areas, or that only those colonies in inaccessible sites have survived. Breeding biotopes may be the limiting factor for the present populations of small Procellariiformes and the large Cory's shearwater seems to be the only regular breeder on the main islands. Changes in the coastal plant communities mainly due to the invasion of cane grass *Arundo donax* have also resulted in major losses of suitable burrowing ground. The high levels of intraspecific and interspecific competition for nest cavities may play an important role in limiting the small Procellariiformes populations, since other potential nesting places are likely to be infested by predators. Islands seabirds populations are highly vulnerable and predisposed to extinction. However the limits of space inherent in island ecosystems, which are at the root of the vulnerability of insular forms can be, and increasingly have been, used to advantage in the resurrection of lost island populations. Islands habitats respond to management more readily than continental ones in much the same way that they can be destroyed more readily. Habitat management actions are relatively recent in the Azores. A joint project together with the University of the Azores and the Royal Society for the Protection of Birds, funded by the EU LIFE programme, allowed the Direcção Regional do Ambiente (DRA) to carry out an habitat restoration experience on Praia Islet Special Protection Area, in Graciosa. An eradication programme for introduced rabbits using poisoned bait was conducted by Wildlife Management International Ltd. and D.R.A. in 1997. The result was a total eradication followed by a quarantine and contingency plan to reduce the chances of re-infestation by rabbits or other non-native species. Debris dams were also constructed to assist in collecting soil in the erosion scars on the same islet and endemic vegetation specimens were collected on Baixo Islet, neighbouring SPA, and multiplied to re-vegetate Praia Islet and slowly remove the weed species. Results of these habitat management actions included the significant increase of the Common Tern *Sterna hirundo* breeding colony and the recovery of the Roseate Tern *Sterna dougallii* breeding colony in Praia Islet.

3.

Eradication and Control of Exotic Species on the Island of Madeira

by

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Secretaria Regional do Ambiente e dos Recursos Naturais

The **Laurissilva forest on the Island of Madeira,** priority habitat of Annex I of the Habitats Directive was recently declared World Nature Heritage under the aegis of UNESCO. This forest is the site of occurrence of multiple species in Annex II of the Habitats Directive and Annex I of the Birds Directive. The area is under serious threat due to the presence of invasive plants in particular the *Hedychium gardnerianum* which recently went into its colonization phase in new and extensive areas, the *Acer pserrdoplatanus*, the *Solanum mauritianum*, the *Ailanthus altissima*, the *Pittosporum undulatum* and the *Passiflora molissima* at the lowest level of the indigenous forest, in the transition zones to this lowest level and even in abandoned agricultural lands, which puts the **Laurissilva** forest regeneration and expansion at risk, creating points of degradation and substitution of the indigenous flora, constituting a serious threat to the equilibrium and consequential continuity of this habitat.

The ease with which these species are propagated, as referred to above, associated with local climatic conditions (with atmospheric humidity and ground humidity playing a predominant role) may be the explanation for their rapid expansion, after having overcome an apparent period of adaptation that has been under way since their introduction into the island of Madeira many years ago.

Due to the fact that the main infestations are concentrated close to watercourses, the use of chemical methods of eradication constitutes most certainly a threat both to the water and to public health. It should also be mentioned that these methods of contact and systemic herbicides used by some farmers, have not proven to be effective. On the contrary, one of the methods of eradication of these species that is completely effective is uprooting by mechanical means.

The Madeira Nature Park is in the process of developing an extensive project of eradication and control of invasive plants, both within and without the indigenous forest. This project has the support of not only EU funds, but also other international institutions such as the WWF. At the Regional level there are various institutions that are participating in this programme. Particularly noteworthy is the support provided by the Madeira Military Command and various other Regional Government institutions. Along with the monitoring and uprooting of the invasive species, the plant material is also put to good use. This project is being accompanied by studies on the dynamics of the invasions and risk assessment maps are being drawn up in association with Portuguese universities.

A project is being developed with the aim of reforestation of the areas under intervention with indigenous species outside the area of the *Laurissilva* forest (since within the forest regeneration occurs naturally).

4.

A.

Conservation of Zino's Petrel through restoration of its habitat

by
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The Eastern Mountainous Massif of Madeira Island constitute one of the most important terrestrial habitats of Macaronesia. It harbours a high proportion of endemic taxa, amongst which many threatened species can be found. The objective of the project presented here is to restore the whole ecosystem and provide the conditions to function in optimal climax state.

This applies especially to the Freira da Madeira, *Pterodroma madeira*, a priority bird species that breeds in the area. At the end of this four-year project the following results are expected: 1. Upland vegetation starting to recover; 2. Improvement of the Status of *P. madeira* population 3. Emergence of a strong public support for conservation of the area, including optimised visitor use consistent with enhancing its conservation value 4. Implementation of an effective management of the area.

In order to achieve these results the following main actions will be undertaken: 1. (*Upland vegetation starting to recover*) 1.1. Remove all existing domestic livestock from the area 1.2. Maintain the whole project area free of domestic livestock 1.3. Establish baseline to monitor vegetation response to management actions (including status of key endemic plants species) 1.4. Establish baseline to monitor the response of different fauna groups (namely birds and insects) to management actions; 2. (*Status of P. madeira population improved*) 2.1. Minimise effect of rats on *P. madeira*; 2.2. Minimise effects of cats on *P. madeira*; 2.3. Ensure threats to *P. madeira* from egg or skin collectors are minimised; 2.4. Better understanding of dynamics and impact of alien species on upland ecosystem and control methods; 2.5. Ensure level of knowledge about *P. madeira* improved to help refine further conservation work on the area. 3. (S*trong public support for conservation of the area reached*) 3.1. Increase public and institutional support for conservation of the area; 3.2. Implement programme of visitor activities); 4. (*Management of the area effectively implemented*) 4.1. Assess area features; 4.2. Develop and implement a management plan.

The project is co - funded by the (i) EC, through a Life project, (ii) by Fauna and Flora International and (iii) the Regional Government of Madeira, trough the Secretaria Regional do Ambiente e Recursos Naturais.

B.

Control of introduced predators and herbivores to protect critical species: the case study of the Freira da Madeira

by
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Background information

The Freira da Madeira *Pterodroma madeira* is a burrow-nesting seabird, endemic to the island of Madeira, is listed as "endangered" (Collar and Stuart, 1985; Groombridge, 1993) and classified as "critical" by Collar *et al.* (1994). It is included in Appendix 1 of the EU Wild Bird Directive .

The present known status of Freira da Madeira population is between 30 and 40 breeding pairs, with a breeding area restricted to the mountains of Madeira. Breeding occurs between March and October in burrows on vegetated cliff ledges. Currently, five breeding ledges are known. The species' present conservation status is attributed to predation by introduced mammals, namely Black Rats *Rattus rattus* and feral cats *Felis catus* and the loss of habitat mostly due to overgrazing.

In 1986 conservation efforts were started with the objectives of monitoring the population size and productivity of Freira da Madeira, controlling mammalian predators around the breeding ledges and mitigating habitat degradation caused by sheep and goats in the area. Since 2001 a very wide habitat and species recovery project was started with funds from a EU Life programme.

C.

Restoration of the terrestrial habitat of Selvagem Grande

by
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The Selvagens Islands are located between 30º 01´ 35" North and 30º 09' 10" North and 15º 52' 15" West and 16º 03' 15" West.and represent an example that is remarkably representative of the ecological and biological processes occurring during the development of land and marine animal life ecosystems and communities. Due to a rare combination of a variety of factors – namely geographic location, isolation and very difficult colonization conditions – they contain habitats that are particularly representative and important for the conservation *in – situ* of the biodiversity, particularly of species that are vulnerable worldwide.

In the past *Selvagem Grande* was subject to some introductions that can put its valuable natural heritage at risk, being this the reason why the project "Restoration of the terrestrial habitat of *Selvagem Grande*" is under way. The action contemplate in this eradication programmes involves fundamentally the Tobacco plant *Nicotiana glauca*, the mice *Mus musculus* and the rabbits *Oryctolagus cuniculus.*

The eradication of the tobacco plant is being done by mechanical means while the mice and rabbits are being poisoned. A major component of practicability of an island eradication campaign is an assessment of risk to non target species, especially vertebrates, and whether mitigation actions can reduce any perceived impacts. Several important species of bird and reptile were identified as potentially being at risk from control operations and specific measures of protection were taken.

5.

Alien wildlife, isolation and islands in Finland

by

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As a part of northern Fennoscandia, the Finland can be considered at least partly as an evolutionary isolated ecosystem. This is because in evolutionary terms the present Fennoscandia is young: the last glaciation ended only 10 000 years ago, and, moreover, the Baltic see seems to hinder the spread of e.g. many mammals.

Bearing this in mind we can conclude the following. Two contradictory features may influence the establishment of non-indigenous species in Finland. On one hand, the harsh climate prevents invasion of most southern species. On the other hand, the relatively low number of species in Finnish ecosystems allows new species to establish themselves quite easily – if they are physiologically adapted to northern conditions.

In game introductions made to Finland, a high success rate (85 % of the species introduced have established themselves) has been found. This resembles the 100% success rate of mammal introductions into Ireland and Newfoundland, and reinforces the fact that the success rate can be much higher than the general "tens" rule by Williamson & Fitter. One obvious reason for the success of game introductions in Finland is that the species have been selected on the basis of their natural distribution, hence species adapted to cold climate.

In Finland, true islands are represented by the SW archipelago. Here mink and raccoon dog are affecting indigenous biota. The mink predation can be especially heavy on e.g. black guillemot and razorbill which have not been adapted to this kind of predator. The raccoon dog is suspected to have diminished common frogs in the archipelago since the frogs are so scarce in raccoon dog diet although they should be abundant on the islands.

A mink control program in outer archipelago in SW Finland has further emphasized the importance of mink predation on certain waterfowl. In mink control areas, the tufted duck, velvet scoter and shelduck numbers clearly increased compared to control areas after mink removal.

A control program on alien predators started in 2002 also in urban birds wetlands in the mainland. Mainland control programs has not generally worked well. The wetlands in the ongoing study are partially isolated, however. And, one could hope that the control would be more effective since the wetlands are not so easily recolonized by the predators.

6.

Azorean introduced plants: global characterisation and a study case - *Clethra arborea Aiton* (*Clethraceae*)

by

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ABSTRACT

The Azores Archipelago, comprising nine relatively young oceanic islands, located at a considerable distance from colonisation sources, is a very interesting region for the study of biological invasions. The islands present some variation at their geographic, physical and human descriptors. Alteration of the Azorean native ecosystems was caused by way of their direct use as a resource, but also by their replacement by farmland, leading to changes not only in the vegetation but also on soil and hydrology. The Azorean native vascular flora is relatively poor in number of species, although it is considered as a relict flora of the Tertiary with a high similarity regarding the flora of Madeira. Many plant species were deliberately introduced as agricultural crops, animal fodder, medicinal herbs, for fibre, as ornamental and hedgerow species, and for forestry. In this work we present: 1) a characterisation of the Azorean introduced vascular flora; 2) the results of a random survey for vascular plant invaders in the Archipelago; 3) a study case of a plant invader, *Clethra arborea*.

1. The percentage of introduced plants in the Azores (68,9%) is relatively high, even for an island flora, and is clearly higher than that for mainland Portugal. A possible explanation for this result is the considerable island surface where native vegetation was cleared and replaced by agricultural systems, largely composed of introduced species and weeds. The majority of the introduced taxa present a wide geographic distribution, and many are considered as weeds in other regions. In general, families and genera contributed with a reduced number of introduced taxa, although some exceptions occur, namely in Poaceae and Fabaceae. Significant correlations were found between the percentage of introduced taxa per island and some geographic descriptors: human population density (positive correlation), percentage of the island surface with native vegetation, and the altitude (negative correlations).

2. A random sampling of introduced vascular plants in the Archipelago allowed the definition of the most frequent and abundant taxa globally and per island. Several taxa were common in all the islands (*Pittosporum undulatum, Hedychium gardnerianum, Arundo donax, Mentha suaveolens, Paspalum dilatatum,* etc.), but some differences were also detected between islands. As an example, *Agave americana* is very common in Santa Maria, *Solanum mauritianum* is common in São Miguel and Terceira, *Gunnera tinctoria* and *Leycesteria formosa* are common in São Miguel. Introduced vascular plants are common in marginal habitats, but also in pastures and in crops. Several introduced species are invading coastal vegetation, coastal scrub, wetlands, native shrub/forest stands, and some are a threat to the native ecosystems. The survey allowed the detection of plant invaders that are still scarce in some of the islands, and that should be readily controlled to avoid further spread. Species already considered as noxious in some of the islands should be contained in order to avoid dispersal to the other islands.

3. *Clethra arborea* is a tree endemic to Madeira and extinct in Tenerife island, which is presently invading different plant communities in São Miguel island, where it is considered as naturalised since the 1960's. Although considered as an important food resource for the endemic bird *Pyrrhula murina*, *C. arborea* might cause, in the long run, a negative impact due to competition with native plant species. This tree was studied as a simplified model of plant invader, since native and invaded habitats are similar. It is an exception to the general type of invader, presenting a very restricted distribution. The following hypothesis were suggested to explain the success of *C. arborea* in São Miguel, i) it is a gap replacement species; ii) it profited from the transition from a tree-type community in Madeira to a

shrub-type community in São Miguel; iii) the set of natural enemies controlling the plant in Madeira is lacking in São Miguel.

In Madeira island *C. arborea* is found in the cloud zone forest, the laurissilva, from 400 m upwards in the south and from 200 m upwards in the north, reaching 1500 m. In São Miguel *C. arborea* was found in pockets of high altitude native vegetation, from 400 to 1000 m, but also in wooded bogs, river valleys and water-stream shores, along forest margins and roadsides. There was a difference in the structure of the vegetation associated with *C. arborea* in the two islands, a shrubby community in São Miguel, a tree-like community in Madeira. Differences were found in upper and lower canopy heights, and in basal diameter, between vegetation from both islands.

Growth studies of different basal diameter classes suggest that *C. arborea* presents a stage of rapid vertical growth, followed by branching and beginning of reproduction.

In late Autumn the number of seeds per fruit is at a maximum, but this number rapidly declines in the following months. Observations in Madeira suggest that seed production per fruit is higher than in São Miguel.

C. arborea shows a relatively stable seedling and sapling bank on safe-sites in the forest - bryophyte cushions and small vertical slopes in the forest floor.

C. arborea seed traits, namely reduced size, thin testa, anemocory, differ from those of native shrub/tree taxa. Seeds showed a positive response to light, and germinated at temperatures of 10°C or above, on bryophyte cushions or open soil, but not on leaf litter, and they kept their germinating ability for two years. The seed germination traits, namely a positive response to light, support our hypothesis according to which it is a gap replacement species.

In laboratory studies, *C. arborea* seedlings showed an higher biomass allocation to the leaves than the native shrubs. *C. arborea* showed a relatively high specific leaf area when compared to the native species. Under low light intensities *C. arborea* didn't grew faster than native species, and differed by its leaf traits. In competition experiments, with higher light intensity, *C. arborea* kept its biomass allocation pattern, and showed a high relative growth rate. These results, which are similar to what was found for invaders in Hawaii, support the hypothesis according to which *C. arborea* is a gap replacement species, which might have profited from a lower stature of the invaded forest.

In both islands *C. arborea* is infected by leaf fungi. Regarding phytophagous insects, several defoliators were found, especially in Madeira. Seed predators were also found both islands. It was not possible to explain the success of *C. arborea* in São Miguel only based on differences in natural enemies between the two islands.

C. arborea trees might be controlled by a cut stump method with application of low concentration of triclopyr or imazapyr. Saplings and young plants might be controlled by up-rooting. A management strategy for *C. arborea* in São Miguel should be integrated with the production of native species, the protection of native communities, control of other invaders, and the establishment of a system to prevent dispersal to other Azorean islands. To avoid further spread, *C. arborea* should be eradicated from the western part of the island and controlled along roads, water-streams and wood margins. In a later stage, large-scale control actions should be essayed at conservation sites.

This study case of a biological invasion from one island to another should be used in education programs, increasing the awareness towards biological invasions and conservation.

7.

RABBIT ERADICATION ON THE ISLET OF MONTAÑA CLARA

(Lanzarote, Canary Islands)

by

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Montaña Clara is a small islet (1.3 km^2) situated about 8 km to the north of Lanzarote. In the south there is a sandy plateau while the northern half is occupied by a very steep volcano (256 m a. s. l.) with its crater opened to the sea. Rains are scarce (100-200 mm/year) but sometimes can occur torrentially at autumn or winter. The vegetation is the typical of the dry lowlands of Lanzarote (*Chenoleoides tomentosa*, *Suaeda vera*, *Lycium intricatum*, *Euphorbia balsamifera*, *Launaea arborescens*, etc.).

The islet is protected by the Canarian Government as an Integral Nature Reserve inside of a Natural Park and also considered a SPA by the European Birds Directive. Montaña Clara is uninhabited and access is forbidden but in the past it used to be visited by fishermen to collect shearwaters, limpets and crabs.

Montaña Clara has high biodiversity importance harbouring seabird colonies (*Calonectris diomedea*, *Puffinus assimilis*, *Bulweria bulwerii*, *Hydrobates pelagicus*, *Oceanodroma castro*, *Pelagodroma marina* and *Larus cachinnans*), birds of prey (*Falco pelegrinoides*, *F. eleonorae*, *F. tinnunculus*, *Pandion haliaetus* and *Tyto alba*) and endemic reptiles and mammals from the eastern islands (*Gallotia atlantica*, *Tarentola angustimentalis* and *Crocidura canariensis*). Also, *Anthus berthelotii* and *Corvus corax* are breeding species and the islet is visited by numerous migrant birds.

Like many other islands of the world, rabbits (*Oryctolagus cuniculus*) were introduced in the Canaries soon after its conquest. Historical references indicate that this lagomorpha was liberated at Montaña Clara before 1584 and perhaps in the XV Century.

Rabbits were known to damage vegetation, accelerate erosion and to affect the nesting places of seabirds. Eradication on the islet started on July 2000 as part of the Life project entitled "*Restoration of the islets and the cliffs of Famara (Lanzarote Island)*", and developed by the Cabildo Insular de Lanzarote.

Rabbits have been eradicated from numerous islands (Philip Island, Round Island, Bowen Island, etc.) using several techniques (virus, poison, trapping, predators and shooting).

Our project was carried out by live capture of rabbits. Four persons, staying 15 days a month on the islet, set progressively a total of 333 traps: 145 Tomahawk and 188 self-designed traps. The last ones were wire netting cages with a one way door that can catch more than one rabbit and were built of different size. At difficult places traps and material were transported by helicopter. Traps were baited with several foods but mainly with apples.

A total of 127 rabbits were captured and the last one being caught on May 2001. The team continued on the islet until January 2002 without finding any sign of rabbits. Between November 2001 and January 2002, when most of the seabirds have left the colonies, trained dogs were transported to the islet.

To be certain the objective has been reached, periodic visits for monitoring are planned during the period 2002-03. First of them took place on June 2002 and again no evidence of rabbit presence was found.

A total of 144 individuals of non-target species (*C. diomedea*, *F. tinnunculus*, *L. cachinnans* and *Sylvia communis*) were captured during the trapping period. All of them, except two Cory's Shearwaters that resulted dead, were liberated without any problem.

Trapping alone have been rarely used to remove rabbits and there is not any island the size of Montaña Clara where rabbits have been eradicated by this method. However, if future monitoring proves that the eradication has been achieved, our project shows that this technique, although expensive, can be carried out successfully with little damage to non-target species. However we have to consider that Montaña Clara with a density of 0.95 rabbits/ha is one of the lowest values of the world.

Finally we believe that the commitment of the people involved in the project has been essential in the eradication.

8.

Rat predation on seabirds and control measures in Chafarinas Islands

by
Jorge F. Orueta,
With the contribution of
M. Igual, T. Gómez, G. G. Tapia & L. S. Mármol.

The Chafarinas archipelago (35º 20' N, 2º 25' W) is located 2,5 miles from the Mediterranean coast of Morocco. Congreso, Isabel II and Rey Francisco, total 50 ha. The islands lack fresh water and dry halophytic, xerophytic and nitrophilous vegetation (*Salsola, Lycium, Atriplex,* etc) cover their surface. Only Congreso (20 ha) and Rey Francisco (12 ha) are of conservation concern; Isabel II is inhabited by a military garrison. Introduced species include: Black rats (*Rattus rattus*) in all three islands, Feral rabbit (*Oryctolagus cuniculus*) in Congreso and Feral cat (*Felis cattus*) in Isabel II.

Congreso has a sharp topography, with high and vertical cliffs, 137 m a.s.l. in its summit. Rey is elongated in shape and easily accessible in most of its surface, reaching only 24 m a.s.l.

This archipelago holds the second most important colony of Audouin's gull in the world. They nest both in Rey Francisco and in Congreso, with a total of around 2000 pairs. The estimated minimum population size Cory's shearwater is from 800 to 1000 pairs, all of them in Congreso Island. The islands also hold a big population of Yellow-legged seagull.

Predation by rat has been considered a limiting factor for Audouin's gull breeding, thus encouraging rat eradication campaigns. On the other hand, the breeding success of Cory's shearwaters in Chafarinas Islands was among the lowest reported for the Mediterranean colonies. Low productivity of Cory's Shearwaters has been suggested as a consequence of black rat high density.

Several poisoning operations have been organised since 1991, with a different degree of intensity. The biggest limiting factor for poisoning is the exigency to use closed baiting stations to avoid non-target poisoning. Before every operation, trials were done to assess acceptance of baits and poison and fitness of baiting stations. In every campaign, pulsed baiting was approached to avoid big quantities of poison being available: we allow rats to consume poison for some days and then let the poison to act. We also favoured to spread a maximum number of baiting stations, with a bigger human effort, instead of big quantities of bait in a smaller density. More abundant stations increase the probability of being detected by rats, and small quantities of bait avoid overdosing (both for the potential secondary poisoning risk and the waste of bait).

Previous to 1992 operation (before seagulls breeding season), *brodifacoum* was tested in two different formulations: paraffin blocks and small pellet chow. Similarly, four different baiting stations were tested: plastic tins, plastic pipes, wood boxes and a covered vertical feeders. Pellet bait was chosen because of big acceptance to rats and plastic tins due to easier transport and protection against humidity. Tins were set horizontal to allow entry of rats through the opening and fixed with pickets and stones. A census was made with snap-traps, what caused already a big reduction of rat population, particularly in Rey Francisco. One poisoning campaign was done before seagulls breeding season and several after it. After this operation results were spectacular in Rey Francisco island, where no rats were detected for two years. The diminution was less important in Congreso island, due to a less intensive effort because the less accessible parts were not covered with baiting stations.

In 1992, after the first poisoning campaign, a short survey on Cory's shearwater breeding success gave the understanding that it was apparently bigger than in previous years. Since 1999 a detailed monitoring of Cory's shearwater population has been done. That year, breeding success was only 0.27 chicks per nest.

In 1999, 2000 and 2001, more systematic and intensive operations were carried on. In the while, an approach to know the impact of rats on Audouin's gull was performed. The deeper knowledge of Cory's shearwater population allowed to research the effects of rat control on its breeding success.

Another intensive poisoning campaign was completed in the Islands during the winter 1999. As pellets used in 1992 were nor available in 1999, we made essays with *brodifacoum* paraffin blocks, *flocoumafen* in paraffin-cereal blocks and *diphacinone* in cereals. Paraffin-cereal blocks were retained due to high acceptability by rats and used in two types of bait stations: plastic tins, as in 1992, and plastic boxes were 45 mm holes were made to allow rats, but no other animals, to come in. Tins were scattered in the biggest and most accessible area of the islands (surface and slopes) with three bricks. In less accessible points (cliffs and small beaches), boxes were used: we need to leave bigger quantities of bait (five blocks) due to difficulties of access; the shape and smaller entry of these boxes made them even safer than tins for non target species. Nine pulses were done in tins and four in less accessible boxes. Diminution in bait consumption was very strong.

After this campaign, rats were no detected by fur traps or any other sign during 2000 neither in Congreso nor in Rey Francisco. Breeding success of Cory's shearwaters attained 0.7 chicks per nest. Nevertheless, hatching success was similar before and after poisoning campaign, suggesting that rats are not able to predate Cory's shearwater eggs. In 1999, the main cause of mortality was rat predation, as indicated by the disappearance of hatchlings aged of 2 to 7 days. In contrast, in the breeding season after intensive poisoning hatchling mortality was much lower. Differences detected among the different nuclei show how the most isolated cliffs are safer from rats.

In winter 2000 intensity of poisoning was lower, and rat managed to recover in Congreso, but not up to previous levels. Thus, *C. diomedea* productivity was 0.51 chicks per nest, between the data of the two previous years. All differences are significant, at island level and at nucleus levels. Poisoning continued in 2001's winter, but due to several incidents, Cory's shearwater breeding monitoring was impossible to be carried on, although total breeding success would be available in September. In Rey Francisco rats remained undetected in 2001 and 2002.

Factors affecting reproduction of Audouin's gull are more complex, because predation, klepto-parasitism and competence from Yellow-legged gull is intense. Nevertheless, an experiment on predation on its eggs showed that rats consume easily Audouin's gull eggs when broken, but they are deficient predators of full eggs even without parental protection.

The experience shows that black rats are inefficient seabird eggs predators in Chafarinas islands. Nevertheless, the availability of deserted eggs, in addition to corpses, provides an amount of buffer food that allows rats to attain a bigger population size and to recover after culling campaigns. Rats are able to survive even from very scarce and amazing resources, so a small number can survive and bear a huge population in a small period.

Even with strong and time consuming security measures eradication is possible in small islands. If topography is complex, more effort should be done. Detection measures should be also be maintained, overall if re-invasion is possible.

Cory's shearwater chicks has shown to be very sensible to rat predation during the first week of life, so also a good indicator of rat activity.

9.

Opportunities to prevent and manage Invasive Alien Species

by

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Invasive alien species (IAS) are recognized as one of the major causes of biodiversity loss and habitat destruction on a global scale, whereby islands are extremely vulnerable, due to their specific biogeographic situation based on their isolation. The term "island" in this context is not restricted to real islands but also includes ecosystem islands. Alien climbing vines smothering entire forests, alien ants eating everything crawling and walking, alien intruders pushing out native biodiversity, alien mammals devouring the vegetation cover on islands, alien insects spreading deadly alien viruses scary headlines heard daily in the struggle of biodiversity with invasive alien species – not from other worlds, but spread with human assistance from one part of our globe to another. Often the newly invaded ecosystems are not evolved with the alien species and do not have effective measures to control their populations. The invasive alien species cause havoc mainly through direct predation, outcompeting native organisms for essential resources, and hybridization with indigenous species. All of these can cause dramatic changes to ecosystems, especially if populations of key species are altered. In addition to these environmental problems many IAS impose enormous economic costs and impacts on human health. The rapidly accelerating human trade and travel over the past century has dramatically enhanced the spread of invasive species, allowing them to surmount natural barriers. However, not all non-indigenous species are harmful. In fact, the majority of species used in agriculture, forestry and fisheries are alien species.

Currently, Europe faces a range of extremely damaging bioinvasions. Some introduced species have an almost instant impact, e.g. diseases, but often IAS show a considerable lag phase between establishment of first populations and becoming a damaging invader. Thus, it is likely that many alien species currently established in Europe are a kind of invasive time bomb. While on other continents the importance of managing IAS is widely accepted, in most cases Europe is still ascertaining the status of IAS. One of the major goals in biodiversity preservation is the conservation or restoration of ecosystem functioning and its sustainable use. In order to accomplish this goal, alien species and their roles need to be assessed.

There are four major steps to deal with invasive alien species: 1. prevention, 2. early detection, 3. eradication, and 4. control. A pathway analysis is the basis for exclusion methods based on the different ways of introductions rather than on individual species. Prevention of introductions is the first and most cost-effective line of defence. Three major possibilities to stop further invasions exist: 1. interception based on regulations and their enforcement with inspections and fees, 2. treatment of material suspected to be contaminated with non-indigenous species, and 3. prohibition of particular commodities under international regulations. Deliberate introductions should all be subject to an import risk assessment.

Early detection of a potential invader is often crucial to eradicate a particular damaging species while populations are low. When prevention has failed, an eradication programme is the preferred method of action. Successful eradication programmes in the past have been based on 1. mechanical control, e.g. hand-pulling of weeds or hand-picking of snails, 2. chemical control, e.g. using toxic baits against vertebrates, 3. habitat management, e.g. grazing and prescribed burning, and 4. hunting of invasive vertebrates. However, in most successful cases several different methods need to be combined. Two major components of IAS prevention and management campaigns are the involvement of stakeholders and an increased public awareness about the problem.

The last step in the sequence of management options is the control of an invasive species. The aim is to reduce the density and abundance of an invasive organism to below an acceptable threshold. Generally, the same methods as used in eradication programmes can be used for control projects. Mechanical control is highly specific to the target, but always very labour-intensive. Chemical is often very effective as a short-term solution. The major drawbacks are the high costs, the non-target effects, and the possibility of induced resistance in the pest species. Additionally, a highly cost-effective, permanent, self-sustaining method for management of IAS is classical biological control. As for other methods, non-target effects need to be minimized. Integrated pest management, combining several methods, will often provide the most effective and acceptable control.

10.

Éradication d'espèces mammaliennes allochtones d'écosystèmes insulaires de 4 aires biogéographiques : Océanique tempérée, Méditerranéenne, Tropicale et Subantarctique.

Conséquences sur les populations d'espèces autochtones.

par

Mr Michel PASCAL[1]

RESUME

Depuis 1992, 13 opérations d'éradication de populations mammaliennes allochtones appartenant à 6 espèces ont été entreprises sur 11 archipels relevant de l'autorité de la France. Ces 11 archipels appartiennent à 4 provinces biogéographiques (Océanique tempérée, Méditerranéenne, Tropicale et Subantarctique).

Ces opérations ont été conçues comme des opérations de recherche - action relevant du domaine de la Biologie de la Conservation.

Pour chacune de ces opérations un document de stratégie a été constitué afin d'éclairer les prises de décision par les politiques et gestionnaires. Ce document apporte les informations disponibles permettant de fonder la réponse à une série de questions jugées a priori essentielles car devant guider des décisions relevant de plusieurs ordres :

Doit-on ou non procéder à l'opération d'éradication projetée ?

Quelle(s) stratégie(s) d'éradication adopter offrant de bons gages de succès et une forte innocuité à l'égard des espèces autochtones ?

Comment contrôler le succès ou l'échec de l'opération d'éradication ?

Quelles informations collecter sur les populations cibles afin d'en inférer les causes d'un éventuel échec ?

Quelles informations collecter sur les espèces autochtones afin d'apprécier l'impact de l'élimination de la ou des espèces allochtones cibles ?

Comment pérenniser l'éventuel succès de l'éradication ?

Ces documents ont été soumis systématiquement à l'avis des Conseils scientifiques et/ou Conseils de gestion ayant en charge la gestion des îles sur lesquelles ces opérations devaient se dérouler. En outre, certains ont été soumis pour avis et/ou approbation au Comité National Permanent de la Nature placé auprès du Ministre de L'Environnement.

C'est à la suite de cette démarche que des éradications espèces mammaliennes ont été entreprises sur 47 îles, ou îlots d'une superficie allant de 0,2 ha à 150 ha. Dans plusieurs cas, l'opération a été conduite simultanément sur un ensemble d'îles et d'îlots (cas de l'Archipel des Sept-Îles ou de l'île Lavezzu par exemple).

Pour 45 de ces sites, l'objectif a été l'éradication d'une seule espèce : 18 tentatives d'éradication du Rat surmulot (Rattus norvegicus), 25 tentatives d'éradication du Rat noir (Rattus rattus), 2 tentatives d'éradication du Lapin de "garenne" (Oryctolagus cuniculus).

Pour 2 de ces sites, l'objectif a été l'éradication simultanée de plusieurs espèces : Le Chat haret (Felis silvestris) et le Lapin de garenne sur l'île Guillou (Kerguelen), la Mangouste de Java (Herpestes javanicus), le Rat noir et la Souris domestique (Mus musculus) pour l'îlet Fajou (Guadeloupe).

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Sur l'ensemble de ces opérations, 3 échecs ont été enregistrés : l'éradication du Rat surmulot sur l'île de St. Riom et ses 6 îlots périphériques pour de claires raisons techniques, l'éradication du Rat noir sur les îlets de St. Anne (Martinique) et sur l'Îlet Fajou en Guadeloupe pour des raisons non encore établies. Ces deux dernières opérations sont actuellement poursuivies.

La nature et l'importance de l'impact des opérations d'éradication sur les espèces non-cibles ont été établies pour chaque opération. Jugé mineur, cet impact a essentiellement porté sur la capture d'oiseaux par les ratières. La majorité de ces oiseaux a été libérée en bon état.

L'impact de l'opération d'éradication sur les espèces autochtones a été apprécié post-éradication par :

- Le suivi d'indices d'abondance,
- Le suivi de l'effectif de couples nicheurs,
- Le suivi du succès de reproduction,
- L'observation directe de la réinstallation d'espèces localement disparues.

Les espèces dont les populations ont été suivies appartiennent à la faune mammalienne, l'avifaune, la carcinofaune et l'herpétofaune.

À l'heure actuelle, il n'a été descellé aucun effet pervers de l'élimination de l'allochtone sur la faune autochtone.

Afin d'apprécier le risque de ré-infestation post-éradication, la structure génétique de populations de Rattus norvegicus d'îles d'un ensemble d'archipel de Bretagne a été établie. L'analyse a concerné la variabilité de 10 micro-satellites parmi les plus variables connus pour l'espèce, chacun étant porté par un chromosome différent. Un premier résultat, établi pour les seules îles de l'Archipel de Molène - Ouessant et leur proche continent, a montré un très fort effet fondateur pour chacune des populations insulaires et l'absence de flux de gènes inter-îles et entre les îles et le proche continent. Cette analyse est actuellement étendue à l'ensemble des populations des îles bretonnes qui ont fait l'objet d'opérations d'éradication. Les premiers résultats confirment les conclusions de la première étude. Ce type d'analyse va être étendu aux populations de R. rattus dans le cadre d'une démarche comparative.

11.

Invasive species on islands: the need for global cooperation

by

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Problems and opportunities.

Invasive alien species (IAS) arguably pose the greatest threat to biodiversity on islands and other isolated ecosystems. Islands typically have a high proportion of endemic species and are vulnerable to biological invasions. For example, of all recent bird extinctions that have occurred on islands, over 54 % have been attributed to invasive alien species. Islands often have high proportions of threatened species and island people typically rely heavily on natural resources for economic and cultural purposes. On the other hand, islands also present special opportunities for the prevention of invasions and the containment, eradication or control of existing invasive species. For example, many successful eradications have now been achieved on islands, even of invasive species that had been established for over a century. Over the past 30 years invasive mammals, in particular, have been eradicated from an increasing number of larger islands. Important progress is also being made with management of invasive plants and invertebrates. Several case studies in eradication of invasive alien species were reported at last year's international conference on this subject. The proceedings of this conference " are about to be published by IUCN as a 400 page volume, entitled "Turning the tide: the eradication of invasive species" (eds. C.R. Veitch, M.N. Clout).

Given the successes with eradications, and the opportunities on islands for prevention of further invasions, there is an urgent need to raise awareness and to provide the means for sharing technical IAS expertise between island countries and countries with islands. We should avoid 'reinventing the wheel' in different countries around the world and encourage global cooperation to make further progress in building both local and collective capacity to deal with invasive species on islands. This idea was the impetus behind the concept of the 'Cooperative Initiative on Invasive Alien Species on Islands', which has recently been launched by the IUCN/SSC Invasive Species Specialist Group (ISSG).

Relevance to the Convention on Biological Diversity

The Convention on Biological Diversity (CBD) has repeatedly recognised the very urgent need to deal with invasive alien species in isolated and vulnerable ecosystems. . At its April 2002 meeting in The Hague, the Sixth Conference of the Parties to the CBD endorsed the international cooperative initiative on IAS on islands developed by New Zealand, the IUCN Invasive Species Specialist Group and the Global Invasive Species Programme. It called on the Global Environment Facility (GEF), Parties, Governments and relevant organisations to support and participate in it.

"Seed" funding for the first year (for a pilot phase focusing in the South Pacific) has since been provided by the New Zealand Government and the Pacific Development and Conservation Trust.

Goal and objectives of the Islands Initiative

The goal of the Cooperative Initiative on Island IAS is to '*conserve island biodiversity by building capacity to manage invasive alien species on islands*'. The initiative will contribute to capacity building by facilitating cooperation and the sharing of expertise internationally, so that island communities can manage the impacts of IAS.

The initative recognises scope for international cooperation in:

- Prevention of new invasions
- Eradication of invasive alien species
- Control of IAS (where eradication is not currently feasible)

The key objectives of the initiative can be summarised under four headings:

- Making better use of existing information
- Sharing knowledge and skills internationally
- Systematically developing better techniques
- Building local and regional capacity

Specific actions proposed under these objectives are listed below:

1) Making better use of information:

- Load existing data on island IAS into the Global Invasive Species Database
- Develop an international register of expertise on island IAS

2) Sharing knowledge & skills

- E-mail based exchange of information via Aliens-L listserver (already 600 subscribers)
- Provide technical advice and support to selected IAS management projects
- Establish peer review system for new projects
- Facilitate emergency response for dealing with new incursions
- Promote cooperation between island states on IAS management projects

3) Developing better techniques

- Improve methods for eradicating IAS on islands
- Improve screening and quarantine systems
- Improve early detection of alien species
- Improve safe and sustainable control methods which minimise non-target effects

4) Building local and regional capacity

- Provide training in IAS management activities
- Facilitate exchange of expert personnel between countries with islands
- Encourage the identification of in-country IAS management capacity needs

Potential participants in the initiative include:

- Countries with islands
- People with skills
- Donors
- Affected local communities

European nations and NGOs can have a role at all of these levels. Many European countries have islands (including affected local communities) and several have people with skills in managing invasive alien species. Some nations and NGOs are also capable of playing a role as donors, to help this initiative develop both regionally and globally.

Contact details

Further information on the 'islands initiative' is available from the following sources:

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Global Invasive Species Database

www.issg.org/database

12.

Alien marine species in the Mediterranean
- or leaving the door open while closing the windows

By

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Introduction

Much attention has recently been given to the prevention of the introduction of marine alien species some of which are invasive and cause problems to the ecological balance. This interest is highlighted and is reflected in recommendations of many bodies. The first meeting of Experts on Marine and Coastal Biological Diversity of the Convention on Biological Diversity (CBD), in Jakarta, 1997, highlighted the issue by including it as one of the five main issues of concern. The Bern Convention and the Barcelona conventions are showing concern on this issue and so has the IMO and the Global Environment Facility (GEF). Much has been done towards eliminating or at least minimising the introduction of alien species. Much, of course, remains to be done.

The purpose of this paper is to identify what is seen as a major threat if not the major threat to ecological equilibria in the Mediterranean. This is the introduction of Indo-pacific species into the Mediterranean through the Suez canal. The canal was man-made and it is therefore an inescapable conclusion that the species coming through the canal, and many have, are introductions. If the canal was to be constructed today any environmental impact assessment study would undoubtedly highlight the dangers posed by the connection of the Red Sea and the Mediterranean and propose measures for controlling the migration of species through the canal. As this migration is ongoing it needs, therefore, to be addressed in the same way.

Background

The Mediterranean, as we know it to day, was formed about 5.3 million years ago. At that time movements in the earth´s crust opened up the Gibraltar straits enough for the Atlantic waters to fill the enormous salt depression that was the more or less dry Mediterranean basin. In parts this was a few kilometres below the level of the Atlantic Ocean. This water brought with it living organisms that were the precursors of today's Mediterranean marine fauna and flora.

The Gibraltar straits, until the opening of the Suez canal, formed the Mediterranean´s only link with the other oceans. Through it entered many species of fish and other marine animals. Evaporation exceeded, as it does now, the fresh water inflow into the Mediterranean maintaining a steady current from the surface Atlantic into the Mediterranean. This current continued bringing into the Mediterranean species from the Atlantic that went on colonising this sea, as its environment changed through geological times. This colonisation is natural and part of the evolution of the Mediterranean ecosystem. With the advent of the last major ice age, about 40,000 years ago, the Mediterranean started warming up. Marine turtles for example colonised this sea about 10,000 years ago when this sea warmed up enough to sustain nesting on its beaches.

Today´s Mediterranean is characterized, as a result of its morphology and hydrography, by a rather low productivity. The Atlantic water that enters the Mediterranean through the Gibraltar straits mainly follows the north coast of Africa, with various branches on the way, and reaches the East Mediterranean. Water travels mainly in an anticlockwise rotation in the Levantine basin. On the way to the East Mediterranean nutrients enter various life cycles and are either landed as fish or sink, ultimately, to the lower layers of the sea; as a result the east Mediterranean gets what is left over and is consequently one of the most oligotrophic seas in the world.

On its way here the seawater gets not only poorer but also warmer and very salty, hence denser. In the area south west of Cyprus, in winter, this water, which is known as Mediterranean Water, cools, sinks to deeper layers and slowly moves west. Ultimately it gets out of the Mediterranean and into the Atlantic through the lower strata of the straits of Gibraltar.

The hydrography of the Mediterranean, as outlined above, is such that it does not allow, the passive at least, outflow of organisms back into the Atlantic. This has enhanced the relative isolation of the Mediterranean and the consequential evolution of many endemic species in this sea.

The Lessepsian migration

The opening of the Suez canal last century, in 1869, has led to the connection of the Mediterranean with the Red Sea. For the first time the Mediterranean´s pure Atlantic-origin fauna faced competition from invading Indo-pacific animals and plants that established themselves first in the Canal and later in the Mediterranean Sea. Several hundred species have since established themselves in the Eastern Mediterranean and the number is growing fast. This immigration, which has been named the Lessepsian immigration, after Ferdinand De Lesseps, the Frenchman that built the canal, has been the subject of many studies during the last half of last century(eg., Steinitz, 1967). These Indo-pacific species now form over 12% of the marine fauna of the East Mediterranean and 5% of the entire Mediterranean marine fauna (Fredj *et al.*, 1990; Bellan-Santini, 1992; Fredj *et al.*, 1992). Many species, some well known, such as the Red Soldier Fish and two Siganids (Rabbit Fish) are now common in the commercial fish catches of Cypriot fishermen. Many species of benthic organisms have also colonised the island (Hadjichristohorou *et al* 1997). Several other species are common in the catches of fishermen in the east Mediterranean., such as *Upeneus moluccensis* which has been replacing the more valuable local Red and Striped Mullets. The spread of Indo-pacific species in the Levantine basin seems to follow an anticlockwise pattern, no doubt following the prevailing coastal currents. Many species, some of them nuisance species (eg., some jellyfish) and some invasive (eg., *Caulerpa racemosa*) are now well established in the east Mediterranean and are spreading west. Very few Mediterranean species have managed to colonise the canal and spread in the Red Sea.

A newcomer to the Cyprus coastline can now be found on this Vermetus shelf and lower down on shallow rocky substrates practically anywhere on the island. This is a Stromb shell, *Strombus persicus (=S. decorus),* a Red Sea immigrant, that has colonised the shallow waters of the island during the last decade or so. It seems to be competing with the Mediterranean Cone Shell (*Conus mediterraneus*), which it seems to have replaced in some areas.

Recent immigrants from the Red Sea that have established themselves in the coastal waters of Cyprus include *Caulerpa racemosa* and *Stypopodium shimperi*. Both and especially *Caulerpa racemosa*, have spread in a very explosive fashion since about 1990, to cover very large areas of sea bed in many areas around the Island.(Argyrou *et al* 1997) This *Caulerpa* covers the sea bed and especially soft substrates, in a mat a few centimetres thick competing very successfully with species such as *Caulerpa prolifera* and *Cymodocea nodosa* which it replaces. Apparently this species has as yet no enemies in the Mediterranean and if its proliferation continues it is likely to revolutionise the whole East Mediterranean shallow water ecosystem, with far reaching effects not only on the native marine flora but also and perhaps more significantly, on the marine fauna of the area. The reduction for example of *Cymodocea nodosa* in the key feeding areas of *Chelonia mydas,* in the Levantine Basin, will inevitably have an effect on the survival of this species in the Mediterranean. This marine turtle feeds practically exclusively on this sea grass in the Mediterranean, at least up to its sub-adult stage. (Demetropoulos and Hadjichristophorou, 1995). *Caulerpa racemosa*, fortunately, for the time being at least, seems to have "lost vigour" and is apparently proliferating more slowly now.

Perspectives/practicalities

It is not the purpose of this paper to list the species that have come into the Mediterranean, extensive lists and related papers exist elsewhere. CIESM, for example, has now established a web-searchable database of exotic (mainly Lessepsian) species in the Mediterranean for fish, molluscs and decapod Crustacea, giving, so far, detailed information on about 280 species (CIESM 2002). The purpose of this paper is to underline the need to control this migration, the impact of which is both obvious and unpredictable, as it is obvious that whatever other measures are taken to curb the

introduction of alien species, through ballast water etc, such measures will be of little value in the end, if the door left wide open by the opening of this canal is not controlled. The canal provides not just a narrow path for alien/invasive species but a highway for them into the Mediterranean. The immigration of species from the Red Sea into the Mediterranean has, moreover, not stopped but is ongoing, as is witnessed by the flood of new records of new immigrant species in this sea. The magnitude of the problem, or perhaps better, the need to do something about it seems to have escaped the attention of the environmental and scientific community which so far has focussed on studying the immigration . Solutions to the problem may at first seem to be utopian or too expensive, but they are probably neither. Focussing on the problem will generate simple solutions. Salinity or other barriers may be feasible and do not seem to be beyond the scope of the funding capabilities of GEF or the EU for example. If no measures are taken to stop further immigration into the Mediterranean of Red Sea organisms, by creating suitable barriers to living organisms in the Suez Canal, further instability of the Mediterranean ecosystem is inevitable.

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13.

Invasive Alien Species in the Canary Islands, Spain

by
Mr Juan Luis Rodríguez Luengo, Mr José García Casanova
(Biodiveristy Service of Regional Government of the Canary Islands)
and other contributors

[Voir document T-PVS/IAS (2002) 2 addendum]

A p p e n d i x 1

Programme

Workshop on Invasive Alien Species on European Islands and Evolutionary Isolated Ecosystems

9.10 – 9.20 Welcome by Environment Regional Secretary Helder Marques da Silva

9.20 - 9.35 Opening of the Seminar by Mr João Silva Costa, President of ICN : "*Invasive Aliens Species, a major risk to biodivesity of islands and evolutionary isolated ecosystems. Legal and administrative measures taken by Portugal*"

9.35 – 9.45 Introduction to the Seminar by Council of Europe and IUCN

1st Session: Threats posed by Invasive Alien Species on islands and evolutionary isolated ecosystems, with particular attention to Invasive Alien Species affecting endemic and endangered native species

9.45 - 10.15 "*Invasive species on islands: the need for global cooperation*", by Mr Mick Clout (IUCN Invasive Species Specialist Group, Auckland, New Zealand)

10.15 – 10.40 "*The non-flying terrestrial mammals of the Mediterranean islands: an example of the role of the biological invasion of alien species in the homogenisation of biodiversity*", by Mr Marco Masseti (University of Firenze, Italy)

10.40 – 11.00 Coffee break

11.00 – 11.20 "*Alien marine species in the Mediterranean - or leaving the door open while closing the windows"*, by Mr Andreas Demetropoulos and Mrs Myroula Hadjichristoforou (Cyprus Wildlife Society and Department of Fisheries and Marine Research , Cyprus)

11.20 – 11.40 "*Invasive Alien Species as the main threat to Azores seabirds populations"*, by Mrs M. Pitta Groz, Mr J.C. Pereira et Mr A. Silva (Regional Directorate of Environment, Lajes do Pico, Portugal)

11.40 – 12.00 "*Invasive Alien Species in the Canary Islands, Spain*", by par Juan Luis Rodríguez Luengo (General Directorate of Environmental Policy of the Regional Government of the Canary Islands)

12.00 – 12.20 "*Alien wildlife, isolation and islands in Finland"*, by Mr Petri Nummi (University of Helsinki, Finland)

12.20 – 14.25 Lunch

2nd Session: Management of IAS, including prevention of arrival, control, eradication programmes and restoration

14.25 – 14.50 "*Eradication of Invasive Alien Species on island ecosystem in four biogeographical areas: Oceanic temperate (Brittany), Mediterranean (Corsica), Tropical (Martinique & Guadaloupe) and Sub-Antartic (Kergelem)"*, by Michel Pascal, (INRA, Rennes, France)

14.50 – 15.05 "*Control of introduced predators and herbivores to protect critical species: the case study of Freira da Madeira"*, by Ms Dilia Meneses (Parque Natural da Madeira, Portugal)

15.05 – 15.20 "*Rat predation on seabirds and control measures in Chafarinas Islands"* by Mr Jorge Fernández-Orueta (GENA, Spain)

15.20 – 15.35 "*Rabbit Eradication on Montaña Clara (Canary Islands, Spain)"*, by Mr Aurelio Martín (University of La Laguna, Canary Islands, Spain)

15.35 – 15.50 "*Azorean introduced plants: global characterisation and a study case* – Clethra arborea aiton *(Clethraceae)"* by Mr Luis Filipe Dias Silva (University of the Azores, Portugal)

15.50 – 16.10 Coffee break

3rd Session: Legal and institutional aspects of the IAS: key elements and priorities of a national or sub-national policy on Invasive Alien Species for the insular territories

16.10 – 16.30 "*Legal tools/Overview of existing instruments"*, by Clare Shine (IUCN Commission on Environmental Law)

16.30 – 16.50 "*Chart on opportunities to prevent and manage invasive alien species"*, by Mr Rüdiger Wittenberg (CAB International Switzerland)

16.50 – 17.50 Discussion: identification of key concepts for a possible recommendation to the Standing Committee to the Bern Convention

17.50 – 17.55 Closure of the workshop

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18.00 – 18.15 [without interpretation to French] *Video*: "*Eradication and Control of Exotic Species on the Island of Madeira"* by Mr Miguel Domingues (P. Natural da Madeira, Portugal)

20.00 Dinner offered by the Regional Secretary for Environment, Mr. Helder Marques da Silva. Hotel Fayal.

A n n e x e 1

Programme

Atelier sur les Espèces exotiques envahissantes dans les îles européennes et dans les écosystèmes isolés évolutivement

9h10 – 9h20 Accueil par le Secrétaire Régional pour l'environnement M. Helder Marques da Silva

9h20 - 9h35 Ouverture du Séminaire par M. João Silva Costa, Président de l'ICN : "*Invasive Aliens Species, a major risk to biodivesity of islands and evolutionary isolated ecosystems. Legal and administrative measures taken by Portugal*"

9h35 – 9h45 Introduction au Séminaire par le Conseil de l'Europe et l'UICN

1e Session: Menaces engendrées par les Espèces exotiques envahissantes dans les îles européennes et dans les écosystèmes isolés évolutivement, avec une attention toute particulière aux Espèces exotiques envahissantes affectant les espèces endémiques et indigènes menacées

9h45 – 10h15 "*Invasive species on islands: the need for global cooperation*", par M. Mick Clout (UICN Groupe de spécialistes sur les Espèces invasives, Auckland, Nouvelle Zélande)

10h15 – 10h40 "*The non-flying terrestrial mammals of the Mediterranean islands: an example of the role of the biological invasion of alien species in the homogenisation of biodiversity*", par M. Marco Masseti (Université de Florence, Italie)

10h40 – 11h00 Pause café

11h00 – 11h20 "*Alien marine species in the Mediterranean - or leaving the door open while closing the windows"*, par M. Andreas Demetropoulos et Mme Myroula Hadjichristoforou (Cyprus Wildlife Society et Département des Pêches et de la Recherche marine , Chypre)

11h20 – 11h40 "*Invasive Alien Species as the main threat to Azores seabirds populations"*, par Mme M. Pitta Groz, M. J.C. Pereira et M. A. Silva (Regional Directorate of Environment, Lajes do Pico, Portugal)

11h40 – 12h00 "*Invasive Alien Species in the Canary Islands, Spain)*", par Juan Luis Rodríguez Luengo (Direction Général de politique environnemental du Gouvernement régional des îles Canaries)

12h00 – 12h20 "*Alien wildlife, isolation and islands in Finland"*, par M. Petri Nummi (Université de Helsinki, Finlande)

12h20 – 14h25 Déjeuner

2e Session: Gestion des espèces exotiques envahissantes, y compris prévention des arrivées, contrôle, programmes d'éradication et de rétablissement

14h25 – 14h50 "*Eradication of Invasive Alien Species on island ecosystem in four biogeographical areas: Oceanic temperate (Brittany), Mediterranean (Corsica), Tropical (Martinique & Guadaloupe) and Sub-Antartic (Kergelem)"*, par M. Michel Pascal, (INRA, Rennes, France)

14h50 – 15h05 "*Control of introduced predators and herbivores to protect critical species: the case study of Freira da Madeira"*, par Mme Dilia Meneses (Parque Natural da Madeira, Portugal)

15h05 – 15h20 "*Rat predation on seabirds and control measures in Chafarinas Islands"* par M. Jorge Fernández-Orueta (GENA, Espagne)

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15h35 – 15h50 "*Azorean introduced plants: global characterisation and a study case* – Clethra arborea aiton *(Clethraceae)"* par M. Luis Filipe Dias Silva (Université des Açores, Portugal)

15h50 – 16h10 Pause café

3e Session: Aspects législatifs et institutionnels des espèces exotiques envahissantes : éléments clés et priorités d'une politique nationale ou sub-nationale sur les Espèces exotiques envahissantes pour les territoires insulaires

16h10 – 16h30 "*Legal tools/Overview of existing instruments"*, par Mme Clare Shine (UICN Commission on Environmental Law)

16h30 – 16h50 "*Chart on opportunities to prevent and manage invasive alien species"*, par M. Rüdiger Wittenberg (CAB International Suisse)

16h50 – 17h50 Discussion: identification de concepts clés pour une recommandation éventuelle au Comité permanent de la Convention de Berne

17h50 – 17h55 Clôture de l'atelier

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18h00 – 18h15 [sans interprétation veres le français] *Vidéo*: "*Eradication and Control of Exotic Species on the Island of Madeira"* by Mr Miguel Domingues (P. Natural da Madeira, Portugal)

20.00 Dîner offert par le Secrétaire Régional pour l'environnement M. Helder Marques da Silva. Hôtel Fayal.

Appendix 2 / Annexe 2

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