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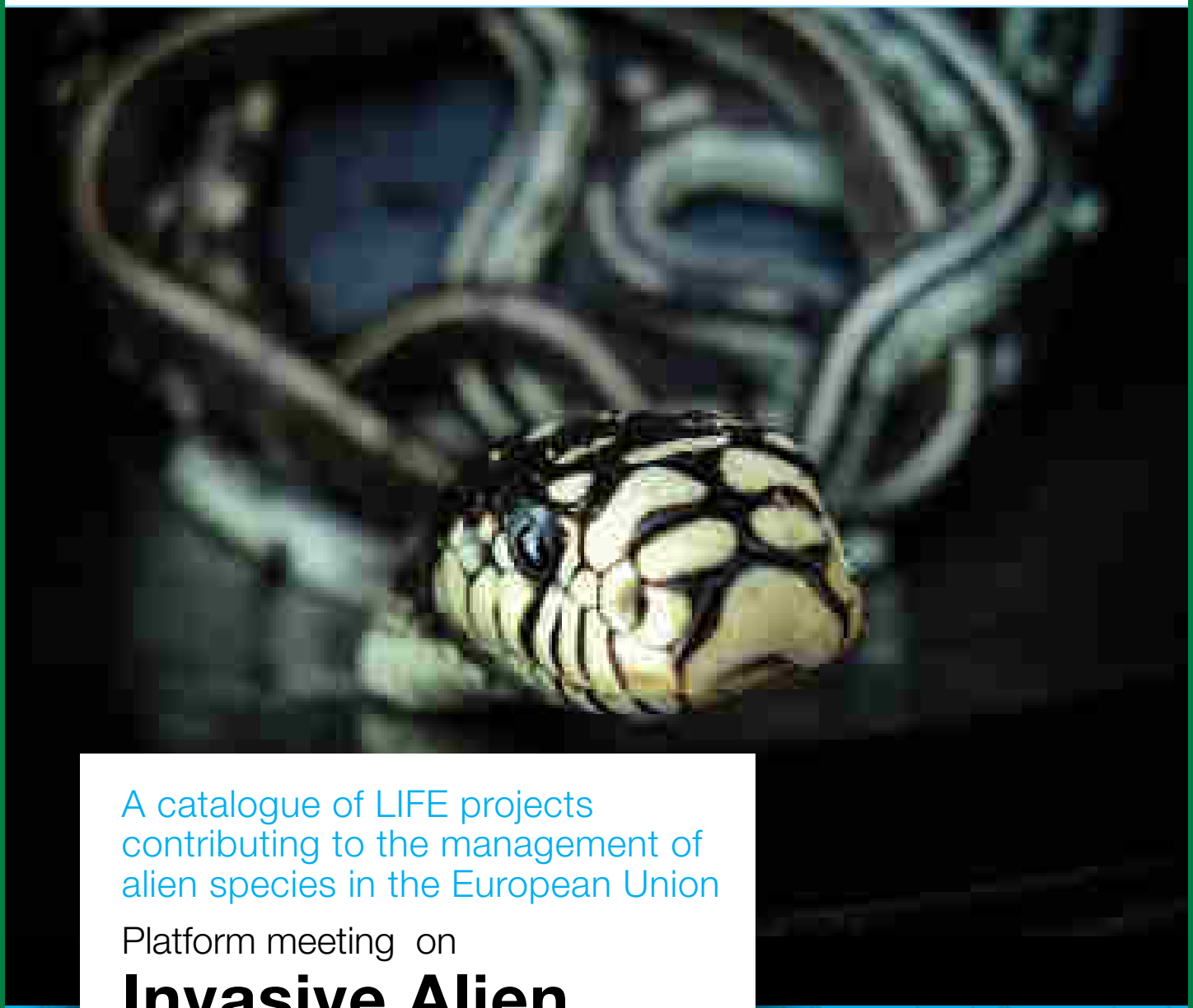

A catalogue of LIFE projects contributing to the management of alien species in the European Union

Platform meeting on

Invasive Alien Species (IAS)

29-30 November 2017, Milan (Italy)

Regione Lombardia

Acknowledgments

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A catalogue of LIFE projects
contributing to the management of alien species in the European Union

Platform Meeting on Invasive Alien Species (IAS- 29-30 November 2017, Milan (Italy)

Editors: Riccardo Scalera, Alberto Cozzi, Chiara Caccamo, Iva Rossi

Cover image: *Lampropeltis getula californiae* on the island of Gran Canaria. LIFE10 NAT/ES/000565 LAMPROPELTIS - Control of the invasive alien species *Lampropeltis getula californiae* on the island of Gran Canaria (author: Jorge Saavedra Bolaños)

Partner

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Con il contributo di

This abstract book was produced with the contribution of LIFE within the LIFE Integrated project
LLIFE14 IPE IT 018GESTIRE2020 - Nature Integrated Management to 2020

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Red squirrel threatened by grey squirrel. The photo won the photo contest organised by the project LIFE EC-SQUARE.

Plants of *Calendula maritima* included in a dense nucleus of Carpobrotus spp. at Tonnara S. Giuliano (Trapani, Sicily)

Introduction

Biological invasions are recognised as a key driver of biodiversity loss, and as such Invasive Alien Species (IAS) have been one of the key EU policy issues addressed by the LIFE programme over the years. This was already highlighted in two past publications, i.e. the LIFE Focus brochures aimed at analysing the contribution of the LIFE programme in relation to the management of IAS, published by the European Commission (EC) in 2004[1] and in 2014[2]. Those publications, supported by a few other technical papers and reports, stressed the importance of the LIFE instrument in relation to the development and further implementation of EU policy and legislation on IAS. Additionally, several conferences and workshops were organized within the LIFE programme, with a focus on specific IAS related themes and/or regions, along with a number of other media products. Such communication and information activities are an essential component of each single LIFE project thanks to the strong element of outreach that characterizes the programme itself. Their effect has been twofold: from one side it was pivotal to raise awareness on IAS so to change people attitude towards the problem, whereas from the other side it gave the necessary visibility to the LIFE instrument itself, confirming its role as the key financial tool to fight IAS in Europe.

The LIFE programme contributed to generate an impressive body of knowledge in terms of innovative actions, lessons learned, experience, best practices, and technical information, and had a key role in paving the way to the development and adoption of the EU Regulation 1143/2014 on IAS, which entered into force on 1 January 2015. The EU Regulation on IAS seeks to address the problem of IAS in a comprehensive manner so as to protect native biodiversity and ecosystem services, as well as to minimize and mitigate the human health or economic impacts that these species can have. For this purpose, the EU Regulation on IAS foresees three types of interventions: i) prevention, ii) early detection and rapid eradication, and iii) management. Basically, such interventions correspond to the typical measures financed by LIFE programme (implemented through this instrument even before the EU Regulation on IAS entered into force, thanks to the provisions set in the EU Nature

[1] *Scalera R, Zaghi D (2004). Alien species and nature conservation in the EU. The role of the LIFE program. LIFE Focus. European Commission, Bruxelles. Pp.60. http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/alienspecies_en.pdf.*

[2] *Silva JP, Sopeña A, Sliva J (2014) LIFE and Invasive Alien Species. Publications Office of the European Union, Luxembourg, 1–78. http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/life_ias.pdf.*

Introduction

Directives, the policy documents developed by the Bern Convention of the Council of Europe, the Convention of Biological Diversity etc.). Therefore, as LIFE continues to finance projects targeting these measures the programme is considered essential for ensuring a sound implementation of the IAS Regulation, including the risk assessments required to inform the evolution of the list of species of Union concern, which represents the core part of the Regulation.

In the light of the need to share knowledge and experience generated in the program, it was decided that the time to bring together the multitude of LIFE funded projects dealing with alien species had come. For this reason, following a proposal from NEEMO (the external monitoring team supporting the European Commission and EASME for the implementation of the LIFE programme[3]) a platform meeting specifically focused on IAS is planned in Milan on 29 -30 November 2017. The organization of the meeting is hosted by Lombardy Region, coordinating beneficiary of the Integrated Project LIFE14 IPE/IT/000018 GESTIRE 2020 “Nature Integrated Management to 2020”, which includes actions dealing with IAS.

The aim of the platform meeting is to gather project beneficiaries, along with stakeholders and practitioners, as well as representatives from the main institutional bodies such as the European Commission, the Executive Agency for Small and Medium-sized Enterprises (EASME), the Joint Research Centre (JRC) and the Secretariat of the Bern Convention of the Council of Europe.

The meeting is expected to be an occasion to assess strengths and weaknesses of the LIFE programme in relation to the implementation of the EU Regulation of IAS (along with the related EU Biodiversity strategy 2020), to evaluate future challenges and opportunities, including links with other nature protection EU policy and legislation (Birds and Habitats Directives, Wildlife Trade Regulations, Water Framework Directive, etc.) along with possible synergies with other EU financial resources (Horizon 2020, Rural Development funds, Marine and Fisheries Fund, etc.).

California Kingsnake

[3] In addition to monitoring of ongoing LIFE projects NEEMO is entrusted with the tasks of facilitating networking between projects and dissemination of best practises developed by LIFE projects, e.g. through organising dedicated platform meetings for LIFE projects, conducting communication activities, drafting LIFE publications etc. The consortium consists of more than 150 experts, working in 9 regional teams all over the EU, http://neemo.eu/

Preface

The platform meeting on invasive alien species is a major opportunity to share experience and knowledge on the work done within the EU to fight biological invasions in compliance with the overall EU environmental policy and legislation framework. A selection of LIFE projects (around 30) will be presented during the two-day event by invited speakers, but we are aware that there are many more case studies which deserve adequate dissemination and which may act as example for the development of further ideas and proposals.

For this reason, with the fundamental support of the LIFE Integrated Project GESTIRE 2020, we prepared the present publication. The objective is to give visibility to a larger selection of LIFE projects dealing with IAS, including those that are not participating to the meeting. Additionally, this publication has been fundamental to start collecting information on a document to be developed and possibly agreed to at the end of the workshop, e.g. including recommendations for improving the performance of LIFE projects on IAS.

For this purpose, all beneficiaries of LIFE projects dealing with alien species were requested to provide a short overview of their LIFE projects. In particular, besides the key administrative details (e.g. project title and code, contact information, budget and duration) of each single project, beneficiaries were requested to provide concise information about target species, main activities and relevant costs, sustainability of results and lessons learned, recommendations, references, etc. For any additional information it is possible to refer to the relevant contact person indicated in the project accounts. On this regard, the specific instructions provided to the project beneficiaries are reported in the table below with the purpose to facilitate the identification of information which the reader may expect to find for a single project.

Preface

Target species	List of the invasive alien species (IAS) targeted by the project.
Background and aims	Description of the socio-economic and geographical context of the project, **pathways** of introduction and spread, the type of **environment** in which this particular invasive alien species entered and how it developed over time, the impact on biodiversity (species and habitats affected, particularly if listed in the Nature directives), and on human health and welfare, and relevant economic damages. Overall relevance for implementation **of EU and national policy and legislation** in the EU and beyond.
Key measures and relative costs	Approach and activities developed to address the IAS problems (e.g. whether the **key measures** entail prevention, early detection and rapid eradication, long-term control and containment, monitoring and surveillance, restoration actions, awareness raising campaign, support to governance and capacity building etc.) and the **costs** for the actions specifically aimed at IAS, including **unit costs** (i.e. per individual removed, ha of land cleaned etc.).
Results (foreseen and achieved in relation to the IAS measures)	Concrete outcomes of the activities pursued in reducing the impacts of IAS in the project area; results also in relation to the measures helping to achieve the favourable conservation status of species and habitats (Habitats and Birds Directives), the good ecological status of freshwater ecosystems (Water Framework Directive), and the good environmental status of marine ecosystems (Marine Strategy Framework Directive).
Lessons learnt	Advice on strategies and approaches to reduce the risk of IAS, **innovation** characteristics and **best practices**, including a discussion of the adopted solutions (e.g. in relation to lack of awareness and **social conflicts** due to opposition from the general public, limited knowledge of the target species, and relevant methods for control/ eradication); experience with **stakeholders**' involvement (participatory approaches to measures focusing on IAS, citizen science, etc), including evidences of **social benefits** coming from the management of IAS (engagement of researchers, green jobs, etc.); discussion of potentialities for **replicability** and **transferability** to other EU countries.

Preface

Sustainability of results (in relation to the IAS measures)	Discussion on the **sustainability** of the achieved results (needs for future actions to implement or secure results, unsolved problems and possible options for overcoming them); **alternative funding sources** (either at local, national or EU level) for continuation and sustainability of results.
Recommendations	Discussion of remaining key problems and possible solutions for future actions. Examples are key **knowledge gaps** which would be useful to address through technology and research actions to facilitate the sound management of IAS (e.g. it may include a reflection on upcoming technologies like gene drive and the risks involved); main constraints linked to c**onflicts with other EU and national policy and legislation** affecting the sound management of IAS.
References	Links to 1-2 key information sources that provide more in-depth understanding about the case study and can serve as learning material for others facing similar challenges.

The result is the present publication including contributions from 62 LIFE projects dealing with IAS, many of which are presented during the event by the relevant beneficiaries invited as speakers. It is a massive collection of data and information, which shows the richness of the knowledge and experience created by the LIFE programme, and ultimately the strong commitment of the LIFE beneficiaries.

Beside stressing once more the prominent role of the LIFE programme in the implementation of the EU policy and legislation framework for nature conservation, we wish this output will contribute to facilitate networking between all project beneficiaries and IAS practitioners, to promote an effective use of the LIFE funding along with any other relevant EU financial resources and, ultimately, to contribute to the sound implementation of the EU Regulation on IAS.

Editors
Riccardo Scalera, Alberto Cozzi,
Chiara Caccamo, Iva Rossi

LIFE08 INF/B/000052

AlterIAS – Increase awareness to curb horticultural introductions of invasive plants in Belgium

Duration	From 01/01/2010 to 31/12/2013
Total budget	€1,010,804.00 (EC co-financing 50%)
Website	www.alterias.be
Coordinating beneficiary	Laboratoire d'Ecologie, Université de Liège, Gembloux Agro-Bio Tech (Belgium)
Other partners	PCS Proefcentrum voor Sierteelt, Centre Technique Horticole de Gembloux, SPF Santé Publique, Sécurité de la Chaîne alimentaire et Environnement (Belgium)
Contact	Mr. Grégory Mahy (Unité Biodiversité et Paysage - Gembloux Agro-Bio Tech);
e-mail	g.mahy@ulg.ac.be

Target species

Ailanthus altissima, Acer negundo, Aster lanceolatus, Acer rufinerve, Aster x salignus, Amelanchier lamarckii, Baccharis halimifolia, Aster novi-belgii, Bidens frondosa, Buddleja, Buddleja davidii, Cyperus eragrostis, Cornus sericea, Duchesnea indica, Cotoneaster horizontalis, Fallopia japonica, Elaeagnus angustifolia, Fallopia sachalinensis, Fraxinus pennsylvanica, Fallopia x bohemica, Helianthus tuberosus, Heracleum mantegazzianum, Lupinus polyphyllus, Hyacinthoides hispanica, Lysichiton americanus, Impatiens glandulifera, Mahonia aquifolium, Impatiens parviflora, Parthenocissus inserta, Mimulus guttatus, Parthenocissus quinquefolia, Persicaria polystachya, Prunus laurocerasus, Prunus serotina, Quercus rubra, Senecio inaequidens, Rhododendron ponticum, Solidago Canadensis, Rhus typhina, Solidago gigantean, Robinia pseudoacacia, Rosa rugosa, Crassula helmsii, Rudbeckia laciniata, Egeria densa, Spiraea alba, Hydrocotyle ranunculoides, Spiraea douglasii, Lagarosiphon major, Spiraea x billardii, Ludwigia grandiflora, Ludwigia peploides, Azolla filiculoides, Myriophyllum aquaticum, Elodea Canadensis, Myriophyllum heterophyllum, Elodea nuttallii, Lemna minuta.

Background and aims

The horticultural industry in Europe and elsewhere in the world has made a vast array of diverse plant species available to the public. Ornamental horticulture is the main pathway of plant invasion worldwide. In Belgium, almost all black list plants have been introduced as ornamental plants. When informed about the risks of biodiversity loss caused by some commercialized species, nursery professionals were found to be responsive to the issue and concerned by the detrimental impacts of IAS. The overall objective of the AlterIAS project was to reduce the introduction of invasive plants at source, by raising awareness about their environmental risks amongst the whole ornamental horticulture supply chain in Belgium, from growers to gardeners. The project aimed to promote best practices for preventing the release and spread of invasive alien species through a voluntary Code of Conduct produced with the involvement of the horticultural sector.

Key measures and relative costs

The whole project was about prevention. The following communication tools were developed and used: three folders, one 60 page brochure on alternative plants available, one website, a 45 minutes documentary film, a didactical toolkit for the horticultural teaching sector, an information stand used during horticultural fairs, and an information board displayed in the institution of each associated beneficiary. Other publications were also produced, like the Code of conduct on invasive plants, reports of socio-economic surveys and an After LIFE Communication Plan. The Code of conduct on invasive plants is one of the most important deliverable of the project.

Results

A total of 4,400,000 persons were reached or potentially reached by the project's actions in Belgium. At the end of the project, the horticulture professionals surveyed were more aware of the ecological impacts of invasive plants.

Lessons learnt

The project showed how important communication actions and involvement of the stakeholders are to raise awareness and change attitudes towards invasive ornamental plants.

Sustainability of results

The After Life continuation of the project is managed by the regional authority.

Recommendations

The project's approach to stop the introduction of IAS at source is readily transferable, with the project being contacted by interested stakeholders from around Europe.

Exemple of communication tool

LIFE13 NAT/CY/000176

LIFE-FORBIRDS - Improving lowland forest habitats for Birds in Cyprus

Duration	From 01/10/2014 to 31/12/2017
Total budget	€978,718.00 (EC co-financing 50%)
Website	www.lifeforbirds.eu
Coordinating beneficiary	Department of Forests (Cyprus)
Other partners	Game and Fauna Service, Frederick University, Cyprus Forest Association (Cyprus)
Contact	Mr. Takis Tsintides (Department of Forests)
e-mail	ttsintides@fd.moa.gov.cy

Target species

Acacia saligna, Acacia salicina, Eycaliptus spp.

Background and aims

The proposed project has three major objectives: (a) to implement conservation/management measures for selected bird species listed in Annex I of the Birds Directive occurring in the Natura 2000 (SPA) sites (CY3000005, CY6000009 and CY6000007), (b) through the implementation of these pilot conservation management measures to demonstrate to the Cypriot foresters and other stakeholders, the benefits of adopting a more holistic forest management approach that will address the needs of birds dwelling in or visiting the forest, and (c) to contribute towards, enhancement of public awareness on the need to conserve wild birds and combating bird crime within the broader project area. One of the specific objectives of the project is to restore bird habitats through the removal of IAS and extensive reforestations of local habitat types species. One of the concrete conservation actions of the project focuses on the removal of alien woody plant species over an area of 6 ha, with emphasis on invasive (*Acacia saligna*, *Pinus halepensis*, hybrids of Pinus, *Eucalypts* spp. etc), which have been abundantly planted 30-40 years ago by the Department of Forests (in two of the three project sites). The removed vegetation will be replaced with indigenous vegetation enabling the creation of specific natural habitat types existing in the area. The habitat types that will be established are those present or that have existed in the past in the project sites and now they are in a poor conservation status, namely: 5210, 5220*, 5330, 9320 and 5420.

Both *Acacia* spp. & *Eycaliptus* spp. were introduced to the island by the English authorities on 1880 and were used extensively in reforestations (*Acacia saligna* in particular is the widest distributed IAS in the island). Only the last 10-15 years there is a change of forest policy that targets gradual removal of all IAS and the restoration of the occupied areas with local habitat types species. In addition, some of these species (*Acacia* spp.) are favored by locals involved in illegal bird trapping activities (lime-sticks) due to their ability to vigorously grow and occupy an area. It is a common practice for them to plant and tend these species since they provide resting places for birds and a perfect spot for placing lime-sticks. Bird-trapping creates a negative image for the island abroad, with serious impact on tourism.

Key measures and relative costs

Since IAS have been established through false forest practices of the past, in several locations covering several hectars, guidelines have been issued by the Department of Forests (DF) for avoiding the use of these species for plantations anywhere in the island. Workshops involving employees of DF as well from other Governmental Departments, Municipalities etc. are being organised occasionally so as to raise awareness regarding the IAS problem.

DF has hired in the past an expert in the removal of invasive species from Israel which produced specific protocols for the removal procedure of IAS in Cyprus. These protocols have since been applied in 3 LIFE projects [2 completed, 1 on-going (LIFE 13 NAT/CY/000176)] with success. Since DF is the responsible authority for managing natural habitat types within state forest land, through the After-LIFE actions of the above mentioned projects monitoring of IAS as well as long-term control is of key priority. *Acacia* spp. are resilient and need persistance in their long-term control. The removal procedure of *Acacia* spp. has been estimated around €10,000/ha including costs for buying removal equipment (power drills, chainsaws, axes, knives) as well as herbicides, safety equipment, transportation and labor costs. It is a timely procedure as it requires each stem of the plant to be treated individually. Determining factors that may increase the procedure cost is the slope of the terrain as well as the density of plant cover. With *Eycaliptus* spp. this is not the case, since the removal procedure is not carried out on an extended area but only selective individuals are removed with silvicultural treatments. Thus, the cost is significantly lower and can be estimated around 13/individual including labor, transportation and herbicide costs.

Results

Removal of *Acacia saligna* individuals at Kavo Gkreko SPA in April 2015 & 2016 targeted 5,800 individuals (stem = individual) covering 3,2 ha in total. Removal of *Acacia saligna* at Koshi – Pallourokampos SPA in April 2017 targeted 10,720 individuals, covering 2,1 ha (higher stem density and increased slope of terrain). In the case of Kavo Gkreko SPA the success rate of 2015 was 82,5%, whereas of 2016 72%. The dead Acacia trees of 2015 were processed with a wood chipper machine and the woodchips were used as fertilizer for DF plantings. Dead Acacia trees of 2016 and 2017 will be removed and disposed to a green point or an industry using biomass for energy. Selected individuals were left at both SPAs to rot so as to attract insects. In all the above mentioned sites that Acacia spp. were removed, extensive reforestations are taking place so as to restore the natural occurring habitat types. Up to now 4.17 ha have been restored and approximately another 4 ha are to be restored until the end of the project. Removal of *Eycaliptus* spp. took place only in Koshi – Pallourokampos site, targeting 138 selected individuals.

Lessons learnt

Acacia spp. are extremely resilient and very difficult to removed and controlled. Planting of these species should be avoided at all costs since they spread and occupy space rapidly. The most efficient control procedure and follow up method is the one that uses selective application of glyphosate herbicide. Glyphosate is known to degrade rapidly in soil with DT50 values ranging from 3-174 days in the field, with an average half-life of 47 days. Because of high adsorption to soil particles the risk of movement of glyphosate is very low. In addition, it is degraded by micro-organisms and/or microbes in the soil. Glyphosate has no soil activity and with the applied control procedures it is inserted directly into the cambium of the targeted individuals in specific small amounts and therefore is translocated to the phloem and accumulated at above ground growing points. Social conflicts have aroused in a specific area of the island between the local residents and the respective authorities. During 2017, SBA authorities initiated removal procedures of all *Acacia saligna* trees so as to address the problem of illegal trapping with limesticks. Protests against the operations from the locals were held. The protestors' allegations where that an environmental destruction was taking place, but the real reason behind was that they were involved in illegal bird trapping activities, thus the removal of Acacia trees would have a direct impact in their profits. Despite the protests, the removal procedures were carried out successfully. Social benefits from the management of IAS come directly from the involvement of local residents of the treatment areas who are employed by DF for the removal procedure.

Sustainability of results

The forest policy of DF has change and thus favours the removal of IAS. The species targeted mostly is *Acacia saligna*. Monitoring and controlling procedures are mandatory for several years after the initial control procedure. This is now a priority in each habitat management plan approved by the Department of Environment when IAS are present in an Natura 2000 site. Monitoring of IAS and continuity of the control procedures are envisaged also in all After-LIFE plans when a project has addressed IAS. Various funding sources for addressing IAS on a national level include EU structural funds as well national funding.

Recommendations

The major concern when addressing the problem of IAS in Cyprus is the timely effort needed. Many years need to pass in order to completely eradicate *Acacia* spp. from the field. Selective herbicide treatments are timely, costly and the ones that have the best results up to now. Networking with other countries with similar problems should be pursued and established so as to broaden the national knowledgebase regarding IAS.

Control procedure of *Acacia saligna* trees at Kavo Grecko SPA

References

The full version of the protocols established for the treatment of IAS in Cyprus can be found from the following links:

GR version: https://tinyurl.com/yba2k57o

EN version: https://tinyurl.com/y7y8mhm2

LIFE11 NAT/CZ/000490

LIFE CORCONTICA - Grasslands and streams restoration in SCI Krkonoše: Future of *Nardus* grasslands*, Dwarf gentian* & Bullhead

Duration From 01/06/2012 to 30/04/2018
Total budget €3,588,573.00 (EC co-financing 75%)
Website www.life.krnap.cz
Coordinating beneficiary Správa Krkonošského národního parku (Czech Republic)
Other partners DAPHNE ČR - Institut aplikované ekologie; Ministerstvo životního prostředí (Czech Republic)
Contact Mr. Tomáš Janata (Správa KRNAP)
e-mail tjanata@krnap.cz

Target species

Rumex alpinus; Lupinus polyphyllus.

Background and aims

Krkonoše are the highest mountains in the Czech Republic; part of the High Sudetes. A very large, varied territory includes the old flat surfaces and the top parts of the Krkonoše, the deeply cut valleys, numerous subarctic and alpine features and periglacial phenomena. Alpine colonists came to the Giant Mountains in the 16th century and brought with them the seeds of the Alpine sorrel. The sorrel has been spreading through the Giant Mountains since then. Nowadays sorrel grows over wide expanses of meadows (for ex. habitats 6230 *, 6510, 6520). The main objective of the project is to create appropriate conditions to ensure a favorable state of European important habitats (6230*, 6510, 6520), and species of European importance (*Gentianella praecox subsp. bohemica**) and bullhead in European important area Krkonoše; thereby to contribute to the conservation of biodiversity and to fulfill the functions of a network of protected areas Natura 2000. One of the partial aims of the project is to prevent damage to habitats 6230 *, 6510, 6520 from invasive plant species *Rumex alpinus* and *Lupinus polyphyllus*.

Key measures and relative costs

Key measures are long-term control and containment, public campaign about main vector of spreading - human activities, making models of spreading, monitoring of spreading. The highly biodegradable glyphosate-containing herbicide (3-5% concentration) was applied by leaf spraying prior to flowering of Rumex alpinus and 10% herbicide solution for *Lupinus polyphyllus*. Cost approx. €650/ha (even with herbicide). Some enclaves have entered to organic farming and therefore it is not possible to use biodegradable herbicides. These areas are only mowed before flowering invasive plants. Cost approx. €880/ha/one action (to be done 2-3 times per season). The goal was to eliminate or reduce the incidence of invasive plants by 90% over an area of 45 hectares over three or five years.
Attempt on *Rumex alpinus*: Disposal of rhizomes by excavation - cost about €1850/ha.
Reduction of plants by suffocation under the hay layer - cost approx. €60/person/day (mowing and transport of biomass to target area), €210/ha (3,5 day/one person/ha).

Results

Disposal by herbicide: for 3-5 years, the total destruction of adult plants and their rhizomes is guaranteed. However, the stock of seeds in the soil is large and therefore new seedlings are emerging every year. The total elimination of the invasive species on the given area is possible only after the seed bank has been exhausted in the soil (about 15 years). Liquidation by mowing the inflorescence: many times less efficient, does not destroy adult plants, depletes the seed bank. Removal of rhizomes by digging: destroys adult plants, does not guarantee destruction of all rhizomes, destroys seed bank. Plant disposal by suffocation under the hay layer: minimal efficiency, complements seeds of suitable plants increases competition stress for dominant IAS. Within the project, about 48 hectares of land were managed, most of them repeatedly in the period of 3-5 years. Complete elimination is not possible for such a short period of using gentle mowing methods. Over the course of the project, the incidence of invasive plants was reduced to about 50%. It seems to be necessary, for achieving deep impact to the target area, use of several methods together with strong ability to assess and influence the circumstances and choose the best mixture of methods according to a specific case.

Lessons learnt

During the wide spreading information campaign on the fight against IAS, only 43% of the owners agreed to planned interventions and were willing to provide a right by correspondence. During the project it was necessary to get contacts for personal communication and personally communicate intensively on the project, expected results, methods of eradication and the implications for owners. It's not just a matter of eliminating the IAS. The absence of alien organisms will ensure only purposeful, long-term and careful work with the landscape and the society that uses the landscape. It is necessary not only to know the ways of liquidation of IAS but also to enrich the landscape context: legislation (national, regional), education, social level.

The most effective method – the first of all: to ensure quality long-term care of landscape with economical sense. Practical eradication of *Rumex alpinus* with herbicide (for 2 years), then overlapping areas with Rumex by hay from nearby. In the coming years, is necessary to destroyed seedlings - by mowing, pasture, herbicide, until the stock of the seed bank (about 15 years) is depleted. The method for *Lupinus pollyphylus* eradication is similar. The methods can be transferred to other EU countries.

Sustainability of results

The sustainability will be guaranteed by an after-care contract with the farmer of the enclave, who has committed to continue to dispose of the invasive plants as much as possible (cutting, pasture, herbicides) for next 10 years. Sustainability of results is only possible with broad social consensus. Public and expert cooperation is essential. If the relationship to the problem is contradictory, long-term sustainable results cannot be achieved. Currently we use national resources for environmental care, resources of the EU Common Agricultural Policy, own resources and a limited community aid.

Recommendations

Public education in the problem of the introduction of foreign organisms. Conflict of some effective IAS eradications methods with environmental care. Insufficient support for IAS eradication by the EU's Common Agricultural Policy addresses only a very limited number of species. Effective national and local policies. Professional and financial capacities for public communication and organizing interventions.

***Rumex alpinus* before (2013) and after (2016) targeted interventions in the area Klínovké Boudy.**

Denmark

LIFE12 NAT/DK/001073

REDCOHA-LIFE
Restoration of Danish Coastal Habitats

Duration	From 01/08/2013 to 31/07/2018
Total budget	€2,845,912.00 (EC co-financing 50%)
Coordinating beneficiary	Danish Nature Agency (Denmark)
Other partners	Municipality of Thisted, Municipality of Ringkøbing-Skjern (Denmark)
Contact	Mr. Uffe Strandby
e-mail	ufstr@nst.dk

Target species

Rosa rugosa, Pinus mugo, Pinus contorta and *Picea sitchensis.*

Background and aims

Rosa rugosa was introduced in Denmark in mid 1800. In the 1950s and 1960s the development of summer cottages along the Danish Coast increased substantially and R. rugosa became popular as an ornamental species and particularly as a hedge plant. The species has been spread into nature habitats especially along the coast. Habitats threatened are: 2120 Shifting dunes along shorelines with *Ammorphilia arenaria*, 2130* Fixed coastal dunes with herbaceous vegetation (Grey dunes), 2140* Decalcified dunes with *Empetrum nigra*, 2150* Atlantic decalcified fixed dunes (Calluno-Ulicetea), 2160 Dunes with *Hippophae rhamnoides*, 2170 Dunes with *Salix repens* ssp. Argenta, 2180 Wooded dunes of the Atlantic, Continental and Boreal region, 2190 Humid dune slacks. The aim of this project is to estimate the occurrence of *R. rugosa* in coast habitats by means of remote sensing (spectral analysis) and to test a number of specific methods like excavation, milling, covering with weed mats, grazing and herbicide treatment, etc.

Key measures and relative costs

The key measures entail: mapping and detection of the species, awareness raising campaigns and monitoring.

Results

It is expected that fighting *R. rugosa* will improve the conservation status of coastal habitats on more than 400 ha (gross area). As a result of the distribution of leaflets and the intensive focus in the media, it is expected that the public attitude and awareness about *R. rugosa* will increased substantially.

Lessons learnt

It is too early to draw any conclusions regarding the different fighting methods. We have used excavating, milling and covering with mats as fighting methods. However, those methods were applied during late 2015, and summer 2016, so we have not had sufficient time to monitor the long-term impact. On the other hand, we do have some lessons learned regarding the use of spectral analysis (remote sensing) as a tool to estimate the occurrence of *R. rugosa* in coastal habitats. 4 sub-plots of 27,4 ha were selected for a complete monitoring of the occurrence of *R. rugosa.* The spectral analysis revealed an occurrence of the species of 1.2 % and the field inspection revealed an occurrence of 4.5 %.

Sustainability of results

A sustainable research set-up has been established in term of identifying the most effective and efficient method to combat *R. rugosa*. The Municipality of Thisted has established an interesting project in a summer cottage area. In this area four different methods (excavating, covering with weed mat, spraying and lubricating with herbicide) have been tested on ca. 25 land plots (2,3 ha). The Danish Nature Agency has so far tested four different methods in different locations. Covering with weed mats (0,3 ha), grazing by goat (0,75 ha), grazing by sheep (1,5 ha), milling (17,5 ha) and excavating (1 ha). The methods were launched in the end of 2015 and the beginning of 2016, so it is still too early to draw any conclusions on the impact.

Recommendations

It is highly recommended to continue the monitoring of the different applied fighting methods and apply the necessary follow-up fighting. It could be interesting to conduct a study on changes on attitudes towards IAS in order to evaluate the most cost-effective awareness-raising method.

Grazing by sheep on habitats invaded by *Rosa rugosa*

LIFE13 NAT/DK/001357

REWETDUNE-LIFE
Restoration of wetlands in dune habitats

Duration	From 01/08/2014 to 31/07/2019
Total budget	€2,873,843.00 (EC co-financing 60%)
Website	naturstyrelsen.dk/naturbeskyttelse/naturprojekter/lifehulsig-hede/
Coordinating beneficiary	Danish Nature Agency (Denmark)
Other partners	Municipality of Frederikshavn (Denmark)
Contact	Mr. Karsten Frisk
e-mail	kfr@nst.dk

Target species

Rosa rugosa, Heracleum mantegazzianum, Pinus mugo, Pinus contorta and Pices sitchensis.

Background and aims

Rosa rugosa was introduced in Denmark in mid 1800. In the 1950s and 1960s the development of summer cottages along the Danish Coast increased substantially and *R. rugosa* became popular as an ornamental species and particularly as a hedge plant. The species has been spread into nature habitats especially along the coast. Habitats threatened are: 2120 Shifting dunes along shorelines with *Ammorphilia arenaria*, 2130* Fixed coastal dunes with herbaceous vegetation (Grey dunes), 2140* Decalcified dunes with Empetrum nigra, 2160 Dunes with *Hippophae rhamnoides*, 2170 Dunes with *Salix repens* ssp. Argenta, 2190 Humid dune slacks, 7150 Depressions on peat substrates of the *Rhynchosporion*. The aim of this project is to estimate the occurrence of R. rugosa in coast habitats by means of remote sensing (spectral analysis) and to test a number of specific methods like excavation, milling, covering with weed mats, grazing, etc.

Key measures and relative costs

1. Mapping and detection could be developed as a sufficient method of mapping IAS. It depends of the quality of the original mapping material. Mapping of one IAS (*R. rugosa*) in a specific area (5,500 ha) has been made with a cost of €2,8/ha.
2. Fighting *R. rugosa* in hilly dunes at the coastline is difficult. Heavy mechanical equipment will damage the klith habitat. Chemical method is not an option in the project. Method of mowing/crushing with minor robot crushers has been completed both with regard to the first intervention and subsequent intervention over re-growth. The cost of first intervention with robot crushers is estimated to about €3,000/ha. The cost of intervention with robot crushers on re-growth is estimated to about €1,200 /ha. On steep coastlines we have tested a method of inserting an excavator with a crusher mounted at the tip of the crane and “sweeping” the areas with *R. rugosa*. The cost estimated is about €3,000/ha. We are testing covering with biological mats (corn fibers), that in a period of five years will disappear by itself (biological combustion). 3) Awareness campaigns are important actions in the project. An information campaign on proper behavior in sensitive areas is about to take place. The campaign is targeted to local schools, local societies for outdoor activities, tourist offices, summer cottage renting bureaus, local camping areas and local hotels. The cost estimated is about €67,000 or 12/ha.

Results

It is expected that fighting *R. rugosa* will improve the conservation status of coastal habitats on 27 ha (gross area). Complete eradication of *R. rugosa* will hardly be possible with current methods. But we can inhibit and prevent further spread of IAS while looking for effective methods of extinction (in endangered natural areas). As a result of dissemination (public tours, intensive focus in the media, information campaign on proper behavior in sensitive areas) it is expected that the public attitude and awareness about *R. rugosa* will increase substantially.

Lessons learnt

It is too early to draw any conclusions regarding the different fighting methods. We have used excavating, milling and covering with mats as fighting methods. However, those methods were applied during late 2015, summer 2016 and summer 2017, so we have not had sufficient time to monitor the longterm impact. On the other hand, we do have some lessons learned (no specific measurements yet) of the use of spectral analysis (remote sensing) as a tool to estimate the occurrence of *R. rugosa* in coastal habitats. In some coastal areas the remote sensing method has been of some success. According to our own and the contractors observations, the result of the remote sensing has been near to a success. Almost all occurrences are registered, and false positive occurrences are few. In other areas, registered occurrences are far less than the real occurrences, most where *R. rugosa* is found in mixed vegetation or overgrown with other vegetation species. In these areas, there is an error of up to 50%. In general, the method can be used to give an overview of the occurrence of IAS.

Sustainability of results

Since chemical control has no future, we are focusing on testing mechanical methods at several places in Denmark (Danish Nature Agency) and we are working on developing of sustainable control methods. On national level the most significant financial resources can be found at the Danish Nature Agency and at the municipalities.

Recommendations

It is highly recommended to continue the monitoring of the different applied fighting methods and apply the necessary follow-up fighting. It could be interesting to conduct a study on changes on attitudes towards IAS in order to evaluate the most cost-effective awareness-raising method.

Fighting *Rosa rugosa* by crushing with two small remote controller crushers

LIFE10 NAT/FR/000192

Continuité Ecologique - LIFE ecological continuity, management of catchment area and associated patrimonial fauna

Duration	From 01/09/2011 to 31/08/2017
Total budget	€3,703,107.00 (EC co-financing 50%)
Website	www.life-continuite-ecologique.eu
Coordinating beneficiary	Syndicat Mixte du Parc Naturel - Régional du Morvan (France)
Other partners	Parc Naturel Régional des Ballons des Vosges (France)
Contact	Mr. Nicolas Galmiche (Syndicat Mixte du Parc Naturel Régional du Morvan)
e-mail	nicolas.galmiche@parcdumorvan.org

Target species

Fallopia japonica.

Background and aims

The plant Japanese knotweed (*Fallopia japonica*), originated in Asia, was introduced in Europe since 1825, for ornamental purposes. Since then it has escaped from the gardens and it has colonized embankments of public works, banks of river, etc. Japanese Knotweed has a strong tendency to invade the places where it settles crowding out any other plant naturally present, especially on the banks of streams. The consequences of its presence are a poor maintenance of the banks of the rivers and a very low biodiversity level. In fact, Japanese Knotweed does not have a developed root system that allows to resist the pulling forces of rivers. It is, therefore, necessary to fight against the Knotweed of Japan present on the banks, before any restoration operation of the ripisylve.

Key measures and relative costs

Key measures: to eliminate the plant by tearing it or cutting it without projecting fragments around it (serp, pruning shears, crescent, false, etc.), to lay a geotextile sheet, to plant plants that grow quickly and heavily. Cost of supply and labor with woven geotextile PP 130 gr/m²: €7,54 HT/m². Cost of supply and labor with biodegradable geotextile: €8,59 HT/m².

Results

The eradication of the Knotweed has been successfully tested in this project. For example, on the banks of the Cousin river, an area of about 300 m² was treated after removal, laying a woven PP 130 gr/m² willow plantation. Two months after the work, the Knotweed grew through the holes of staples or along the cuttings of willows. During that period, it was necessary to remove the regrowths at least three times in the summer. Two years later, the Japanese Knotweed was eliminated on the site, competing with the Willow. Tests have been carried out using biodegradable geotextile and they showed that this technique worked. Finally, 1,611 m² of IAS were removed.

Lessons learnt

A complete removal of IAS from a watershed seems illusory. However, it is possible to eliminate fairly contained foci by promoting the regrowth of a more suitable vegetation. Many eradication techniques exist or are being experimented. An effective fight against this species will only happen through the training of local residents. During the project, several information and demonstration campaigns were made in this direction.

Sustainability of results

This action will be continued using Natura 2000 funds.

Recommendations

New avenues are to be explored using local and “natural” materials such as woven hemp mulch.

Demonstration site for the suppression of Japanese knotweed

LIFE11 ENV/FR/000746

SeineCityPark - Development of an urban green infrastructure in the Chanteloup loop

Duration	From 01/08/2012 to 31/07/2017
Total budget	€3,473,266.00 (EC co-financing 49.92%)
Website	www.seinecitypark.fr
Coordinating beneficiary	Département des Yvelines (France)
Other partners	Commuanuté Urbaine Grand Paris Seine & Oise (France), Port autonome de Paris (France), Ecorem (Belgium)
Contact	Ms. Isabelle Chatoux (Département des Yvelines)
e-mail	ichatoux@yvelines.fr

Target species

Reynoutria japonica, *Ludwigia peploides*.

Background and aims

The actions against invasive species were carried out on a former gravel pit consisting of two ponds, meadows and woodlands. The site is located in the Seine valley a few kilometres downstream of Paris (France).

Invasive species were undoubtedly introduced during the filling of the quarry (contained in contaminated soil).

In particular, creeping water primrose (*Ludwigia peploides*) occupied 80% of the banks of the ponds, thus preventing local species from developing.

Key measures and relative costs

The actions implemented to deal with species are as follows:

- Inventory and mapping of the species to be treated.
- Eradication work using various methods.
- Awareness raising among businesses and the implementation of procedures to prevent the spread of the species.
- Public awareness raising (worksite signs, etc.).
- Site monitoring to detect new outbreaks.
- Monitoring of treated outbreak sites in order to evaluate the effectiveness of the methods used.

Costs:

- Manual removal of creeping water primrose: about €8/m incl. VAT.
- Restoration of the Japanese knotweed (*Reynoutria japonica*) sites by digging and plantation: €100/m incl. VAT.
- Restoration of the Japanese knotweed sites by confinement of the rhizomes using membrane barriers: €80/m incl. VAT.
- Maintenance of the Japanese knotweed sites by manual removal: € 20/m incl. VAT.

Results

The actions have enabled:

- the surface area of the Japanese knotweed treated to be divided by 10, however this requires annual maintenance of the sites;
- the surface area of creeping water primrose to be divided by 7, however the sites must be maintained by manual removal on a yearly basis.

Lessons learnt

The cost of eradicating creeping water primrose and Japanese knotweed is very high.

Intervention should be limited to sites where this invasive species impacts on heritage species and/or habitats and sites that present a risk of spreading.

Where possible, the removal of contaminated soil should be avoided in order to prevent the contamination of other sites. Prevention and awareness raising are essential to limiting the spread of invasive species given that their spread is mainly due to a lack of knowledge and poor practices.

The works undertaken have made it possible to employ staff benefiting from return to work programmes. Volunteer work camps have also been organised.

Sustainability of results

The actions undertaken and the results obtained must be sustained through regular maintenance of the sites treated.

The Yvelines Department's environmental policy makes it possible to finance the sums allotted for site maintenance. However, the duration of maintenance required until the sites become permanently clear is indeterminate, and abandonment of maintenance work would negate efforts to eradicate the species treated.

Seine valley

LIFE13 NAT/FR/000075

LIFE PETRELS - Halting the decline of endemic Petrels from Reunion Island: demonstration of large-scale innovative conservation actions

Duration	From 01/07/2014 to 31/07/2020
Total budget	€3,107,240.00 (EC co-financing 49.89%)
Website	www.petrels.re
Coordinating beneficiary	Parc national de La Réunion (France)
Other partners	Société d'Etude Ornithologique de La Réunion (SEOR), Université de La Réunion, Office National de la Chasse et de la Faune Sauvage (ONCFS) / Brigade Nature Océan Indien (BNOI) (France)
Contact	Ms. Jennifer Ailloud (Parc national de La Réunion); Mr. Patrick Pinet (Parc national de La Réunion)
e-mail	jennifer.ailloud@reunion-parcnational.fr; patrick.pinet@reunionparcnational.fr.

Target species

Felis catus, *Rattus rattus*, *Rattus norvegicus*.

Background and aims

The LIFE+PETRELS project is based on Reunion Island, a French overseas territory in the Indian Ocean which has the same political status as other departements in mainland France. The aim of the LIFE+PETRELS project is to stop the decline of two endemic "Petrel" species, Barau's petrel (*Pterodroma baraui*, endangered, estimated 8000 to 15,000 pairs left) and Mascarene petrel, (*Pseudobulweria aterrima*, critically endangered, estimated 10 to 50 pairs left) through innovative techniques and actions. Petrels are endemic philopatric seabirds which spend their lives at sea but come back to Reunion island for their breeding period. They live in remote areas from 600 m high for the Mascarene petrel to 3000m high for the Barau's petrel. The island was free from humans and predators until colonisation began in the 17th century. The first sight of a cat is reported in a document which dates back to 1703. In 350 years, the island lost 3 bat species, 22 bird species and 3 reptile species due to human impact and predators. The main predators to petrels are rats and cats. Rats induce eggs and chicks mortality and cats induce adult and chick mortality. One cat can kill up to 90 Barau's Petrel a year. The presence of rats and cats is reported up to 3,000 m with a density decreasing with altitude. At 1,800 m high, we calculated cat density to be 0.4 cat/km². Other endemics species are impacted by the same invasives predators: *Coracinanewtoni* (critically endangered), *Phelsuma borbonica* (endangerd), *Phelsuma inexpectata* (critically endangered). We can add some endemic plant species to the list, impacted on their fructification by rats. Cats and rats are known to be main vectors of leptospirosis which is a zoonotic disease. Cats are as well vectors of toxoplasmosis (*Toxoplasma gondii*) which is also a disease transmittable to humans. The extent to which these diseases are present in the natural environment (water/soil) on Reunion island is not yet known.

Key measures and relative costs

In our project different actions focus on reducing the impact of IAS on petrels:

- Adapting the regulation and elaborating IAS control implementation and follow-up protocols. Total cost cash + personnel: €74,430.
- Decrease of IAS impacts on endemics petrels (deratization of breeding sites; iimplementation of a demonstrative protocol for the control of feral cat populations on study sites; control of feral cat population around and inside colonies). Total cost cash + personnel: €672,349.
- Triggerring a change in the island's economic development strategy towards an eco-responsible behavior (development of the island towards eco-responsible behavior; create incentive actions for the management of domestic animals, mainly feral cats; create incentive actions to improve management and storage of waste; enforce the regulation of the management of stray animals by the municipalities; set up waste police operations). Total cost cash + personnel: €135,960 including work about light pollution.
- Inform and involve the population and users in petrel conservation (create several events to raise awareness on IAS and risks for the petrels; create an information campaign during the stranding season). Total cost cash + personnel: €77,420.
- 10 deliverables on IAS emerging from these actions are expected by the EU commission before the end of the project in 2020: Total costs of IAS management should also include the two follow-up actions in which a lot of human time is dedicated to monitoring and surveillance of the implementation of the previous actions. (personnel costs: €158,680).

IAS management represents, in total, 38 % of the project costs.

Results

Cat control: it is performed by LIFE+Petrels agents and agents of the National park at the heart of Park territory, in the wild areas. Close to urban areas, at lower altitudes , cat control is performed by a professional insertion association called AVE2M with which we share our traps. Cage traps are controlled every day (for animal welfare) which induces a high cost by cat. Since 2016 we have installed camera traps to control cage traps (decreasing the cost by cat but cost not evaluated yet) and we also decreased the numbers of cages from 5 to 8 depending on the area (open or closed area) but without decreasing the surface and the capture rate. To compare between years and structures, we calculated an overall catch rate. In February 2017, we managed to contribute to the implementation of a prefectural decision which allows the use of kill traps for cats (Timm's traps and X traps) in precise patches around and within colonies. This comes in addition to cage traps, that we continue using.

Rat control: our first results led us to optimize the protocol and decrease quantity. For the 2015/2016 reproduction season for the 2 Barau's petrel colonies we saw an increase by around 10% of the reproduction rate but it's too soon to conclude that it is the effect of rat control and not another environmental factor like El Nino for example.

Lessons learnt

Controlling IAS inside Reunion island costs a lot of money and time. The optimization of the cat control allowed us to pass for the LIFE+/PNR from 344 day/agent in 2015 to 198 day/agent in 2016. In proportion with the other actions we are doing, cat's control took us 47.25% of our fieldwork in 2015 and pass at 25.32% in 2016 after protocol's optimization.

Sustainability of results

Our intervention sites are all inside the national park territory so they will continue the efforts on cat's control and deratization inside colonies. Also the association AVE2M+ should continue cat control in lower altitudes closer to towns. This prefectural decision was contested in court by a foreign animal welfare association. A judicial investigation is underway. We don't how long we will be allowed to use killing traps close to and inside colonies. This prefectural decision also allows us to use poison. Unfortunately none of the effective poisons can be bought in France yet. Homologation for this product would cost around €300,000 which is out of our budget.

Recommendations

French law is quite restrictive and not adapted to the IAS control species on tropical islands. In law, the cat is considered to be a domestic animal only (which means that it has an owner). This implies that stray cats, even if caught at high altitudes and remote areas of the island, cannot be euthanized on site, but should be brought back to a veterinarian to be checked before euthanasia. Controlling cat populations inside these areas is thus really difficult inducing several hours of hiking each day to check traps and bring back the cat to a vet for a check up. In the past, all the check ups have ended in euthanasia due to the wild and aggressive nature of the cats we would bring back, which never had seen man. With the prefectural decision that we got in February, things became much more adapted to the constraints we faced in the field. Yet, this new regulation is insecure due to the fact it was contested before court, and remains applicable only in tight patches, inside and close to petrel colonies, which is a good beginning, but not enough. We think that law should take into consideration our regional specificities. Thanks to camera traps, we see that even with strong cat control effort with cage traps, some cats still refuse to enter in the cages and cannot be captured this way. For these cats, only poisoning seems to be an achievable solution. French law should enable us the use of a poison molecule, such as the PAPP molecule, which is considered to be animal welfare friendly, in countries like New Zealand or Australia.

References

Technical reports and various master student's thesis (in French) are available on request.

LIFE15 PRE/FR/000001

LIFE IAP-RISK - Mitigating the Threat of Invasive Alien Plants in the EU Through Pest Risk Analysis to Support the EU Regulation 1143/2014

Duration From 01/02/2016 to 30/06/2018
Total budget €433,328.00 (EC co-financing 40%)
Website www.iap-risk.eu
Coordinating beneficiary European and Mediterranean Plant Protection Organisation (France)
Other partners Centre for Ecology and Hydrology (United Kingdom)
Contact Mr. Rob Tanner (European and Mediterranean Plant Protection Organisation)
e-mail rob.tanner@eppo.int

Target species

Ambrosia confertiflora, *Andropogon virginicus*, *Cardiospermum grandiflorum*, *Cinnamomum camphora*, *Cortaderia jubata*, *Ehrharta calycina*, *Gymnocoronis spilanthoides*, *Hakea sericea*, *Humulus scandens*, *Hygrophila polysperma*, *Lespedeza cuneata*, *Lygodium japonicum*, *Prosopis juliflora*, *Sapium sebiferum*, *Pistia stratiotes* and *Salvinia molesta*.

Background and aims

The overall objective of the IAP-RISK project is to mitigate the threat of invasive alien plants (IAP) to the European Union by producing 16 high quality pest risk analysis (PRAs) that meet the requirements of the EU Regulation no. 1143/2014.

Key measures and relative costs

In total, 37 IAP species were prioritised using a modified version of the European and Mediterranean Plant Protection Organisation (EPPO) Prioritization Process designed to be fully compliant with the Regulation. The updated EPPO prioritization process was designed (i) to produce a list of invasive alien plants that are established or could potentially establish in the European Union; and (ii) to determine which of the species have the highest priority for a PRA and, eventually, to be proposed for inclusion in the list of Union concern. Following prioritization, 16 invasive alien plants were identified as having a high priority for risk assessment and will be assessed using the EPPO express pest risk analysis following the requirements set out in Article 5.1 of the Regulation. The Centre for Ecology and Hydrology will model the potential occurrence of the species using species distribution modelling which will support answering key questions within the risk analysis.

Results

To-date six expert working groups have performed risk analysis on 12 plant species. Six PRAs have been submitted to the European Commission for review, and these include: *Cardiospermum grandiflorum*, *Cinnamomum camphora*, *Gymnocoronis spilanthoides*, *Hygrophila polysperma*, *Pistia stratiotes* and *Salvinia molesta*. Additional six PRAs (*Ehrharta calycina*, *Andropogon virginicus*, *Humulus scandens*, *Lygodium japonicum*, *Prosopis juliflora* and *Hakea sericea*) are currently under review.

Lessons learnt

The prioritization process designed within the framework of the LIFE project has proved to be an invaluable tool in assessing species for risk analysis. This tool is freely available and it can be amended to suit any taxonomic group, region or country. Additionally, within the project the EPPO risk analysis template has been amended to suit plants specifically and to incorporate ecosystem service impacts.

Sustainability of results

The risk assessment documents produced as a result of this project will be used to potentially list a species as a species of Union concern. This will act to regulate the species within the European Union with measures which will include a ban on sale. These measures will act to prevent further negative impacts on biological diversity and ecosystem services.

Recommendations

Further research is needed on a global scale to evaluate the impacts of invasive alien plants on both biodiversity and ecosystem services.

References

Branquart E. *et al.*, 2016. A prioritisation process for invasive alien plant species compliant with Regulation (EU) No. 1143/2014. EPPO Bulletin 46: 603–617. https://doi.org/10.1111/epp.12336.
Tanner R., *et al.*, 2017. The prioritisation of a short list of alien plants for risk analysis within the framework of the Regulation (EU) No. 1143/2014. NeoBiota 35: 87-118. https://doi.org/10.3897/neobiota.35.12366.

An invasive aquatic plant, *Pistia stratiotes* invading a river system in the south of France

LIFE15 NAT/FR/000864

LIFE CROAA - Control stRategies Of Alien invasive Amphibians in France

Duration From 01/09/2016 to 31/08/2022
Total budget €3,419,739.00 (EC co-financing 60%)
Website www.life-croaa.eu
Coordinating beneficiary Société Herpétologique de France (France)
Other partners Communauté de Communes de Thouarsais, Cistude Nature, Comité Départemental de Protection de la Nature et de l'Environnement du Loir-et-Cher, Parc Naturel Régional Loire-Anjou-Touraine, Parc Naturel Régional des Landes de Gascogne, Parc Naturel Périgord-Limousin, Université d'Angers (France)
Contact Mr. Christophe Eggert
e-mail myriam.labadesse@lashf.org

Target species

Lithobates catesbeianus, *Xenopus laevis* and other exotic amphibians which can be released in the environment.

Background and aims

The American Bullfrog (*Lithobates catesbeianus*) and the African clawed frog (*Xenopus laevis*) are two amphibian species that have been introduced in France, in Europe, and other continents. They are a major threat for wetlands because of their impacts on autochthonous communities (competition, predation, transmission of pathogens), and their strong colonization capacity (high productivity, high dispersal abilities). In France, *L. catesbeianus* has been introduced in Gironde, Bassin d'Arcachon and Dordogne (Aquitaine) and in Sologne (Centre). *X. laevis* is present in a single area straddling the two departments Deux-Sèvres and Maine-et-Loire.

Key measures and relative costs

1. Long-term control and containment: the efficiency of alternative control strategies will be assessed using a modeling approach that integrates ecological and biological data. The eradication of small population nuclei will be carried out by each local beneficiary. Novel capture methods will be tested and applied. The strategies offering the best cost-efficiency ratio will be selected and applied.
2. Prevention/awareness raising campaign: the network of stakeholders involved in trade and exchanges of alien amphibians will be identified. An action will be carried out to raise awareness about risks and responsibilities among stakeholders (public, laboratories, breeding facilities, herpetological societies).
   Education and information tools will be created for schools, local authorities, and specific local stakeholders (pond owners, fishing societies). Actions ranging from education resources developed on various media to specific training sessions will be carried out. Knowledge generated by the project will be released through academic publications. A conference gathering managers and scientists working on biological invasions of amphibians and reptiles in Europe will be organized. An Internet website and multimedia resources, such as a short film, will be created in order to enhance information search on alien amphibians by stakeholders. 3) Early detection: the Société Herpétologique de France will develop an early detection tool for alien amphibians from the onset of the project. It will resort to and expand its network of local and national observers, and will inform about the development of this mapping tool. The Coordinating Beneficiary will involve the Groupe de Travail national sur les Invasions Biologiques en Milieux Aquatiques to assess the risks for any novel case of introduction. For the foreseen costs for the actions specifically aimed at IAS, we can estimate it to €1,670,601 for the six years.

Results

The expected results of the project are:

1. The development of a modeling method to select the optimal control strategy against an invasive population of amphibians.
2. An efficiency gain for capture methods (20%).
3. The eradication or significant reduction of small populations of *L. catesbeianus*. For large populations, we aim to forbid colonization of at least two sites of high ecological value and to limit expansion along dispersal corridors for *X. laevis*. For *L. catesbeinaus* in Gironde, we target the eradication in eight sites.
4. Raising awareness about alien amphibians among the main pet shop brands, laboratories, herptile amateurs, and naturalist NGOs.
5. The creation of a network of trappers across the range of *X. laevis*.
6. The creation of an operational network of observers to structure and feed the early detection and assessment system for alien amphibians.
7. The publication of at least four publications in international scientific journals and the organization of an European conference on alien species of amphibians and reptiles. Communication about the project and its results through the Internet website is a key action that will target as a priority federative structures, involved in the management of environment and operating at national scale, to ensure the broadest release of information.

Sustainability of results

At the end of the project, some actions will have to be continued (early detection system, support for public policies, management of invasive amphibians and ecological monitoring, communication and awareness-raising). The actions implemented during the LIFE CROAA will make it possible to raise public awareness of the issue of invasive species and to mobilize managers of natural areas confronted with this issue. This will facilitate the continuation of the main actions of the project thereafter. Funding will be sought during the project to ensure the continuation of the actions.

References

Measey G. J. *et al.*, 2012. Ongoing invasions of the African clawed frog, *Xenopus laevis*: a global review. Supplementary material. Biological invasions, Vol. 14, pp. 2255–2270.

Demonstration site for the suppression of Japanese knotweed

LIFE10 NAT/DE/000009

Eichenwälder bei Wesel - Acidophilous oak woods with bogs and heaths

Duration From 01/01/2012 to 30/06/2018
Total budget €3,254,676 (EC co-financing 50%)
Website www.life-eichenwaelder.de
Coordinating beneficiary Biologische Station im Kreis Wesel e.V. (Germany)
Other partners Landesbetrieb Wald und Holz NRW; Nordrhein-Westfalen-Stiftung; Regionalverband Ruhr; Ruhr-Grün (Germany)
Contact Mr. Klaus Kretschmer (Biologische Station im Kreis Wesel e.V)
e-mail kretschmer@bskw.de

Target species

Prunus serotina (P. s.).

Background and aims

Prunus serotina is a neophyte from North America, which was planted in Germany for a long period as a fast-growing grove along streets to increase soil fertility on sandy soils and against the inhibiting of fires in pine forests. Today, *Prunus serotina* is particularly problematic on sand soil. It is growing very fast, prevents the development of an autochthonic natural rejuvenation and so it displaces indigenous species.

The displacement of natural vegetation also takes place in the project area. The habitats 2310, 2330, 4030 and 9190 are especially affected. Local is the spreading of *Prunus serotina* so large that the habitats would disappear without an intervention. Thus *Prunus serotina* is a significant problem for the conservation of the Natura 2000 habitats in the project area. The removal is an essential part of the life project.

The aim of the measures is to remove *Prunus serotina* from an area of approximately 500 ha in an amount that no negative effects are given to the concerned habitats.

Key measures and relative costs

In order to achieve the goal, international workcamps were carried out, forestry contractors were commissioned and campaigns were organized with volunteers.

Since the problem is not new, it was possible to draw on experiences from various projects. At the same time as the project start, the state of North Rhine-Westphalia developed guidelines to combat *Prunus serotina* On this basis, the following measures were defined:

- Removal of fruit bearing trees as a source of infection.
- Removal of young plants from still largely free habitats.
- Control of all kind of plants in habitats where there is acute need for action.

As concrete methods of control were used:

- Tearing out of (young) plants.
- Removing the bark in a kind of ring.
- Sawing the trees at a height of 1 meter and reworking at least 2x times in the following years.

The application of biocides and biological control agents was examined, discussed and rejected at the beginning of the project. The project started 3 years before IAS. The corresponding guidelines are then considered indirectly.

Results

The removing take place in all affected project areas. At the end of August (2017) 600 ha had been worked on; 6 workcamps with 100 young people from 20 countries were organized, 11 contracts were given to contractors and several days were worked with school classes and voluntary staff. Many areas were repeatedly worked on in successive years. The objectives set with the project have been achieved or exceeded with regard to the implementation of the measures. However, there is still a need for action.

To date, €160,000 has been spent. €10,000 more than calculated at the start of the project (without personnel costs). The action is yet not fully finished.

Lessons learnt

Prunus serotina is considered as a neophyte which is difficult to fight. The results show that control on sandy soils in the affected habitats is possible. The support of young international volunteers is, by itself, not an effective means of combating *Prunus serotina* However, the workcamps were a great success for the project, because they brought together young people from different nationalities and promoted their general commitment to nature.

Sustainability of results

The measures must be carried out over several years. Since *Prunus serotina* can hardly be completely exterminated, it must be observed continuously. Important is a consistent removal of fruit trees – also in the environment of the affected sites. This is a special challenge for the future.

Recommendations

An unsteady natural development will favor *Prunus serotina* and lead to a degradation of the habitats.

References

Information source that provides more in-depth understanding about the case study and can serve as learning material for others facing similar challenges: www.neobiota.naturschutzinformationen-nrw.de.

Group of youth people who have just pulled out a wild cherry

LIFE15 NAT/DE/000745

LIFE-Patches & Corridors - Development of a habitat network for the Violet Copper to promote a sustainable metapopulation

Duration	From 01/10/2017 to 31/12/2022
Total budget	€2,455,479.00 (EC co-financing 60%)
Coordinating beneficiary	Biologische Station StädteRegion Aachen e.V. (Germany)
Other partners	Ministerium für Klimaschutz, Umwelt, Landwirtschaft - Naturund Verbraucherschutz des Landes Nordrhein-Westfalen (Germany)
Contact	Mr. Bernard Theissen (Biologische Station StädteRegion Aachen e.V.);
e-mail	bernhard.theissen@bs-aachen.de

Target species

Impatiens glandulifera, *Heracleum mantegazzianum*, *Fallopia japonica*.

Background and aims

The project is located in the Eifel mountains, a low mountain range in the western part of Germany. The Natura 2000 sites are biodiversity hotspots with a high value for recreation. Nevertheless, forestry, mainly with non-native spruce plantations, is of importance for both public and private owners. Dairy farming is the main subject of agriculture. Thus meadows and pastures maintain a great portion of the landscape. The Eifel forms a plateau with settlements located on the agriculturally used top and many small creeks, emerging from swampy headwaters, running down to the river Rur, forming more or less steep valleys. The source of IAS are gardens and disposal sites of garden waste, respectively.

Beekeepers used to spread the plant as nectar source. Seeds and cuttings are spread unintentionally by construction vehicles between construction sites. Creeks are vectors of seedlings within the alluvial plain.

Locally *I. glandulifera* dominates the hydrophilous tall herb fringe communities, alluvial meadows and forests. Negative impacts on the biocoenoses are highly probable. The IAS *F. japonica* and *H. mantegazzianum* have not been objectives of the project in the first instance. Nevertheless, their presence within the Natura 2000 sites along with their impact on biodiversity, on human health (*H. mantegazzianum*) as well as on the structure of buildings (*F. japonica*) calls for action. Since sources and pathways of distribution are similar, actions addressing public awareness and political decision making are carried out as well.

Key measures and relative costs

Main source of IAS is illegal dumping of garden waste. Thus the public awareness has to be raised, aiming at a sustainable eradication. Information will be spread by press articles, leaflets, excursions, etc. Local authorities and construction companies have to be sensitized to the problem of construction sites as IAS source or stepping stone. Currently, IAS are mapped and data are processed in GIS. Maps will be kept up to date including information like location and amount of IAS, measures conducted, etc. A call to share observations should involve people in this issue. A contract to eradicate IAS will be awarded for a five year period to gardening and landscaping companies. Within After-LIFE the biological station will maintain monitoring, eradication and public awareness. Costs for actions explicitly aimed at IAS are comparably low. Personal costs of about €20,000 and €75,000 for the eradication measures are calculated. Costs for public awareness in the project are not in detail calculated for the IAS issue.

Results

Main goal is to protect the natural species structure of both, hydrophilous tall herb fringe communities and alluvial forests, by elimination of the Himalayan Balsam (*Impatiens glandulifera*) in four valleys within the Natura 2000 site. According to the HBD, the favorable status of species and habitats of 6430, 9180, 91D0, 91E0 will be improved.

Lessons learnt

Our approach to eradicate *I. glandulifera* is to pull out plants including their roots. Due to our experience, the total eradication can be successful in a five year period. Until now, the general public does not really care for the problem. Very few people get in action on their own. A lot of people, also at the authorities, do not believe in a sustainable success of actions against IAS. One local authority was successful in applying for financial support against IAS. The money can only be spent against immediate risks to people – in detail *H. mantegazzianum*. *I. glandulifera* is not seen as risk to people. Yet we could convince the responsible actors that *F. japonica* is a risk for buildings.

Sustainability of results

Future actions should aim at solutions against illegal dumping of (garden) waste and against the transfer of IAS by construction vehicles. Companies should have the duty to monitor construction sites when works are finalized. Our project can initiate a discussion on these issues. Nevertheless, a solution cannot be presented within the project period.

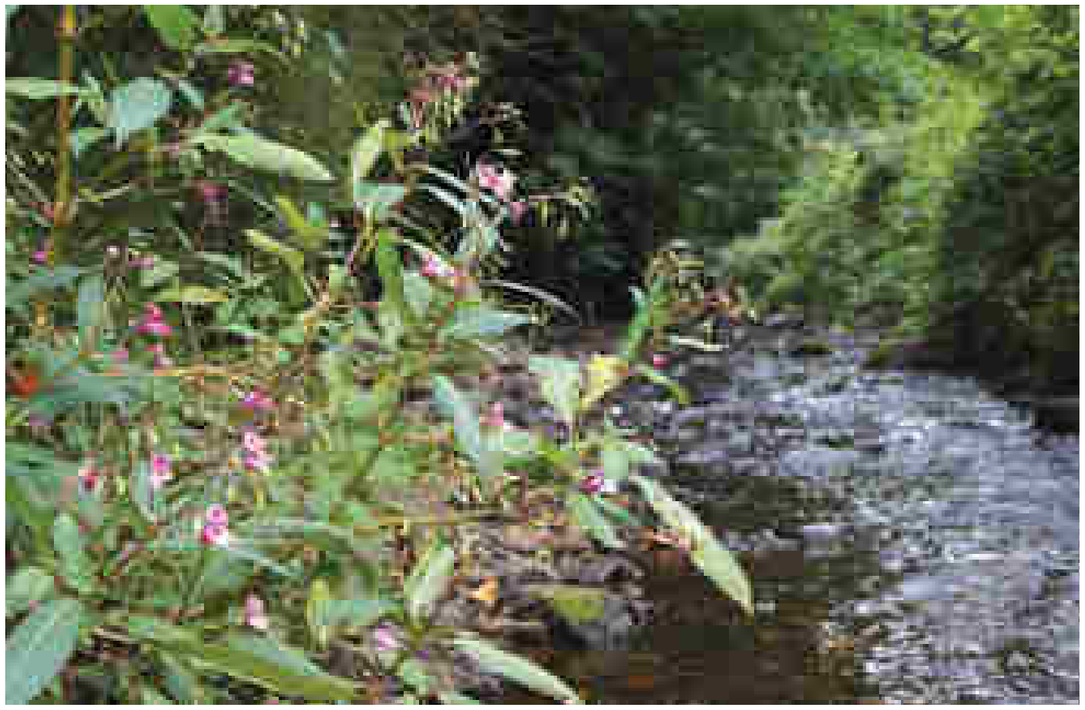
Recommendations

To establish a sustainable success in the eradication of alien invasive plants, an adequate statutory framework has to be set up. The cultivation of IAS has to be restricted. It has to be clarified that cultivated alien invasive plants can be legally removed from private properties. The general public as well as the authorities have to be convinced of the threats caused by IAS and their economic implications. Thus, amongst others, the financial efforts of IAS eradication should be made visible. Finally, an adequate (garden) waste disposal is a key factor establishing a sustainable strategy.

References

Management-Handbuch zum Umgang mit gebietsfremden Arten in Deutschland (2015): Band 1: + 2 ISBN-13: 978-3784340418 + 978-3784337418.

The Himalayan Balsam (*Impatiens glandulifera*) is a threat to alluvial habitats. Seedlings are spread via creeks and emerge easily on their banks



LIFE12 ENV/GR/000466

LIFE CONOPS - Development & demonstration of management plans against - the climate change enhanced- invasive mosquitoes in S. Europe

Duration From 01/07/2013 to 31/12/2017
Total budget €2,989,314 (EC co-financing 49.53%)
Website www.conops.gr
Coordinating beneficiary Benaki Phytopathological Institute (BPI)
Other partners Agricultural University of Athens (Greece); National Centre for Scientific Research "DEMOKRITOS" (Greece); Azienda Unità Locale Sanitaria della Romagna – Area Organizzativa Omogena di Ravenna (Italy); Centro Agricoltura Ambiente "G. Nicoli" (Italy); ONEX SA (Greece); Regione Emilia-Romagna – Public Health Service (Italy); TERRA NOVA Ltd (Greece); Institute of Urban Environment & Human Resources (Greece)
Contact Mr. Antonios Michaelakis (Benaki Phytopathological Institute)
e-mail a.michaelakis@bpi.gr

Target species

Aedes albopictus (Asian tiger mosquito), *Aedes aegypti*, *Aedes atropalpus*, *Aedes geniculatus*, *Aedes japonicas*, *Aedes koreicus*, *Aedes triseriatus*.

Background and aims

Several Invasive Mosquito Species (IMS) have been introduced in Europe, where they met favorable environmental and climatic conditions enhanced by the continuously evolving Climate Change phenomenon, to establish permanent populations. The problem of IMS is becoming of primary importance on the EU scenario as evidenced by the increasing number of detection in different EU countries and because of the public health risk related to the vector capacity of some of these mosquitoes for several pathogens. The predicted increases in rainfall and temperature are likely to extend the distribution of mosquitoes and associated pathogens, in addition to shortening the development time of mosquito larvae and the extrinsic incubation period of pathogens. LIFE CONOPS aims *inter alia* at developing:

1. identification of the most important risky point of entries in Greece and Italy for IMS;
2. a network of 12 prototype devices for the surveillance of the IMS populations in selected high-risk areas in Greece and Italy;
3. the necessary integrated management plans for the confrontation of the IMS problem both in the current period as well as in the future based on climatic projections.

Key measures and relative costs

Long-term / qualitative economic benefits: more convenient cost-benefit approach by implementing IMS surveillance activities allowing early detection of IMS and rapid adoption of suppression measures. Therefore, operational Management Plans for Invasive Mosquito Species (IMS-MP) have been developed by the LIFE CONOPS team with the aim to provide an easy-to-use-tool serving the local/regional bodies responsible for IMS management. An emergency vector control plan has been proposed and responsibilities clearly assigned to deal with the potential epidemic risk in case of imported Chikungunya, Dengue and Zika cases which came into force in September 2016 by a Ministerial Circular issued by the Hellenic Ministry of Public Health.

Results

The major results are:

1. An innovative prototype mosquito monitoring device (MD). The MD promotes the process of surveillance & control of adult IMS through its unique innovative design & operation characteristics, which differentiate it substantially compared to the current devices existing in the global market.
2. A set of Integrated Management Plans which specifically focus on the efficient, direct and on-time confrontation of the IMS problem.

Lessons learnt

The management plans that will be fully developed and validated at the end of the project will be available for implementation in every EU country. Their main directions and principles can be adopted and used everywhere in the world for IPM (Integrated Pest Management). The identification of the relevant stakeholders has been performed as the most important step to guarantee the sustainability of the management plan, ensure future exploitation of the project's outcomes and assist in the achievement of its goals. The first year (2016) of the MDs' operation as well as the demonstration of the MDs that took place, revealed significant potentials for market exploitation of the developed MD, which will be further investigated by the project in order to get MD to a close-to-market status. Dissemination of the project's results is a key element for its valorisation. Effective dissemination strongly influences the project's exploitation chances and its potential to be sustained after the project's lifetime.

Sustainability of results

It is very important that most of the project's beneficiaries are directly related to IMS. In addition, the established collaboration with HCDCP in Greece ensures the AFTER–LIFE sustainable continuation of the project. For Italy, the Public Health Services will undertake the continuation of the project by increasing the coordination at the national level. The innovative value of the project is mainly based on the development of the prototype MD which is designed in such a way so as to play a very important role in assisting efficiently and cost effectively the future surveillance of IMS in high risk areas. The developed Management plans against IMS as well as all relevant activities, under pilot implementation both in Greece and Italy are providing useful data about their effectiveness as well as indication for possible improvements. LIFE CONOPS management plans have been legally operating in Greece since August 2016: a ministerial circular produced by Hellenic Ministry of Health and distributed to all public health units in Greece. In Italy improvements of the previously adopted mosquito control measures have been obtained such as the door-to-door strategy against the already well established IMS *Aedes albopictus* and the quality control following the emergency measures applied on the imported case of disease (CHIK, DEN, ZIKA). At the end of the project the key actions will become permanently included in the duties of public health bodies and mosquito control agencies, to guarantee the continuation of the surveillance activity in risky point of entry, with the use of the prototype devices and the continuation of the dissemination activities.

Recommendations

Gaps have been identified in the difficulty to clearly recognize and hierarchically categorize the risk in point of entries because of the unpredictability of the introduction event. Moreover the port and airport authorities are reluctant to accept to host MD in their area because there is no policy/regulation on the need to conduct mosquito surveillance in these sites.

References

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Presentation of the LIFE CONOPS project and demonstration of the newly developed Monitoring Device prototype (MD) to more than 60 representatives of DG Environment, LIFE Unit and NEEMO at an event that was held in the Airport of Thessaloniki "Makedonia" on 21/04/2016

LIFE13 NAT/GR/000909

LIFE ELClimA - Conservation measures to assist the adaptation of *Falco eleonorae** to climate change

Duration	From 01/08/2014 to 30/9/2018
Total budget	€1,206,201 (EC co-financing 74.50%)
Website	www.lifefalcoeleonorae.gr
Coordinating beneficiary	University of Patras – Research Committee (Greece)
Other partners	Hellenic Ornithological Society/Birdlife Greece, Nature Conservation Consultants Ltd (Greece)
Contact	Mr. Sinos Giokas (University of Patras)
e-mail	sinosg@upatras.gr

Target species

Rattus rattus.

Background and aims

Eleonora's falcon (*Falco eleonorae*) is listed in Annex I of the Birds Directive and is considered among the most important bird species in Greece given that the majority of the species' breeding population nests on islets of the Aegean Sea. Among other conservation actions, the project LIFE ElClimA implements rat eradication operations in 2 islet complexes at Crete and Cyclades to minimize the rat predation risk for nesting falcons. The presence of the accidentally human introduced Black Rat (*Rattus rattus*) on the Aegean islets is one of the major threats for ground nesting birds, especially for seabirds and Eleonora's Falcons, leading to high lost rates for fledglings and eggs. Rats are one of the world's 100 worst most invasive alien species (ISSG). The Eleonora's Falcon's International Species Action Plan lists rat eradication as a priority for the species conservation. The islets where Eleonora's Falcon typically breeds are uninhabited, yet they are visited by humans mainly for hunting and fishing. The eradication operations of the LIFE ElClimA project are expected to have immediate and long-term beneficial impacts on the breeding performance, resilience and conservation status of other species of concern that live on the target islets (i.e. birds, invertebrates, lizards, etc.), and more specifically on two of the largest colonies of Yelkouan Shearwater (*Puffinus yelkouan*) and Scopoli's Shearwater (*Calonectris diomedea*) in Greece, as well as on the overall quality of islet ecosystems and habitats.

Key measures and relative costs

The rat eradication measures are implemented in 2 islet complexes covering an area of 705ha and are based on the know-how experience acquired on rat eradications on almost 40 uninhabited islets in Greece for more than 12 years. These measures involve:

1. Preparatory phase: planning of eradication and quarantine measures to create maximum ecological benefits for the local biodiversity, acquisition of licenses, formal correspondence with regional and local state authorities, equipment's purchase, construction of custom-made bait stations, GIS analysis for map generation, creation of geodatabase for data entry and analysis.
2. Rat eradication using bait stations: deployment of bait stations, regular baiting, monitoring of eradication progress, its potential impacts on native biodiversity, removal of rat corpses if found. Post-eradication monitoring is carried out to ensure long-term absence of rats and optimal benefits to native flora and fauna.
3. Prevention of rat reinvasion: measures for the prevention of accidental reintroduction of rats on the target islands in association with dissemination activities.

The methods used ensure maximum safety to non-target species and field workers. During preparatory field surveys special attention has been paid to detection and identification of endemic mammalian and reptile species which should not be exposed to the risk of poisoning. To avoid the disturbance of breeding birds, baiting operations in the colonies of the Eleonora's falcon is implemented from late autumn until early spring, when the falcons have already left their colonies. The total cost of the rat eradications on the islands (including planning, eradication, quarantine measures and post-eradication monitoring) is approx. €250,000 (cost per unit area approx. €355/hectare).

Results

Up to date rat activity has stopped on 6 out of 7 target islets, while only minor rat activity has been recorded in spring 2017 on the remaining island, where baiting still continues. Post-eradication monitoring continues on all islands. Preliminary results indicate an increase of the productivity of the monitored Eleonora's Falcon colony in 2016 (the average productivity was 1.67 in 2005-2007, 1.53 in 2014 it and 2.00 in 2016). But, the spatial distribution of the nests has not changed significantly since 2014, because it takes years for the falcons to reoccupy abandoned sites.

Lessons learnt

The innovative aspect of the current project involves: (A) the planning and implementation of the largest and most difficult so far rat eradication actions in Greece, and (B) the ecosystem based approach, ensuring that the rat eradications will create maximum benefits to the island ecosystems. That achievement should be considered internationally important due to the selectivity and precautious character of the methods used (no collateral damages to non-target local biodiversity). Direct involvement of the local stakeholders was essential for the social acceptance of the actions and long-term maintenance of rat-free islands. The removal of rats and the recovery of the island ecosystems are expected to improve the ecosystem services of these islands and to create social benefits, ranging from research activities to ecotourism. The eradication methods employed by the present project are already a result of replicability and transferability of the methods applied in other regions in Greece and abroad and they provide additional tools which are planned to be used on other island and regions.

Sustainability of results

The sustainability of the achieved results is based on capacity building and training of the local authorities and raising awareness of the islet users. To ensure the continuity of the project actions after LIFE, the project partnership cooperates with the local authorities (Decentralized Administrations of the South Aegean & Crete, Forestry Departments). The local authorities are gaining know-how of the rat eradication methods and are planning, funded by the Hellenic Green Fund, to extend this action and habitat restoration activities to other islets. Furthermore the anticipated benefits and sustainability of the project results will be assured through the distribution of the Good Practice Guide to competent authorities. Birdlife International has also committed to facilitate overall networking activities, including the distribution of the Good Practice Guide. The project partnership in collaboration with local management authorities, will schedule informational events to promote the environmental benefits of the project actions and to disseminate the project team's technical know-how. Additionally, the project partnership has asked the Forestry of Cyclades to designate the project target islets as Wildlife Refuge, given their biodiversity significance. Thus, these efforts will eventually contribute to the sustainability of long-term environmental benefits of the project results in the project areas and beyond. Moreover, the public awareness activities are expected to bring about positive changes in the environmental awareness of local societies. After the end of the project, the project partnership will make every effort to continue monitoring activities in the project areas to ensure the long-term sustainability of the project results. Both NCC Ltd and HOS are currently running other LIFE projects that overlap with the area of implementation of the LIFE ElClimA project. They will thus make use of networking activities among these projects to secure long-term effects.

Recommendations

One of the key knowledge gaps refers to the overall impact of the IAS or other introduced species, e.g. domestic animals, on the ecosystems of the uninhabited islands. This in turn limits our ability to plan holistic eradication, management and restoration measures, which would (a) prioritize the invasive species and the target islands effectively, as well as (b) plan for optimal measures that will create maximum benefits to the islet ecosystems as a whole. So far the prioritization and planning has been limited to particular priority bird species, e.g. Eleonora's Falcon or seabird species. However, there are indications that rat eradications in combination with a limitation of grazing by domestic animal can create multiple benefits to virtually all fauna and flora groups of the uninhabited islets.

References

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Fric J., Evangelidis A. (2017). A review of 12 years of rat operations for the conservation of priority island nesting birds in Greece

Fric J., Dimalexis T., Goritsas V, Evangelidis A., Nikolaou I (2017). Eleonora's falcon (Falco eleonorae) benefitting from rat eradication – The case of Andros, Greece.

Preparation of material for the rat eradication on the islets of Crete

LIFE10 NAT/HU/000020

HUTURJAN - Conservation of priority natural values in Turjánvidék Natura 2000 site southern unit' LIFE+ Nature project

Duration From 01/09/2011 to 31/12/2017
Total budget €2,730,102.00 (EC co-financing 75%)
Website www.turjanvidek.hu
Coordinating beneficiary Duna-Ipoly National Park Directorate (Hungary)
Other partners Ministry of Defence Defence Economic Bureau; Budapest Forestry Company; WWF Hungary (Hungary)
Contact Ms. Annamária Csóka (Duna-Ipoly National Park Directorate)
e-mail csokaa@dinpi.hu

Target species

Alianthus altissima, *Robinia pseudoacacia*, *Eleagnus angustifolia*, *Acer negundo*, *Celtis occidentalis*, *Asclepias syriaca*.

Background and aims

The project area is situated in Central Hungary, in the northern part of the Danube- Tisza Interfluve; it is a valuable and extensive mosaic of dry and humid natural habitats. The sand grasslands are extremely rich in endemic species. The target area of IAS control belongs to Táborfalva Military Shooting Range and Training Area of the Hungarian Army. Since the area has functioned as a military training site from 1876, it is moderately affected by agricultural and forestry use and fragmentation is not characteristic here. As the natural habitats are situated in one large block, and were moderately infested by IAS, we had the opportunity to slow down the degradation of the habitats considerably. However, the natural area is surrounded by non-native tree plantations whose herbaceous layer is composed of IAS as well, and soil disturbance caused by military also facilitates the settlement of IAS. IAS are one of the main threatening factors in the project area. Mainly Pannonic sand steppes (6260) and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0) are affected by IAS; IAS management was carried out in line with the national Natura 2000 and agricultural legislation. In the updated list of IAS of Union concern, only common milkweed is indicated among the targeted species.

Key measures and relative costs

We also aimed to collect the national and international know-how on the management of IAS we were interested in and which are common in Hungary, that is why we held two workshops on practical IAS management. For details regarding the methods (annual schedule of the treatments, active substances, etc. and also expenses/ha) see References 2 and 5.

Results

IAS control was implemented in dry sand grasslands on 1,172 ha (tree of heaven, black locust, Russian olive) and in humid forests on 61 ha (Russian olive, boxelder maple, common hackberry). In October, 2013 'Practical IAS management in conservation' seminar was held, with 100+ participants (representatives of Hungarian LIFE projects with IAS management, all national park directorates of Hungary, forestry companies, IAS experts etc.) (see reference 1). The results of the seminar were included in Rosalia handbook 'Practical Experiences in Invasive Plant Control' (see reference 2). In April, 2016 a very successful 'European Workshop on Control and Eradication of Invasive Alien Plant Species' was held in Budapest, with 130+ participants from 15 countries. The event contributed to the biogeographic process of the Pannonian ecoregion as an official follow-up event. Also a representative of DG. Env. was participated. Special emphasis was put on the invitation of IAS experienced LIFE projects (see reference 3).

Lessons learnt

We used the experience of our former LIFE projects in the IAS management of HUTURJAN project. All our new experience gained in HUTURJAN was published and disseminated. Apart from the best practices in IAS management, we aimed to share with all European countries the know-how acquired in IAS policy, funding possibilities, communication, etc.

Sustainability of results

After the elimination of IAS in the project target area, there will be no need for active intervention in the next 5 years, however, continuous monitoring of IAS is essential. Apart from LIFE, available funding sources for IAS management are at national level: integrated territorial investments (VEKOP, KEHOP) and at EU level: interregional development program (INTERREG).

Recommendations

Also joint recommendations were compiled by the participants of '**European Workshop on Control and Eradication of Invasive Alien Plant Species**' for the EC and Member States regarding IAS (see references 4, 5).

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Field program in the national IAS workshop

LIFE04NAT/IT/000172

ISOTOSCA - Isole di Toscana: nuove azioni per uccelli marini ed habitat

Duration From 01/09/2004 to 31/12/2007
Total budget €566,000.00 (EC co-financing 50%)
Coordinating beneficiary Parco Nazionale Arcipelago Toscano (Italy)
Contact Ms. Francesca Giannini (Parco Nazionale Arcipelago Toscano)
e-mail giannini@islepark.it

Target species

Rattus rattus, *Felix catus*.

Background and aims

The project locations are some islands of the Tuscan Archipelago: Giannutri (240 ha, most significant habitats: 1240 and 1310) and Pianosa (1,025 ha, most significant habitats: 5210 and 1240). In Giannutri the Black rat (*Rattus rattus*) had negative impacts on the breeding success of the Scopoli's shearwater (*Calonectris diomedea*) and public sanitation (cost for pest control approximately €15,000/year). Around ten people permanently live on Giannutri with exclusively seasonal tourism activities; the island is connected by public ferry service and various private vessels which transport vehicles, goods and passengers. On Pianosa the Black rat and a feral population of domestic cats preyed on individuals, eggs and chicks of nesting bird populations including *C. diomedea* and *Ichthyaetus audouinii*. The island houses a branch of the Porto Azzurro Prison, and accommodates approximately 20 detainees and security guards. Its touristic use is regulated and mainly concentrated in spring and summer. The connection with Elba is ensured weekly by a public ferry which transports vehicles, passengers and goods and daily by a private vessel for passengers only.

Key measures and relative costs

Total cost of counteracting IAS: €137,000. Giannutri: creation of an eradication plan and an awareness campaign. Eradication of the Black rat by means of bait-stations filled with rodenticide baits with Brodifacoum as active ingredient. Intervention period: 2005-2007. Operation cost: €320/ha. Pianosa: control of Black rat at a reproduction site of C. *diomedea* by means of bait-station during two summer months (half of June and first half of August) in 2005-2007. Performance of a feasibility study for the eradication of the species. Capture and relocation of feral cats (over 70 individuals) with bloodless methods from March 2006 to December 2007; the population was reduced to just a few individuals. Cost: €515 per individual.

Results

Giannutri: eradication successfully completed and island declared "Rat free" in 2009. Due to the inexistence of nests that could be inspected, it was not possible to monitor the reproductive success of *C. diomedea*, whose population is estimated at 70-270 birds. In 2013 the presence of *Puffinus yelkouan* was recorded again, after total absence in the previous decade. Pianosa: breeding success of C. *diomedea* at Punta Brigantina was 50% in 2005, 0.75% in 2006 and 50% in 2007 (fluctuations are probably due to the small number of nests that can be inspected and to the fact that, as highlighted in later years, predation by other species occurs).

Lessons learnt

ISOTOSCA was the most important project conducted in the Mediterranean up to the time and was useful for implementing later other eradications on the islands of Zannone, Linosa and Pianosa. With regard to the actions taken for controlling the feline population in Pianosa, the regional and national regulations on pet animals strongly limit the intervention techniques. Therefore, elimination of the species from large areas is permitted only at particular conditions and the implementation costs are subsequently much greater.

Sustainability of results

The bio-security measures implemented have been running in Giannutri since 2007. Furthermore, the presence of anti-rat stations on ships is envisaged. Unfortunately, the reliability of conducting the operations is not guaranteed and it is easily expected that in the future the activities will be conducted by the National Park with their own funds, at least for monitoring.

Recommendations

The activation and sustainability of the costs of the bio-security measures remains the most problematic issue, as these measures are perceived as superfluous by the resident population or by other administrations responsible for public health since they realized that rats are no longer present. Now they are used to the absence of rats and unwilling to invest their own resources to prevent them from recolonizing the island.

References

I quaderni del Parco, Documenti tecnici, Volume 1 - Progetto LIFE Natura Isola di Toscana nuove azioni per uccelli marini e habitat – Parco Nazionale Arcipelago Toscano, 2007.

Scopoli's shearwater (*Calonectris diomedea*)

LIFE08NAT/IT/000353

MONTECRISTO 2010
Eradicazione di componenti floro-faunistiche aliene invasive e tutela di specie e habitat nell'Arcipelago Toscano

Duration From 01/01/2010 to 30/06/2014
Total budget €1,584,856.00 (EC co-financing 50%)
Website www.montecristo2010.it
Coordinating beneficiary Corpo Forestale dello Stato, Ufficio Territoriale per la Biodiversità (Italy)
Other partners Parco Nazionale Arcipelago Toscano, Istituto Superiore per la Protezione e Ricerca Ambientale, NEMO srl (Italy)
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Target species
Rattus rattus, *Ailanthus altissima*, *Carpobrotus spp.*, *Acacia saligna*, *Acacia pycnacantha*, *Senecio angulatus*.

Background and aims
The project locations are the following islands of the Tuscan Archipelago: Montecristo (1,039 ha, most significant habitats: 3170*, 3120, 6220, 9340 and 8220) and Pianosa (1,025 ha, most significant habitats: 5210 and 1240). On Montecristo the black rat was present, being a threat to many species of birds and other vertebrates: *Puffinus yelkouan*, *Caprimulgus europaeus*, *Euleptes europaea*.
Ailanthus trees, introduced in the 19th century, have a negative impact on many habitats and some bird species such as *Sylvia undata*. The island, inhabited only by its wardens, is a nature reserve far from the mainland and it is only rarely visited by excursionists. In Pianosa, the various invasive plant species, introduced when the island was a prison, were a threat to the above mentioned habitats. Currently, a few dozen people live there and only during summer the tourism is intense, when access is subject to quotas.

Key measures and relative costs
Montecristo: definition of the plan to eradicate the black rat and installation of a fence to protect a herd of around 40 goats; aerial distribution of rodenticide baits in winter 2012; treatment of the fenced off area and of the inhabited zone with distribution of baits through baitstations (active ingredient: brodifacoum). Cost per ha: €390. Definition of the plan for the elimination of *Ailanthus* across over 183 ha, by chemical and cutting treatments (through the systemic herbicides Picloram and Triclopyr). Cost per ha treated: €2,240.
Pianosa: definition of the plan for treating the area for the removal of *Carpobrotus* spp., *Acacia saligna*, *Acacia pycnacantha* and *Senecio angulatus* (about 25 ha) and the removal through mechanical, chemical and manual uprooting treatments. Cost per m^2: €9,40.

Results
Montecristo: the eradication of rats from Montecristo, declared "Rat free" in 2016, immediately improved the breeding success of *Puffinus yelkouan* (400 to 750 pairs), going from 0 to an average of 85%. The treatment of 183 ha invaded by *Ailanthus* allowed for new plants to grow, lots of which are part of 6220* and 3170* habitats. Pianosa: over around 25,500 m^2 were got rid of invasive species and 7,500 m^2 of dune habitats were restored. Another 100,000 *A. altissima* plants and 34 *Acacia* spp. were destroyed, and 360 m^2 were treated against the spread of *S. angulatus*.

Lessons learnt
On Montecristo, the operation was very demonstrative as it involved the eradication of more than a single species at the same time: R. *rattus* and *A. altissima*, in the presence of an ungulate stock that needed being safeguarded. The low accessibility of many areas made it difficult to repeat treatments on A. altissima. Despite this, the techniques used were useful for planning the removal of *A. altissima* from Pianosa. The rat operation was marked by a high level of technical innovation for the European continent, due to the use of specific software and equipment for the aerial distribution of the baits. The execution of this operation was useful for planning the eradication of *R. rattus* in Tavolara island (Sardinia, Italy).

Sustainability of results
In Pianosa, *Acacia* spp. acacias and *Carpobrotus* spp. were eliminated and there are sufficient regulations preventing their introduction. The last *S. angulatus* and *A. altissima* plants, however, are in the treatment stage, using funds provided by the National Park. In Montecristo, the risk of recolonization by rats is very low and, therefore, only a few good biosecurity practices are necessary. It is more difficult to stop the regrown of *A. altissima* which will require a noteworthy economic commitment with funds to be sought out by the site managers.

Recommendations
The aerial distribution on Montecristo was useful for discussing the shortcomings in Italian and European regulations at this regard, identifying some main issues.

References:
I Quaderni del Parco, documenti tecnici volume 2 - Progetto Life + Montecristo 2010, Parco Nazionale Arcipelago Toscano – Portoferraio 2014.

Aerial distribution of rodenticide in Montecristo

LIFE09 NAT/IT/000095

EC-SQUARE - Eradication and control of grey squirrel: actions for preservation of biodiversity in forest ecosystems

Duration From 01/09/2010 to 31/03/2015
Total budget €2,001,113.00 (EC co-financing 45.43%)
Website www.rossoscoiattolo.eu
Coordinating beneficiary Lombardia Region (Italy)
Other partners Regione Piemonte, Regione Liguria, Insubria Università dell'Insubria, Università di Torino, Università di Genova, Istituto Oikos (Italy)
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Target species

Sciurus carolinensins and *Callosciurus erythraeus*.

Background and aims

The geographical context is areas with high anthropic presence in Northern Italy. Pathways: pet sale and illegal releases on the territory. The species was firstly introduced in 1948 near Turin (Piedmont) and subsequently in 1966 in Genoa (Liguria). After 1990 it was illegally released an unspecified number of times in Lombardy. Environment: urban and sub-urban areas potentially connected with red squirrel habitats, residual forests, woodlands still occupied by native red squirrels and natural parks (priority areas to eradicate IAS). Impact: native red squirrel extinction and ecosystem modification.

Key measures and relative costs

Key measures: IAS release prevention with a Ministerial Decree banning the grey squirrel and other two species from pet trade approved, developing early detection using prepared staff and rapid response in the three regions; management of the populations, first eradication project with live-trapping and surgical sterilization of the animals.
Costs: about €150 per animal (using sterilization), about €50 per animal (using euthanasia).

Results

EC-SQUARE has been the first project in Italy to tackle the management of an abundant and widely distributed IAS in a multi-disciplinary, organised way. Actions initiated during the LIFE project have resulted in the near complete eradication of the alien species in Liguria at Genoa Nervi and in at least two areas in Lombardy and Piedmont. Control activities are ongoing in Lombardy and Liguria. Public awareness of invasive species was raised, with at least one article/week in newspapers during the 4 years of the project. Negative articles decreased during the project.

Lessons learnt

Eradication activities should be transformed into routine activities, involving not only trappers but also other staff and stakeholders, also by increasing the interest of private sectors (e.g. pest control companies etc.). In the case of very small populations living in urban parks, for which euthanasia can induce hostility due to the strong affection feelings towards squirrels, their removal could be made by surgical sterilization, much more expensive and complicate to organize, but more easily acceptable by citizens.
The project was strongly hindered by some animal welfare groups and other local groups, in all regions involved in the project, but particularly in Genoa, where activities in an urban park increased the media coverage and the initial aversion to the management of the grey squirrel population. Oppositions have been addressed by the Task Force, changing the actions when possible and increasing the communication with stakeholders, the public and the media. This has resulted, in time, in a more civil discussion with most of the groups that originally opposed the entire project and meetings between Task Force members and local animal welfare groups have been organized, in order to discuss possible joined solutions of the grey squirrel problem in some key areas.

Sustainability of results

Local and EU level resources have been identified; some are used (LIFE Gestire 2020 in Lombardy, regional fund in Liguria), others only planned (regional fund in Piedmont).
Need to find resources that are currently too scarce. Need to search for possible uses of eradicated animals and not just consider them as a cost (disposal) to reduce costs of eradication. Need to have a greater number of people able to intervene with recognized professionalism. Need to increase awareness of the negative effects that the IAS may have on biodiversity conservation to gain support from citizens.

Recommendations

Interventions are expensive and human demanding. New technical solutions are needed. A possible short-term solution would be the use of automatic traps (in areas of exclusive IAS presence) such as the New-Zealand model; the possibility for correct and safe use of rodenticides (in areas of exclusive IAS presence) must be considered.

References

During the project it was produced a video, a brochure, a leaflet for the general public and these scientific articles:

- Bertolino S. *et al*. A. 2014. A grey future for Europe: *Sciurus carolinensis* is replacing native red squirrels in Italy. Biological Invasions 16: 53-62.
- Bertolino S. *et al*. 2013. Banning squirrels from the pet trade in Italy. Aliens: The Invasive Species Bulletin, n. 33, pp. 44-46.
- Stekolnikov A.A. *et al.* 2014. First finding of the chigger mite *Neotrombicula talmiensis* (Acari: Trombiculidae) in Italy. International Journal of Acarology, 40: 419-420.
- Bertolino S. *et al.*. The grey squirrel in Italy: impacts and management. Red Squirrel Survival Trust and European Squirrel Initiative Editors "The Ecology, Conservation and Management of Red Squirrels in Europe".
- Lurz P. W. W. *et al*.. Squirrel monitoring: snapshots of population presence and trends. Red Squirrel Survival Trust and European Squirrel Initiative Editors "The Ecology, Conservation and Management of Red Squirrels in Europe".
- Signorile *et al*. How population genetics can contribute to the management of grey squirrel invasions. Red Squirrel Survival Trust and European Squirrel Initiative Editors "The Ecology, Conservation and Management of Red Squirrels in Europe".

Red squirrel threatened by grey squirrel. The photo won the photo contest organised by the project

LIFE10 NAT/IT/000239

LIFE RARITY - Eradicate invasive Louisiana red swamp and preserve native white claw crayfish in Friuli Venezia Giulia

Duration From 01/09/2011 to 31/12/2014
Total budget €2,674,744 (EC co-financing 49.22%)
Website www.life-rarity.eu
Coordinating beneficiary Ente Tutela Pesca del Friuli Venezia Giulia (Italy)
Other partners Istituto di Scienze Marine di Venezia – CNR; Università degli Studi di Trieste – Dipartimento di Scienze della Vita; Istituto Zooprofilattico Sperimentale delle Venezie; Università degli studi di Firenze – Dipartimento di Biologia (Italy)
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Target species

Procambarus clarkii.

Background and aims

The first official record of *P. clarkii* in Friuli Venezia Giulia (FVG) was in 2007. RARITY confirmed the presence of *P. clarkii* populations in several plain rivers in FVG. Some streams were first colonized through the illegal release of some specimens, while others by the natural diffusion from rivers of bordering regions. Intensive communication activities of RARITY were addressed to prevent the introduction by aquarium owners or by workers at local gastronomic festivals. *P. clarkii* carries the *Aphanomyces astacii* mycelium that caused lethal effects on native crayfish (*Austropotamobius pallipes complex*), which was not found in river colonized by *P. clarkii*. Louisiana crayfish caused several damages on the banks rivers, but no local institutions recorded the entity or the economic value of such damages. *P. clarkii* is one of the 100 worst invasive species of the list of IUCN and ISSG and one of the European Union interesting species listed in the Reg. EU 1143/2014.

Key measures and relative costs

The inland waters of FVG were monitored between 2012-2014 through a network of 238 stations (of which 44 within Natura 2000 sites); total cost: €175,984 (€250/year per each monitoring site). A map of risk and spread of *P. clarkii* has been realized identifying “the crayfish plague” and the structural failure of the banks of the irrigation canals as the main impacts spread by *P. clarkii*; total cost: part of €124,000. The project represents good practice in the context of European Regulation 1143/2014. Thanks to RARITY, a Regional Regulation (no. 27 of 31/12/2012) for the protection of *Austropotamobius pallipes* and the ban of the capture and release of invasive crayfish (penalties ranging from €25 to €500), was approved and issued; total cost: €9,500. During RARITY the Early Detection and Rapid Response protocol has been activated 10 times, allowing the eradication of the population in Cellina, Claut; total cost: part of €194,000. Health surveillance revealed the presence of the pathogen of the “crayfish plague” within populations of the white clawed crayfish, suggesting the possibility of the presence of a strain with reduced lethality. At the same time, it confirmed *P. clarkii* for the role of the immune carrier of a recently introduced strain lethal to the native species; total cost: part of €302,240. Training, networking, promotion and citizen science-oriented actions (a specific online portal - www.gamberialieni.divulgando.eu has been developed to collect citizen sightings via tablet, smartphone or PC) were carried out for a total cost of €316,000.

Results

Through RARITY about 21,000 *P. clarkii* specimens were removed from the environment, with the consequent decreasing of the overall number of populations. In one case, in Casette lake of Sesto al Reghena, a 87% reduction of the IAS has been recorded by combining the traditional trapping and Sterile Male Release Technique (SMRT), in just two years. During RARITY different doses of X-radiation were tested and 40 Gy resulted to be the best dose as it reduced the fertility of males over the 50% without compromising their vitality. No increase of the spread of *P. clarkii* have been recorded during the overall duration of RARITY. In parallel, more than 40,000 juveniles of *Austropotamobius pallipes complex* have been produced and more than 30,000 (target value of the project) have been released in eight “Nature 2000” sites not overrun by *P. clarkii*.

Lessons learnt

Technical advice important in projects that manage IAS that are vector of diseases for native species: the training of the volunteers and the equipment cleaning, used during monitoring activities, must be detailed and accurate to avoid transfer of the spores of A. astacii, for example, in different sites. Other than EC funds are important to pinpoint structural funds to maintain the system set during the project working after the end of the project itself. It is very important to involve public opinion in order to spread the project message as much as possible and to reach top-level politicians. The IAS control is feasible at the first stage of invasion, but not perceived by public opinion and therefore by politics. As a result, resources are not appropriately allocated at that stage where, with little investment, the problem could be overruled. The issue created by IAS is addressed later when the resources can be unavailable. For this reason, the impacts created by the IASs are immediately presented with great emphasis, focusing on those who are able to hit public opinion (economy, health and safety of individuals).

Sustainability of results

To control the spread of an IAS as *P. clarkii* is necessary to adopt traditional techniques, supported, in some circumscribed cases, by the use of innovative techniques (e.g. SMRT). Having funds is an essential prerequisite. Currently, in FVG dedicated funds are not foreseen by local entities’ budgets. In their absence, EC funds are vital but not certain (after Rarity three LIFE proposals were submitted, but they failed). At the same time, it is mandatory to develop research on innovative control techniques, exploiting dedicated funds (e.g. Horizon 2020) in order to progress more efficient techniques. At the moment in FVG there are no funds available to continue the control of *P. clarkii* if not marginally, at local level.

Recommendations

Political choices; regulations; funds are necessary to face the phenomenon of biological invasions. The fight against IAS has to become structural (organized with structures, specialized staff, resources). Thanks to dedicated funds pheromone-based baits could be more investigated in order to develop solid attracting methods to increase *P. clarkii*’s captures. At the moment in Italy (FVG) this happens only (and partly) for the “plant health” sector. This is why it is important that legislation derived from Regulation 1143/2014 is timely and fully enforced. For example, the ban on trade in *P. clarkii* , in force under EU Regulation 1143/2014 and EU Regulation 1141/2016, cannot be enforced for the absence of applicable fines.

References

2013. “Manual for the public administrations. Knowledge, issues and adaptive management of freshwater crayfish in Friuli Venezia Giulia”, text editing Tiziano Scovacricchi, pp. 48 (www.liferarity. eu/images/pdf/download/manuale_pa_alta_risol.pdf).
2014. “RARITY. Eradicate invasive Louisiana red swamp and preserve native white clawed crayfish in Friuli Venezia Giulia”, pp. 144 (www.life-rarity.eu/images/pdf/download/rarity_final_publication.pdf).


Crayfish catching operations

LIFE11 BIO/IT/000020

LIFE BIOAQUAE
Biodiversity Improvement Of Aquatic Alpine Ecosystems

Duration From 01/09/2012 to 31/08/2017
Total budget €1,353,540 (EC co-financing 50%)
Website www.bioaquae.eu
Coordinating beneficiary Ente Parco Nazionale Gran Paradiso (PNGP) (Italy)
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Target species

Salvelinus fontinalis.

Background and aims

In 2006 the GPNP started a long-term monitoring of aquatic habitats to quantify the impact of several anthropogenic pressures on freshwater ecosystems and in particular of introduced fish (brook trout) in high mountain lakes. Due to the presence of downstream physical barriers to fish colonization, all the lakes of the GPNP were originally fishless, but several lakes were stocked with brook trout *Salvelinus fontinalis* in the 1960s. Starting from the 1970s, GPNP prohibited angling and fish stocking, preventing new fish introductions in still fishless lakes. Due to its high adaptability to cold and oligotrophic waters, brook trout established some reproductive stable populations in 9 natural lakes and 5 reservoirs placed at high altitudes (>2000 m a.s.l.). Fish presence in once fishless lakes produced the extirpation or reduction of native aquatic species and produced indirect effects on the whole ecosystem and on its linkage with the surrounding terrestrial habitats. The Bioaquae project provided for the complete eradication of alien brook trout from three small high altitude Alpine lakes and the experimental eradication from one large high altitude Alpine lake in the GPNP, as a clear application of the EU conservation legislation.

Key measures and relative costs

The eradication campaign was aimed to reduce the negative ecological effects of introduced fish using non-chemical eradication techniques (i.e. gillnetting, electrofishing and rod angling). Besides the eradication, some actions were implemented to i) raise the public awareness concerning the problem of fish introduction in once fishless high mountain lakes, ii) to monitor the impact of the targeted IAS and the resilience of the treated ecosystems, and iii) to provide the scientific and technical background to promote the implementation of similar actions outside the GPNP. Eradication costs (total of €205,000):

- Personnel costs (including monitoring of resilience of treated lakes): one full time technician (5 years salary) + 2 part-time technicians (2 years salary). Total cost: €144,300.00.
- Equipment: electrofishing equipment + inflatable boats. Total cost: €7,220.00.
- Consumables: nets, ropes, and other equipment for the capture of the fish. Total cost: €53,550.00.

Total surface of the targeted lakes: 10.12 ha. Total cost of the eradication action × ha: ≈ €20,263.00. Total number of removed fish: 20,270. Cost of the eradication action × individual removed: ≈ €10.1.

Results

The most relevant results include a description of i) the eradication process/techniques and their effectiveness, to provide a quantification of the efforts required in lakes with different characteristics and to quantify their side effects on non-target species (bycatch) and ii) the post eradication ecological resilience. Eradication efforts varied considerably among lakes, but all the treated lakes were returned to their natural fishless state in 1-3 years. Gillnetting was adopted as main eradication method, but electrofishing was also necessary for removing fish from colonized tributaries and rod angling -experimentally used in one lakedemonstrated to be highly efficient in reducing the initial density of adult fishes. Some native semi-aquatic vertebrates were occasionally captured in the nets, without any negative consequence at a population level. Several ecological indicators were monitored along the eradication campaign in the treated lakes and in a series of control lakes to describe the recovery process and to have a reference against which to evaluate the recovery potential of treated lakes. Lakes recovery started soon after the beginning of the eradication campaign and some ecological indicators (e.g. zooplankton, macroinvertebrates and amphibians) showed that some direct ecological consequences of fish predation can readily be reversed. Short-term recovery dynamics is exemplified by the recovery of i) many macroinvertebrates taxonomic and ecological groups, ii) large zooplankton species (i.e. *Daphnia*), and iii) local amphibians populations (*Rana temporaria*).

Lessons learnt

Fish eradication in high mountain lakes is an advanced conservation action. Before starting an eradication campaign -to prevent the risk of sabotage of the eradication actions (i.e. vandalism on the capture devices and re-introduction of fish)- some essential rules should be respected:

- fish stocking should be forbidden in the treated area/lake to prevent institutional fish re-introduction;
- angling activities should be forbidden to prevent unauthorized fish introductions and conflicts;
- a surveillance service should be in the position to enforce these rules.

These favourable conditions are generally present in protected areas, which should be considered the main recipient of eradication projects. Where these regulations are not adopted the best conservation measure is the prevention of fish stocking. In the presence of the favourable conditions, the complete eradication of alien salmonid species using non-invasive techniques is a feasible conservation action that in some cases can be easily obtained after 1-2 years. The eradication of alien fish produces immediate beneficial ecological effects on a large number of native species/ecological groups.

Sustainability of results

The complete eradication of alien fish from high mountain lakes does not need any action to sustain the achieved results because fish cannot recolonize these isolated habitats. Therefore, if fish stocking prohibition is respected, the achieved results should be considered permanent. To secure the results, surveillance could be an essential tool, but in protected areas the surveillance personnel can easily afford this task.

Recommendations

Knowledge gaps: while fish eradication in high mountain lakes is a feasible conservation action which can locally recover many ecosystems, the extent of fish introductions is general at a regional and global scale. In this context fish eradication campaigns using non-invasive methods can be realistically considered very advanced conservation actions, but with some limitations, if the objective is the recovery of mountain aquatic ecosystems at a regional/landscape level. The combined use of non-invasive techniques (as first choice) and chemical eradication methods could increase the potential and geographic scale of eradication campaigns, but the impacts of chemical piscicides is still controversial and more focused studies on the selective lethality of chemicals could greatly improve the possibilities of recovering large mountain areas from fish invasion. Conflicts with other EU and national policy and legislation: introducing several salmonid species is currently a common practice in all the European mountain ranges and also in many areas protected under the Natura2000 network. Stocking campaigns are usually sustained or approved by governmental agencies, but there is a clear contradiction with conservation legislation prohibiting the introduction of non-native species in European countries and protected areas. In particular the introduction of fish species with a recreational interest seems to be unaffected by national and EU legislation. In some regions, the introduction of alien fish from different countries/continents in mountain aquatic habitats has been prohibited, but not the introduction of the species native of the lowland areas of the same region. Since mountain areas are largely impermeable to fish colonization, it should be emphasized that many fish species that are native of a certain region should be considered IAS in the mountain areas of the same region.

References

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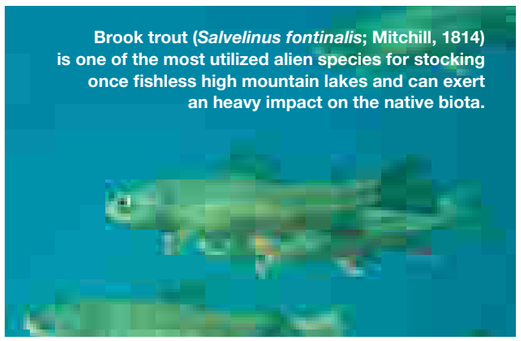

Brook trout (*Salvelinus fontinalis*; Mitchill, 1814) is one of the most utilized alien species for stocking once fishless high mountain lakes and can exert an heavy impact on the native biota.

LIFE11 NAT/IT/000093

Pelagic Birds - Conservation of the main European population of *Calonectris d. diomedea* and other pelagic birds on Pelagic Islands

Duration From 01/06/2012 to 31/12/2017
Total budget €915,744.00 (EC co-financing 50%)
Website www.pelagicbirds.eu
Coordinating beneficiary Dipartimento di Scienze Agrarie, Alimentari e Forestali - Università degli studi di Palermo (Italy)
Other partners Regione Sicilia - Assessorato regionale dell'agricoltura, dello sviluppo rurale e della pesca mediterranea - Dipartimento Regionale Sviluppo Rurale e Territoriale, Fare Ambiente (Italy)
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Target species

Rattus rattus, *Nicotiana glauca*, *Carpobrotus* cf. *acinaciformis*.

Background and aims

Linosa is a small (5.45 km^2) and little-populated (about 430 inhabitants) volcanic island belonging to the Pelagie Archipelago in the Strait of Sicily (Italy). Most of the inhabitants are occupied with agriculture and tourism. An increasing spread of alien plants has been observed in the last decades in the island, also as a consequence of the progressive abandonment of agriculture. *Rattus rattus* colonized the island through ships and boats that are increasingly frequent coming both from Lampedusa Island and Porto Empedocle (Sicily). *Nicotiana glauca* is a plant native to South America. It has been intentionally introduced to Linosa at the end of the 19th century for the potential use to produce charcoal. The experiment failed, but afterwards this alien tree started to abundantly disseminate and naturally regenerate so that it had reached a dramatic level of spread in the island. It has successfully invaded ruderal and synantropic habitats, as well as natural habitats such as rocky coastal cliffs and disturbed Mediterranean maquis. It is toxic to humans, it exerts negative effects on local biodiversity and it represents a main obstacle for natural dynamics in secondary plant succession. *Carpobrotus* is native to South Africa and it was intentionally introduced to Linosa with the aim to stop coastal erosion and for ornamental purposes. This IAS has successfully invaded coastal habitats and semi natural grasslands, among the richest in endemic species (e.g. *Limonium* spp.), including the EU habitats 5320 "Low formations of Euphorbia close to cliffs", 1240 "Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp." and the priority habitat 6220* "Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea". *Carpobrotus* is well recognized to negatively affect biodiversity at all levels and it is considered an "ecosystem engineer" due to its unique ability to deeply change the characters of invaded ecosystems. It is one of the main food resources for Black rat, especially during dry season. The project fits within the scopes of the most recent EU Regulation 1143/2014 on IAS which sets out rules to prevent, minimise and mitigate their adverse impact on biodiversity.

Key measures and relative costs

The key measures to address the IAS problems in Linosa were eradication interventions. The eradication of the Black rat was carried out through the distribution of rodent
baits within protected dispensers in inhabited, agrarian and natural areas. *Carpobrotus* was eradicated through manual and mechanical means. *Nicotiana* young individuals were eradicated with the same means, whereas *Nicotiana* mature individuals were cut at the trunk base and stumps were treated by glyphosate to prevent resprouting. The cost of the eradication of Black rat and alien plants were around €200,000 and €120,000, respectively. During the eradication biosecurity measures to reduce the risk of re-colonization by IAS have been implemented. Moreover, a proposal for a specific regulation with the aim to limit the entry of new IAS on the island has been promoted to the local municipal administration. Awareness raising campaign was carried out to convince people about the benefits of eradicating IAS on the island, as well as on their private ownership. Monitoring activities will be carried out for at least three years after the end of the project (eradication interventions). This should significantly reduce the likelihood of re-invasion by IAS.

Results

The project has achieved the eradication of Black rat population in the island and a concomitant increase in the conservation status of Scopoli's shearwater population. *Carpobrotus* and *Nicotiana* were almost totally eradicated from the island. More than 95% and about 99% of the total areas covered by *Carpobrotus* and *Nicotiana*, respectively, were cleared. In many eradicated areas, a rapid process of natural recolonization by native species was observed so that a constant increase of the conservation status and total extension of habitat of community importance is expected.

Lessons learnt

Through the project we have learned that awareness raising campaign is a key aspect for effectively tackle the IAS problem. Only the consensus of local people and stakeholders may ensure a long lasting effect of the actions undertaken against IAS. This is especially true within confined contexts such as islands. Such task proved to be very hard especially for what concerns *Carpobrotus*, which is really appreciated for its beautiful flowering and its recognized anti-erosion effect. Conversely, the negative ecological effects were neglected and largely unknown. Periodic meetings with local people and stakeholders aimed at proving that benefits arising from eradication largely overwhelm the benefits coming from the cultivation of IAS. The widespread occurrence of Nicotiana in the island has required a hard field work to achieve successful eradication. Such evidence highlighted the prominent importance of prevention and early detection actions to deal with IAS. Time is a relevant component of IAS management. For the same reason, the adoption of a regulation to limit the introduction or stop of new potentially IAS is of crucial relevance. The project has likely contributed to significantly increase the awareness and the potential threats posed by IAS in Linosa island. On the other hand, the knowledge of local biodiversity and the positive effects arising from the project are improved. We think that the knowledge acquired in Linosa can be exported to comparable ecological and climate conditions, as well as socio-economic and human contexts.

Sustainability of results

In order to achieve effective sustainability of the results of the project, i.e. their duration over time, three main requirements have been identified:

1. Monitoring of eradicated areas according to the timeline of the project; and possibly beyond, implementing monitoring activities within the ordinary management of the nature reserve;
2. To adopt the proposed regulation and biosecurity measures, which would significantly reduce the probability of entering new IAS in the island;
3. We plan to continue the actions through the activities of the Sicilian Region, project partner, that is at the same time the manager of the Nature Reserve at Linosa, through ordinary funds.

Recommendations

During the course of the project we found that the spread of IAS had been for a long time a totally overlooked issue in Linosa. For most IAS knowledge is still limited, not only about their biological and ecological characteristics, and their introduction pathways, but even more about their potential and current negative ecological effects. The most effective mean to fill this knowledge gap is to favor the circulation and exchange of information about the taxa that proved to be invasive elsewhere, especially in Mediterranean-type ecosystems. Just this kind of information is included within the regulation concerning trade and/or cultivation of potentially IAS which has been elaborated and proposed within the project. As far as legislation is concerned, the most recent EU Regulation 1143/2014 on IAS unfortunately has not included the IAS targeted by the project; that would have surely made it easier the execution of the project. For instance, probably it would have been easier to convince people about the need of controlling IAS and regulating the entry of new plant material in the island.

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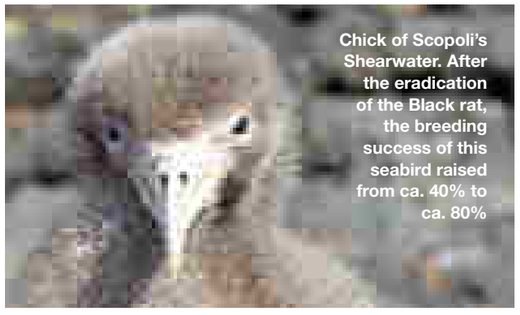
Pasta S. *et al.*, 2017. The alien vascular flora of Linosa (Pelagie Islands, Strait of Sicily): update and management proposals. Willdenowia 47(2): 135-144.
Badalamenti E. et al., 2016. The impact of *Carpobrotus* cf. *acinaciformis* (L.) L. Bolus on soil nutrients, microbial communities structure and native plant communities in Mediterranean ecosystems. Plant and Soil, 409(1-2): 19-34.



Chick of Scopoli's Shearwater. After the eradication of the Black rat, the breeding success of this seabird raised from ca. 40% to ca. 80%

LIFE11 NAT/IT/000188

LIFE CON.FLU.PO. - Restoring connectivity in Po River basin opening migratory route for *Acipenser naccarii** and 10 fish species in Annex II

Duration From 01/12/2012 to 30/06/2018
Total budget €7,088,476.00 (EC co-financing 49.33%)
Website www.life-conflupo.eu
Coordinating beneficiary Regione Lombardia – DG Agricoltura (Italy)
Other partners Regione Emilia-Romagna, Agenzia Interregionale per il fiume Po (AIPO), Autorità di bacino del fiume Po (AdbPo), Provincia di Piacenza, Provincia di Rovigo, Parco Lombardo del Ticino, GRAIA srl (Italy)
Contact Mr. Alberto Lugoboni (Regione Lombardia)
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Target species

Silurus glanis.

Background and aims

The aim is focused on the improvement of the conservation status of 5 endangered fish species in the area: Adriatic Sturgeon (*Acipenser naccarii**) and other 4 species of Cyprinid – South European Nase (*Chondrostoma genei*), Italian Nase (*Chondrostoma soetta*), Italian Barbel (*Barbus plebejus*) and Danube Roach (*Rutilus pigus*) – all listed in Annex II of Habitat Directive. This result will be achieved through:

- development of breeding protocols for these species, lacking till now; fish breeding following the fitness for survival methodology; marking and release in the wild of specimen, and related monitoring program.
- reopening of the ecological connection in the Po river, after about 50 years, through the construction of a Y shape fish ladder for the two branches of the river affected by the Isola Serafini hydroelectric power plant.
- reduce the impact of IAS (target species: wels catfish *Silurus glanis*, introduced as sport fish) through a monitoring room and experimental capture system built in the fish ladder.

Key measures and relative costs

The monitoring room is equipped with cameras working 24h/day able to detect all the specimen passing in the fish ladder. In this way it was possible to determine the main moving period for the wels catfish as support for the control activities. The starting of the experimental capture system built in the fish ladder in October 2017 will permit the capture and removal from the Po river of wels catfish. The cost of the capture system is about €100,000.00 plus about €30,000.00 for its management. Another important aspect related IAS is the development in the Conflupo project of the "Council for the Po River": for the first time AdbPo and the 4 Districts (Piedmont, Lombardy, Emilia-romagna and Veneto) related to the Po river are working together to assure coordinate measures for the river management, including also IAS.

Results

The use of this capture system will permit to reduce the impact of the wels catfish on the local and migratory species concentrated in the area of the fish ladder; this and the "Council for the Po River" will support the favorable conservation status of the species, increasing also the status of the whole freshwater ecosystem.

Lessons learnt

This system is an experimental ones, so time is needed to define both its effectiveness and necessity of corrective measures. At this phase it is important to underline the negative feedback of the wels catfish club (they promote the catch and release fishing, also if the release of the wels catfish in not allowed by law); this highlight the importance to develop communication programs on IAS for the different stakeholders. The agreement between AdbPo and the 4 Districts (Piedmont, Lombardy, Emilia-Romagna and Veneto) is a fundamental step to achieve long term results.

Sustainability of results

A specific working table was established to define how these activities will be supported from the end of the Life project to 2029, when the contract for the management of Isola Serafini hydroelectric power plant has to be renegotiated. From that moment the maintenance of the fish ladder and capture system will be in charge to the new society involved in the management of the hydroelectric power plant. Also the "Council for the Po River" will assure to maintain and implement the results on long term period.

Experimental capture system in the fish ladder installed by the project in Po river (Isola Serafini, PC).

LIFE12 NAT/IT/000395

LIFE EMYS - Ligurian Invasive Fauna Eradication pro indigenous *Emys orbicularis* restocking

Duration From 01/07/2013 to 30/06/2016
Total budget €1,323,496.00 (EC co-financing 49.53%)
Website www.lifeemys.eu
Coordinating beneficiary Costa Edutainment spa (Italy)
Other partners Agenzia Regionale per la protezione dell'Ambiente Ligure, Ente Parco di Montemarcello-Magra, Società Zoologica di Pistoia Srl, Università degli Studi di Genova (Italy)
Contact Ms. Claudia Gili (Costa Edutainment spa)
e-mail cgili@costaedutainment.it

Target species

Alien freshwater chelonian species (with special focus on *Trachemys scripta elegans*).

Background and aims

Name of the threat. Introduction of allochthonous animal species.

- Description: Within Centa plain and the basins of Magra and Vara rivers the main cause of concern is represented by North American freshwater chelonian species, mainly belonging to the genera *Trachemys*, *Pseudemys* and *Graptemys*. One adult individual of *Mauremys leprosa* has been caught within SCI IT 1324909. At the moment of project submission no data on the occurrence of dangerous chelonian species as *Chelydra serpentina* or *Macroclemys temminckii* within the Centa plain were available; one large individual of *Chelydra serpentina* had been caught within Magra river basin in April 2010.
- Impact on habitats/species targeted: Adult individuals belonging to the genera *Trachemys* and *Pseudemys* – by far the most represented allochthonous chelonians within the targeted areas – are mainly phytophagous and thus, when present in high densities, may cause significant reduction of bank and aquatic pool vegetation. Competitions for basking places with the local *Emys orbicularis* individuals, more submissive and shy, are known to occur.
- *Trachemys* and *Pseudemys* juveniles show trophic preferences similar to the ones observed in the autochthonous chelonians, so they compete with the latter ones for food resources and often cause the collapse of local amphibian populations.

The large and aggressive turtles of the genera *Chelydra*, *Macroclemys* and *Trionyx* are able of predating almost any vertebrate species occurring in freshwater ecosystems. For these and other reasons, *Emys orbicularis* individuals usually abandon the habitats in which allochthonous chelonians have been introduced.

Key measures and relative costs

LIFEEMYS has implemented measures to encourage the survival of the European pond terrapin in Liguria, with alien terrapin removal, targeted interventions of remediation, environmental restoration, restocking, raising awareness in Piana del Centa (Albenga, Savona) and invasive species removal in the Magra-Vara basin (La Spezia).
Allochthonous terrapins were trapped , collected, checked from a Veterinary standpoint, marked with microchip, and transferred to the zoological park in Pistoia. The estimated cost for removal of each allochthonous terrapin within this project was 65 euros per individual, without including transfer to Pistoia Zoo and Microhip. Problems arose such as: traps were stolen numerous times. Confirmation of breeding of allochthonous terrapins was possible due to finding of very small/young individuals.

Results

600 alien terrapins were removed (118 in Savona area and 582 in La spezia area) of the species:

- *Graptemys pseudogeographica*
- *Pseudemys concinna*
- *Trachemys scripta* (including *T.s. elegans*)
- *Mauremys sinensis*

We can consider an almost complete eradication from Savona area where 200 animals were estimated to be present but only 118 were collected and less than 5 individuals that could not yet be trapped but belong to different subspecies (not *T. s. elegans*) and therefore most probably not self sustaining. Massive intervention would still be needed to consider the word "eradication" for the Monte Marcello Magra park which has undergone a reduction in numbers insufficient to be considered enough.

Lessons learnt

Innovation & best practices are relevant to the use of the different traps. Social conflicts: we did not suffer too much of this due to the fact that we were not culling the animals. Stakeholders did not know the details of the problem before the project. Social benefits a small community in Albenga feels very involved in the project for the E.orbicularis release, together with the University and Acquario di Genova although it does not yet produce any income. The potentialities for replicability and transferability to other EU countries are 100% but the means of utilization of the money should be further discussed in terms of cost/effect when animals are not culled but maintained alive.

Sustainability of results

The numbers of animals in certain areas are very high and eradication can be almost useless without proper prevention of subsequent reintroduction. The prevention should include all the tools to avoid animals entering the country, breeding and release. We have not yet identified an alternative funding opportunity but will present another project in 2018 including other institutions on a national level.

Recommendations

The word "eradication" might have numerous "faces": in fact the costs of transport, microchip and future maintenance of animals that are not culled, are enormous and could be utilized for other actions; most of these alien species are invading our countries due in consequence to human activities. This means that humans are therefore somehow responsible for caring for their lives or for applying a humane killing procedure to eliminate them. Raising awareness also through the explanation of the damages related to their presence, is the key and a clear plan of what to do with the captured animals should be put in place and communicated accordingly. Decisions on the use of the tools should in fact be taken and subsequently applied with proper explanation of the outcomes.

Restocking of *Emys orbicularis*

LIFE12 BIO/IT/000213

LIFE Alta Murgia - Control and eradication of the invasive exotic plant species *Ailanthus altissima* in the Alta Murgia National Park

Duration From 01/10/2013 to 31/12/2017
Total budget €1,757,740.00 (EC co-financing 47.34%)
Website www.lifealtamurgia.eu
Coordinating beneficiary Consiglio Nazionale delle Ricerche (Italy)
Other partners CUTFAA – Comando unità per la tutela forestale, ambientale e agroalimentare; ARIF – Agenzia Regionale attività Irrigue e Forestali; Ente Parco Nazionale dell'Alta Murgia (Italy).
Contact Ms. Francesca Casella (CNR-ISPA)
e-mail francesca.casella@ispa.cnr.it

Target species

Ailanthus altissima.

Background and aims

The project aims at eradicating the invasive alien plant species *Ailanthus altissima* from the Alta Murgia National Park, SCI and SPA "Murgia alta" IT9120007. Due to its fast growth, in the past the species was intentionally planted by farmers to quickly have shadow in manor farms and sheepfolds, from where it spread to natural habitats, particularly dry grassland displacing the native flora. Moreover, the species causes substantial damages to historical buildings and precious artifacts such as ancient dry stone walls.
The objective of the project contributes to implement the following EU and national legislation:

- EC Habitat and Wild Birds Directives;
- EU biodiversity strategy to 2020;
- Directive on the Sustainable use of pesticides;
- "Atto d'Indirizzo 2012-2014" from Ministry of Environment, in which protection and valorisation of biodiversity in protected areas is a key point;
- "National Strategy on Biodiversity", in which one of the priority actions is the eradication and control of established IAS as threat to biodiversity in the Natura 2000 sites.

Key measures and relative costs

The main activities are: mapping and eradicating *Ailanthus* in all infested areas, increasing public awareness and knowledge about invasive species, the project issues and its results.
Key measures entail long-term control, awareness raising, monitoring and capacity building.
To remove *Ailanthus* from one ha of highly infested land costs €22,000-€24,000.

Results

The main achieved outcomes are a map of the infestation, an eradication action plan, over 470 treated areas with 152 ha of land recovered from *Ailanthus* infestation. The interventions took into a better status of conservation important natural habitats such as *Quercus* woods and dry grasslands.

Lessons learnt

To eradicate the species you must:

- avoid cutting as *Ailanthus* reacts by producing numerous sprouts, increasing the infestation;
- hand-pull the seedlings with their whole root in the very early stages of development.

The best treatment methods consists of mechanical interventions followed by localized applications of the systemic herbicide glyphosate: cut stumps, spaced cuts with sponge, injection and endotherapy. Late summer or autumn treatments are the most effective to kill suckers and roots. Involvement and sensitization of land owners, farmers and common people in the nature conservation, by informing them on the target species invasiveness and on environmental and ecological risk, is of utmost importance for weed management. That can be done individually or by public events such as practical field demonstrations and seminars. Benefits coming from the IAS control are the training of operators, stakeholders and green job building. All lesson learnt are completely replicable and transferable to other EU countries.

Sustainability of results

Treatments have long-term effects but they need to be repeated, so it is fundamental to complete the treatments, to monitor the environment and to train stakeholders.
Alternative funding to continue and sustain the results can be FESR 2014-2020. A project has been proposed but not funded.

Recommendations

Due to the lack of legislation, invasive tree species are considered as other endemic tree species, i.e. forest plants, thus hampering their eradication, but allowing only silviculture practices. As a result, no interventions can be carried out between 15 March and 15 July. Moreover, *Ailanthus* is very abundant along street shoulders, but legislation poses limits in the use of herbicides to control weeds on shoulders, especially in SPAs.

Intervention of eradication of *Ailanthus altissima* in an infested area

LIFE12 NAT/IT/000416

LIFE Puffinus Tavolara - Protection of the largest population of *Puffinus yelkouan* on Earth and containment and eradication of invasive alien species

Duration From 01/07/2013 to 30/11/2018
Total budget €1,557,187.00 (EC co-financing 50%)
Website www.lifepuffinustavolara.it
Coordinating beneficiary Comune di Olbia (Italy)
Other partners Consorzio di Gestione Area Marina Protetta Tavolara Punta Coda Cavallo, NEMO Nature and Environment Management Operators Srl (Italy)
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Target species

Rattus rattus, *Mus musculus*, *Capra hircus*, *Carpobrotus sp.*

Background and aims

The project's actions are mainly localized on Tavolara island (600 ha). Tavolara hosts a military settlement, two small restaurants and few private houses, whereas most of its territory (central sector) is uninhabited and inaccessible due to the very rugged morphology. During summer months, a boat service daily transports hundreds of tourists to the beaches of the SW part of the island. Tavolara and surrounding islets are included in the Marine Protected Area "Tavolara – Punta Coda Cavallo". The IAS targeted are of ancient introduction (Black rat and House mouse) or of more recent deliberate introduction (Feral goat and Ice plant); the first three species are widespread on Tavolara, the Ice plant is present only around the settlements of the SW area. The impact of the IAS on biodiversity is very severe: the island hosts the main population of Yelkouan shearwater (11,000-13,500 pairs, 1/3 – 2/3 of the known global population), and the predation on eggs and chicks by Black rat reduces productivity close to zero. Goats, rats and mice have significant impacts also on other ecosystem components, like invertebrates, reptiles, plants and habitats. Ice plant could potentially occupy most of the flat SW sector, threatening habitats and three plant species listed in Annex I and II of Habitats Directive. Economic damages are limited but the IAS impacts could reduce the touristic value of the island.

Key measures and relative costs

The main action is the eradication of Black rat and House mouse (cost: €402,000). A numerical control of feral goat population on Tavolara is ongoing (cost: €65,000) to reduce its impact on vegetation and the risk of secondary poisoning of scavenger species. The eradication of Ice plant on Tavolara has been completed (cost: €50,000) involving local school classes. Bio-security measures (prevention and early detection and rapid response) will be implemented; a long-term management plan of the goat population will be drafted. Awareness will be raised through environmental education activities in schools and the involvement of students in field operations, as well as by communicating in public meetings.

Results

Rat's removal on Tavolara will increase the productivity (short term) and population size (long term) of *Puffinus yelkouan*; a 5 to 10-folds increase of the young yearly fledged could be obtained at the species level. In the long term, attraction of new breeding species and increase of Scopoli' s shearwater are expected. Other benefits from rodents eradication and goats numerical control may consist in an increase of biodiversity (e.g. by halting seeds predation by rats on habitats) and biomass, and an improvement in ecosystem functions. Eradication of Ice plant will remove one of the most important threats for habitats and plant species.

Sustainability of results

The long-term maintenance of project results should be relatively cheap (i.e. annual cost = 2% of eradication costs). More difficult could be the involvement of local stakeholders.

Recommendations

An optimal planning of actions that require complex operations, advanced techniques and experienced specialists is favored by the involvement of international specialists (extra-Europe for rodent eradications). In the project financial forms, costs for this kind of consultancies should be included.

Tavolara Island

LIFE12 NAT/IT/000940

LIFE + TROTA
Trout population recovery in central Italy

Duration From 01/11/2013 to 31/01/2018
Total budget €1,557,187.00 (EC co-financing 50%)
Website www.lifetrota.eu
Coordinating beneficiary Amministrazione Provinciale di Pesaro e Urbino (Italy)
Other partners Amministrazione Provinciale di Fermo, Legambiente onlus, Parco Nazionale dei Monti Sibillini, Università degli Studi di Perugia, Università Politecnica delle Marche (Italy)
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Target species
Salmo trutta.

Background and aims
Atlantic brown trout (*Salmo trutta*), which has been farmed for over a century in Italy, has been introduced into the rivers of central Italy at least since the first years of Twentieth Century, to ensure an artificial abundance of fish for sport fishing. This led to the progressive displacement of the Mediterranean native species (*S. cettii)* and at the same time has favored a growing genetic introgression in the wild native populations. Because of such a long history of stocking, less than 3% of wild trout populations are not introgressed with Atlantic genes along the Apennine chain. Being a top predator in the freshwater ecosystem, the introduction of huge amount of Atlantic brown trout negatively impacts on endangered freshwater organisms.

Key measures and relative costs
During the project, a specific concrete action was performed to remove by electrofishing Atlantic alien trout in some river traits where preparatory genetic analysis detected only or almost only alien genotypes. Considering that the cost of the action is nearly €87,720 and that during the action approximately 18,000 alien trouts were removed, unit cost for individual removed corresponds to ca €4,87.

Results
The removal of alien trout had a positive effect on animal species included in Annexes II or IV of the Habitats Directive. In the case of the endangered European bullhead (*Cottus gobio*), the information collected during the project highlighted the effectiveness of removal activities to protect native fish biodiversity. Indeed, the abundance and the young-of-the-year percentage significantly grew after the removal activities, as well as body size increased in all age classes in comparison to the pre-removal period.

Lessons learnt
Unfortunately, removal of Atlantic trout in the project area has triggered conflicts with the anglers. Concerning experience with these stakeholders, it should be stressed that, despite numerous public dissemination activities, it is very difficult to convince angling associations and farmers to change their perception of alien species. Indeed, they regard a fish just as a fish, irrespective of its origin or genetic lineage. Therefore, it will be necessary to invest a lot on the ecological training of new generations to achieve long-term results.

Sustainability of results
In relation to the contrast to the diffusion of invasive Atlantic trout in the project areas, the post-Life activities will foresee the installation of ad hoc devices (i.e., electrical barriers) to protect the populations of Mediterranean trout from hybridization as a consequence of migration from downstream river segments still affected by the presence of the alien species. We plan to realize these activities using local funding sources (regional and provincial).

Recommendations
Despite restocking activity was banned from the study area, the genetic survey conducted during the project evidenced ongoing spreading of alien molecular traits in wild trout populations. Domestic trout can come from hatcheries that, in absence of migration barriers, are a source of alien genes in the project area. In fact, not only there is a “physiologic” rate of escape from hatcheries, but the frequent floods and recent earthquakes in the study area provoke the shedding of huge amount of fish. We strongly recommend that hatcheries within or at the border of the Natura 2000 Network be equipped with safety systems that can prevent accidental escape of animals.

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Rondinini C. *et al.* 2013. Lista Rossa IUCN dei Vertebrati Italiani. Comitato Italiano IUCN e Ministero dell’Ambiente e della Tutela del Territorio e del Mare, Roma.
Splendiani A. *et al*. 2016. Alien brown trout invasion of the Italian peninsula: the role of geological, climate and anthropogenic factors. Biological Invasions, 18: 2029-2044. DOI: 10.1007/s10530-016-1149-7.

Young Mediterranean trout (Salmo cettii Rafinesque, 1810, ex S. macrostigma Duméril, 1858) from the Esino river (Esanatoglia, MC)

LIFE13 NAT/IT/000471

RESTO CON LIFE - Island Conservation in Tuscany, restoring habitat not only for birds

Duration From 01/06/2014 to 31/12/2018
Total budget €3,123,670.00 (EC co-financing 50%)
Website www.restoconlife.eu
Coordinating beneficiary Parco Nazionale Arcipelago Toscano (Italy)
Other partners Istituto Superiore per la Protezione e Ricerca Ambientale, Università di Firenze – Dipartimento di Biologia, Raggruppamento Carabinieri Biodiversità (Italy)
Contact Ms. Francesca Giannini (Parco Nazionale Arcipelago Toscano)
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Target species

Rattus rattus, *Felix catus*, *Erinaceus europaeus*, *Phasianus colchicus*, *hybrid of Alectoris rufa x Alectoris chukar*, *Carpobrotus spp.*, *Casuarina equisetifolia*, *Eucalyptus camaldulensis*, *Mesembryanthemum cordifolium*, *Opuntia phaeacantha*, *Senecio angulatus*, *Oxalis pes-caprae*.

Background and aims

The project locations are some islands of the Tuscan Archipelago: Montecristo (1,039 ha, habitats 3170*, 3120, 6220*, 9340 and 8220), Pianosa (1,025 ha, habitats 5210 and 1240), Giannutri (240 ha, habitats 1240, 1310, 6220*, 5320 and 5210), Elba (22,200 ha, habitats 9340, 1240, 1210, 2110, 2210, 2230, 2260, 2250*). These islands have different levels of urbanisation from Montecristo, which is uninhabited, to Elba which has 30,000 residents and high level of summer tourism.
The aim of the project is the removal of invasive plant and animal species alongside various activities to improve the target habitats and the native animal communities. For the invasive plant species, which represent a risk to the integrity of the listed habitats, interventions are planned throughout all project areas; the largest operation concerns eliminating *Carpobrotus* from Giannutri. For the animal species, the main action planned concerns the indigenous species of Pianosa and the protection of many bird species, alongside other vertebrates and invertebrates (*Calonectris diomedea*, *Caprimulgus europaeus*, *Lanius collurio*, *Euleptes europaea*, *Ichthyaetus audouinii*), by the eradication of the black rat, feral cats, two species of galliformes and the hedgehog.

Key measures and relative costs

Completed activities: planning, project plans and protocols for removing the various species; eradication of the *Carpobrotus* on Giannutri (14,000 m^2) and in a localised area on Elba; eradication of the black rat on Pianosa through manual distribution of “bait stations” (expected cost €588,700) and eradication of the Australian pine tree and some eucalyptus plants. Current activities: on Pianosa the removal of feral cats, hedgehogs, pheasants and hybrid partridges through capture and culling (expected cost €634,800); on Montecristo, the eradication of the Bermuda buttercup; construction of a fenced area around a nesting site of the Audouin’s gull on Elba to stop introduced ungulates (wild boars and mouflons) from entering; adoption of biosecurity plans and communication activities.

Expected results

On Pianosa: increase of productivity (short term) and population size (long term) of seabirds: at least *L. audouinii* and *C. diomedea* (30-60 pairs); improvement of habitat condition for bird species breeding on the ground or close to it (e.g. *L. collurio*, *C. europaeus*), for birds present on migration stop-overs, as well as for reptiles, invertebrates and vegetation; protection of approx. 10 ha of habitat mosaics 5210 and 6220*. On Montecristo: recovery of 5 ha of degraded area around Cala Maestra and recovery of approx. 3,5 ha of habitats 9340, 5210, 6220*. On Giannutri: protection of approx. 6 ha of coastal
habitat mosaics 1240, 1310, 5320, 6220. On Elba: protection of dune habitat in Lacona and a nesting site of Audouin’s Gull.

Lessons learnt

The eradication of multiple invasive/non-indigenous plant and animal species alongside “Island restoration” actions will affect various components of the ecosystem and is easily demonstrable. The culling, capture and/or relocation of animal species is a cause of tension among animal welfare groups and other stakeholders. The involvement of local people is fundamental to making the operations more effective. The support and the involvement of other administrations is also crucial for resolving problems that inevitably arise when carrying out the operations.

Sustainability of results

With regard to flora, it seems it is enough to ban the deliberate introduction of some invasive species, giving out and repeating information and periodic monitoring, with immediate response in case of detection of newly established invasive species. With regard to animal species, certain management costs need to be considered for the adoption of biosecurity measures in the port area and to introduce a ban on holding the target species (e.g. cats). The collaboration of the local residents, the port authority and the boating companies will be crucial especially to prevent rats’ return.

Recommendations

With regard to animal species, the existing Italian and European regulation on the methods of capture and culling seems totally inadequate and often in conflict with other rules on animal welfare, which can cause interruptions in the working protocols and increase in costs.

***Carpobrotus* eradication on Giannutri**

LIFE13 NAT/IT/001129

LIFE BARBIE - Reintroduction of the *Barbus caninus* and *Barbus plebejus* into the Emilian tributaries of the River Po

Duration From 01/07/2014 to 31/12/2018
Total budget €2,189,378.00 (EC co-financing 49.97%)
Website www.lifebarbie.eu
Coordinating beneficiary University of Parma (Italy)
Other partners Ente di gestione per i Parchi e la Biodiversità; Autorità di Bacino distrettuale del Po; Spin Off Gen Tech Srl; Ente Parco Nazionale dell'Appennino Tosco-Emiliano (Italy)
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Target species

Freshwater fish species with special regard to invasive cyprinids and wels catfish. In particular: *Barbus barbus*, *Silurus glanis*.

Background and aims

Alien fish species have increased tremendously over the last 20 years and more than 60 different taxa have been recently listed in Italian freshwaters. This is quite an incredible amount of alien species considering that autochthonous fish, most of which are endemic, account to 48. The problem is particularly enhanced in the Po river basin where invasive species have excluded all local taxa except than migratory (anadromous and cathadromous) ones whose stay in the river is limited over time. Entries have started long ago with first species introduced by ancient Romans but the issue has constantly increased since the advent of globalization and free commerce between Eastern and Southern European countries. As a matter of fact, the wide majority of species have reached Italy from Northern and Eastern European basins through several commercial ways, mainly linked to sports fishing. It is noteworthy observing that the arrival of alien species should have been persecuted by local institutions as the Italian legislation has been forbidding introductions of allochthonous organisms since 1997: laws D.P.R. 357/97 and D.P.R. 120/03.

Key measures and relative costs

"Barbie" has been dedicated to management and conservation of 2 endemic barbel specie as bioindicators of good ecological quality of waters. Within the project one specific action has been directed to prevention of alien species restocking and potential ways of eradication according to indication of Regulation 1143/2014 EU. Practical actions have been developed through an electrofishing approach carried out in geographically limited areas. Results were very encouraging as electrofishing in channels peripheral to main course of Taro river demonstrated a sensible decrease of alien biomass subsequent to fishing removal. Particularly one channel was freed by invasive barbels after 6 fishing working days. Although a precise evaluation of costs has never been performed, the technique is quite costless if a specific device for electrofishing is available. In that case, only expenses referred to technicians must be considered.

Results

IAS eradication has been carried out in a limited number of sampling sites after specific habitat evaluation and assessment of demographic consistency of allochthonous fish. More specifically, 7 different IAS were sistematically captured and have been removed from SCI participating in the Life Barbie project. Most of the attention, has been dedicated to allochthonous *Barbus barbus* interacting with native endemic *B. plebejus* and *B. meridionalis* (both listed in Annex II of the Habitat Directive). Most interesting results have been reached in SCI IT4020021 (Medio Taro) where *B. barbus* density has been lowered from 0,50 individual/square meter to 0,02 ind/sm. All removed specimens, accounting for thousands of fish were transferred inside confined areas, mainly ponds and small fishing lakes outside the river drainage. The same activities in the lower river stretches were suspended because of excessive IAS biomass and unsuitable habitats.

Lessons learnt

Electrofishing activity performed by experts and trained technicians seems to be a suitable tool for controls of IAS in limited rivers (so called walking rivers). This activity is mainly related to the habitat characteristics and the possibility of avoiding fast recolonization by fish. It is important to consider that at lowest level of IAS presence we would have restocked with native offsprings. Unfortunately, juveniles availability was not sufficient to saturate the system and avoid alien return. Additional sampling activities are still ongoing. One of major benefits of this activity was the involvement of citizens and students within promotion actions of Life project. Feed-backs were very positive although a sort of complain sometime emerged from animal-rights activists and sports fishermen. For this reason fish were rarely killed and mostly transported to degraded river areas or confined ponds.

Sustainability of results

Future actions will be necessary to implement results in different rivers and a constant monitoring of already cleaned river sections will be necessary. Although electrofishing activities are quite costless, a continuous fund raising is necessary mostly at local or national level. In fact, besides direct sampling actions it will be fundamental to increase the offspring production of native species to be used during restocking practices. This certainly is the major task as sustainability of practical results.

Recommendations

Specific recommendations have to be followed in relation to animal welfare issues and the related involvement of animal activists or anglers. For this reason, specific communication has to be dedicated to this kind of activity and explanations have to be delivered before programmed interventions.

References

Life Barbie Project working group (2016). Controllo delle specie alloctone invasive alla luce del nuovo Regolamento Europeo n. 1143/2014/CE. In graduation thesis of Stefania Manicardi (M. Sc.), University of Parma: 53 pp.

Conservation of mediterranean *Barbus* sp.

LIFE13 NAT/IT/000433

LIFE RES MARIS - Recovering Endangered habitatS in the Capo Carbonara MARIne Area, Sardinia

Duration From 01/06/2014 to 31/05/2018
Total budget €1,510,805.00 (EC co-financing 74.23%)
Website www.resmaris.eu
Coordinating beneficiary Città metropolitana di Cagliari (Italy)
Other partners Università degli Studi di Cagliari - Dipartimento di Scienze della Vita e dell'Ambiente - Centro Conservazione Biodiversità, Area Marina Protetta Capo Carbonara - Comune di Villasimius, TECLA - Associazione per la cooperazione transregionale, locale ed europea (Italy)
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e-mail direzione@ampcapocarbonara.it

Target species

Caulerpa cylindracea, *Carpobrotus acinaciformis*, *Carpobrotus edulis*, *Acacia saligna*, *Acacia karroo*, *Agave fourcroydes*, *Agave attenuate*, *Agave americana*.

Background and aims

The geographical context is the SCI ITB040020, which overlaps almost all the Marine Protected Area "Capo Carbonara" located in Villasimius (South-eastern coast of Sardinia). The main economic activities are addressed to a tourism linked to the sea. Caulerpa cylindracea was introduced in the Mediterranean sea probably by the ballast water; it has the ability to spread rapidly, it takes advantage from the degradation of *Posidonia oceanica* beds (priority habitat 1120*) and has a strong seasonal trend. The economic values of invaded sites could decrease because the reduction of biodiversity causes the homogenization of underwater landscapes. In dune ecosystems, the impact is one of the most significant due to the practice of using exotic species in gardens as ornamental plants. In particular, invasive species belonging to the genus *Carpobrotus*, *Acacia* and *Agave* pose a threat to the priority habitats 2250* and 2270*, determining the decrease of their coverage.

Key measures and relative costs

The activities aimed at the 1120* priority habitat restoration were carried out through manual removal of *C. cylindracea* in a large area (30,000 m^2), experimental removal of *C. cylindracea* in a restricted area by laying darken tarps for a limited period and repopulation of *P. oceanica*. In proximity of these areas, 20 mooring buoys for boats were positioned to limit unregulated anchoring and the possible fragmentation of the algae. Terrestrial actions aimed at the complete restoration of the priority habitats, through the eradication of IAS, the plantation of native plants and the use of naturalistic engineering techniques.
Eradication costs: *Acacia genus*: 10.260,85 m^2 of adult individuals by mechanical removal (€17,640), 10.260,85 m^2 young individuals by manual removal with average coverage 10% (€ 7,563). *Agave genus*: 582,127 m^2 of adult individuals by mechanical removal with average coverage 30% (€ 4,741), 582,127 m^2 of young individuals by manual removal with average coverage 30% (€ 2,383). *Carpobrotus genus*: 6.061,182 m^2 (€ 24,362).

Results

Recolonization events of *C. cylindracea* have been observed after shortly manual eradication. On the other hand, the experimental removal showed a decrease in its coverage reaching values almost equal to 0%. 1,000 m^2 have been repopulated with cuttings of *P. oceanica* (20,000 were planted in Autumn, up to 30,000 in Spring). The monitoring, after the autumnal session, showed a survival of approximately 60%. Terrestrial habitats: germplasm collection of 15 species characteristic of dune habitats, production of 30,000 plants from the collected germplasm and their reintroduction in the habitats. Eradication of IAS in 19,000 m^2 of dune habitats.

Lessons learnt

The Ministerial Guidelines have been used by choosing the most suitable technique for restoration of the priority habitat *1120. Communication actions call for the involvement of private citizens through enlistment to the "RES MARIS Club" and their cooperation in the eradication of invasive plants and their replacement with native ones in private gardens.

Sustainability of results

Better information and education, and improved public awareness on IAS issues by all sectors of society, is fundamental for preventing or reducing the risk of unintentional or unauthorized introductions.

Recommendations

Recolonization events of *C. cylindracea* have been observed after shortly manual eradication, which unequivocally demonstrated the ineffectiveness of the actions carried out. The approach of improving the density of plants within *P. oceanica* degraded beds along with the reduction of free anchoring are the only ways to control and/or minimize the spread of *C. Cylindracea* at the present state of the Mediterranean invasion.

References

Acunto S. *et al.*, 2017. The LIFE+ project "RES MARIS-Recovering Endangered habitatS in the Capo Carbonara MARIne area, Sardinia": first results. Plant Sociology: 85-95. DOI: 10.7338/pls2017541S1/11.
Manuale e linee guida 106/2014 - Conservazione e gestione della naturalità negli ecosistemi marino-costieri.
Il trapianto delle praterie di *Posidonia oceanica*. Istituto Superiore per la Protezione e la Ricerca Ambientale.

Restoration of *Posidonia oceanica* beds (habitat 1120*

LIFE13 NAT/IT/000204

LIFE U-SAVEREDS - Management of grey squirrel in Umbria: conservation of red squirrel and preventing loss of biodiversity in Apennines

Duration From 01/10/2014 to 01/10/2018
Total budget €1,433,241.00 (EC co-financing 50%)
Website www.usavereds.eu
Coordinating beneficiary Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) (Italy)
Other partners Comune di Perugia, Istituto OIKOS s.r.l, Istituto Zooprofilattico Sperimentale dell'Umbria e delle Marche, Legambiente Umbria, Regione Lazio, Regione Umbria (Italy)
Contact Mr. Piero Genovesi (ISPRA)
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Target species

Sciurus carolinensis.

Background and aims

The LIFE U-SAVEREDS Project aims at the conservation of the European red squirrel (*Sciurus vulgaris*) in Umbria and of biodiversity in Apennines forest ecosystems (Mediterranean region). In Umbria, main objectives include:

- eradication of the Eastern grey squirrel (*Sciurus carolinensis*), settled in Umbria following unintentional release in 2000;
- increase of awareness on the threat posed by the alien squirrel, involvement of citizens in eradication activities;
- improvement of the conservation status of the red squirrel.

On a national scale, the Project acts to prevent the expansion of the grey squirrel and for the timely removal of potential new alien squirrel foci. It represents the first practical implementation of the EU 1143/14 Regulation.

Key measures and relative costs

All actions of the Project address specific issues raised by the presence of alien squirrels in Italy:

- implementation of an eradication plan for the grey squirrel in Umbria;
- awareness raising campaign addressed to citizens and stakeholder groups;
- restocking of red squirrel populations;
- development of an Early Warning System and Rapid Response (EWRRS) for alien squirrels.

The budget of the action aimed at the eradication of the grey squirrel is about €180,000, the direct cost per individual removed amounts to €190.00.

Results

- eradication or, at least, removal of 80% of the grey squirrels in the city of Perugia and surroundings;
- restocking of 2 red squirrel sub-populations in Umbria with overall increase in the red squirrel local range (up to 50 km^2);
- management of 6 alien squirrel foci at the National level;
- increase in the awareness of citizens on the threat posed by alien squirrels.

Lessons learnt

The key problems and corresponding solutions include:

- lack of knowledge on the IAS distribution and density, solved through an appropriate monitoring scheme;
- limited involvement of stakeholders in the management activities, partly solved through the implementation of an Information and Communication Plan focused on positive messages (e.g. conservation value of the red squirrel); participatory approaches may be a solution but they work only with respect to doubtful/uncertain citizens;
- inaccessibility of areas inhabited by the alien species, partly solved through technical solutions to optimize removal (e.g. strategic positioning of traps) and adoption of a decision support system to guide management;
- opposition by stakeholders (e.g. animal rights groups) tackled adopting a low communication profile at the beginning of the Project, to avoid severe conflicts, while always ensuring a correct information to all stakeholders.

Sustainability of results

Results achieved through this Project will be secured thanks to after-LIFE monitoring and maintenance of control activities by public agencies when necessary. Sustainability will be ensured by public partners involved in the Project (particularly ISPRA and Regione Umbria) and by the network of technicians involved in the EWRRS and in the Alien Squirrel Emergency Team, that will continue to support public agencies for alien squirrel management. This group also produced technical documents to be used as a guidance for the management of other alien squirrel foci.

Recommendations

A key problem was the lack of participation by the citizens in Project activities. Communication activities should start well in advance with respect to technical ones, as the two processes act on different time scales and a considerable amount of time is required to involve or at least inform the general public.

An European red squirrel in Italy. The LIFE U-SAVEREDS Project aims at protecting its populations in Umbria, where it is threatened by the introduction of the Eastern grey squirrel

LIFE14 NAT/IT/001128

LIFE STOPVESPA - Spatial containment of *Vespa velutina* in Italy and establishment of an early warning and Rapid Response System

Duration From 01/08/2015 to 31/07/2019
Total budget €2,273,738 (EC co-financing 60%)
Website www.vespavelutina.eu
Coordinating beneficiary Università degli Studi di Torino (Italy)
Other partners Abbazia dei Padri Benedettini Santa Maria di Finalpia; Associazione Regionale Produttori Apistici del Piemonte–ASPROMIELE Piemonte; Politecnico di Torino – Dipartimento di Elettronica e Telecomunicazioni (Italy)
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Target species

Vespa velutina nigrithorax.

Background and aims

The yellow-legged hornet Vespa velutina is an invasive alien species (IAS) introduced in France in 2004 from Asia. The hornet has colonized many European countries and is present in Italy since 2012. *V. velutina* preys honeybees and wild bees, so the species is a threat to biodiversity and pollination services, produces economic damages on beekeeping and generates concern among citizens, due to the nests of great size often built in urban areas. Because of these issues, *V. velutina* is classified as an IAS of union concern (Regulation EU 1143/2014; EU 1141/2016).

Key measures and relative costs

The LIFE STOPVESPA project was created to tackle the spread of *V. velutina* in Italy. The main objectives are the spatial containment of the species, the establishment of an early warning and rapid response system (EWRRS) and the development of a harmonic radar prototype to be included in the management strategy. The harmonic radar allows tracking the hornets flying back to their colonies, so as to early detect and remove the nests, and consequently increase the efficacy of the strategy. The overall amount of the project budget (€2,273,738) is therefore dedicated to IAS.

Results

The foreseen containment strategy has been established in project area, where monitoring and destroyer teams are working in nest detection and destruction, with the involvement of local authorities, stakeholders and associations. The strategy allowed to sample 480 nests in Liguria region in 2016, 84% of these nests have been removed by LIFE STOPVESPA. Moreover, this activity has prevented the predation towards many honeybee and wild bees species. The harmonic radar has been developed, it is able to track the hornets for at least 150 m and detect their nests. Improvements are underway, in order to increase both its mobility and its tracking distance to 300-500 m.

Lessons learnt

The beekeepers are the subjects directly concerned by the spread of *V. velutina*, widespread in the territory and able to early detect this species. Therefore, they have been particularly involved in project area. The establishment of EWRRS in other Italian regions should be based on their collaboration too, in order to maintain acceptable the level of costs-benefits, in consideration that sudden populations could be established by passive transport of founder queens. The radar could considerably increase the efficacy of an EWRRS, especially in those areas just invaded by *V. velutina*.

Sustainability of results

The EU Regulation on IAS foresees management activities for *V. velutina*, so the control of the species should continue in Italy after the end of the project, probably coordinated at a regional level.

Recommendations

The creation of a task force able to detect the nests with the use of the radar could guarantee rapid interventions, important especially in case of new outbreaks in areas not yet colonized by the species.

References:
Bertolino S. *et al.* 2016. Spread of the invasive yellow-legged hornet *Vespa velutina* (Hymenoptera:Vespidae) in Italy. Japanese journal of applied entomology and zoology, 51:589-597.
Milanesio D. *et al.* 2016. Design of an harmonic radar for the tracking of the Asian yellow-legged hornet. Ecology and Evolution, 6:2170-2178.
Milanesio D. *et al.* 2017. Recent upgrades of the harmonic radar for the tracking of the Asian yellow-legged hornet. Ecology and Evolution, 7:4599-4606.

"Loop" tag mounted in vertical position on a *Vespa velutina*

LIFE14 NAT/IT/000544

Life PonDerat - Restoring the Pontine Archipelago ecosystem through management of rats and other invasive alien species

Duration From 01/10/2015 to 31/03/2020
Total budget €1,788,216.00 (EC co-financing 60%)
Website www.ponderat.eu
Coordinating beneficiary Regione Lazio – Direzione Ambiente e Sistemi Naturali (Italy)
Other partners Istituto Superiore per la Protezione e la Ricerca Ambientale, Università La Sapienza – Dipartimento Biologia Ambientale, Riserva statale Isole di Ventotene e S. Stefano, Nemo srl (Italy)
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Target species

Rattus rattus, *Capra hircus*, *Ovis musimon*, *Carpobrotus* spp. pl.

Background and aims

The project is carried out in the Ponziane Archipelago, a few miles off the south coast of the Latium Region. Although the Archipelgo includes six islands, only two are inhabited, Ponza and Ventotene, with respectively 2,000 and 700 residents. The project aims at eradicating or controlling invasive alien species (rats, feral goats and Hottentot fig) to preserve native habitat and species of the Ponziane Islands. Alien species will be managed on three islands, but biosecurity measures will be implemented on five islands. Main target habitats are those of Mediterranean coasts and cliffs (i.e. EU Habitat Directive codes 6220*, 3170*, 5320, 5330, 1240, 9340); target species are nesting seabirds (i.e. Scopoli's and Yelkouan shearwater). However, removing or controlling alien species will bring benefits to the whole island ecosystem.

Key measures and relative costs

Conservation actions will consist mainly of: 1) rats and goats eradication in order to restore insular habitats and to improve breeding success of shearwaters. Rats will be eradicated from two islands (about 300 ha, cost about €340,000), goats from one island (about 150 ha, cost: €97,000); 2) restoration through fencing of 5 ha of habitat 9340 in Zannone to exclude mouflons (cost: about €71,000); 3) eradication of invasive alien plants (*Carpobrotus* sp.pl.) from three islands (about 340 ha, cost: about €25,000); 4) implementing an effective biosecurity strategy to prevent rat reinvasion (cost: about €50,000).

Results

Rat removal (on Palmarola and Ventotene) will increase both productivity (short term) and population size (long term) of seabirds *Calonectris diomedea* and *Puffinus yelkouan*. In the long term, attraction of new breeding species, i.e. *Hydrobates pelagicus* at Palmarola, S. Stefano and Ventotene (unlimited breeding site availability on all these islands). Other benefits from rat eradication may consist in an increase in biodiversity (e.g. by halting seed predation by rats on 5330 e 5320 habitats) and biomass, a restoration of ecosystems functions with plant species whose seeds were eaten by rats. Other important results include the reduction of damage caused by rats to agriculture and economic activities and the improvement of sanitary conditions for island inhabitants and tourists. The eradication of *Carpobrotus* sp.pl. will result in a natural recovery of the autochthonous plants communities implying an increase of population awareness about alien plant species issue. At Palmarola, the release from the goat browsing pressure will allow the recovery of the habitats 5330, 6220*, 3170*. By implementing biosecurity measures, we expect an improvement of sanitary conditions at Ponza, through the reduction of the risk of transmission of zoonosis carried by rats. At Zannone, where rats have already been eradicated ten years ago, we aim to maintain a long-term low risk of recolonization. Fencing 5 ha of holm oak forest (9340 EU Habitat) will restore the forest ecosystem function, allowing a natural regeneration in the fenced area (10% of the total habitat available on the island).

Lessons learnt

It is well known that communication and information aspects are very important in projects involving the suppression or removal of invasive species to favour native ones or ecosystems. In the case of island communities, a main issue is that, if not properly communicated, actions may be perceived as an intrusion by outsiders. On-site meetings with populations do not always have a good feedback in terms of participation. In our experience, ensure a constant presence in the area and establish positive relationships with locals are paramount to raise public awareness on relevant conservation topics as well as to gain project acceptance. It is vital to establish a constructive dialogue with port authorities and ship-owners, to allow boats and harbours to be monitored, so that rats cannot be transported and spread over the island.

Sustainability of results

Results of rat eradication will be sustainable, as a strong biosecurity effort will be implemented. A key role will be played by the staff involved in rat eradication, which will continue to perform surveillance beyond the end of the project. The funding will mainly consist in personnel costs, took on charge by Latium Region and by Ponza and Ventotene municipalities.
Life PonDerat will draft a document providing guidelines to reduce the risk of reinvasion of islands, i.e. biosecurity measures. This document will add value to the project, having a high potential for being adopted and applied in other Mediterranean (and not only) contexts. As for goats, this experience represents the first attempt to eradicate feral goats outside national parks in Italy. Long-term persistence of a goat free island will strongly depend upon local public acceptance of the eradication itself.

Recommendations

A major problem in rat eradication project is the limitations resulting from the application of the EU Biocide Regulation 528/2012. Even though the Regulation explicitly provides for a derogation (Article 43), including aspects relating to the protection of the environment, Italian labels of rodenticide baits impose that they should be only distributed within bait stations, thus implicitly forbidding aerial distribution. This has led to legal disputes during the eradication on Montecristo island, which in the end resolved positively but causing problems to many other eradication interventions to come. At Palmarola we have been forced to throw baits inside biodegradable bait stations, a solutions which is challenging and much more expensive than pellet aerial spread. Another critical aspect for many eradication projects is the need of accessing private properties. The need of permission from landowners makes difficult to operate in some islands (e.g. Palmarola for goat eradication).

References:

Capizzi, D. *et al.*, 2010. Prioritizing rat eradication on islands by cost and effectiveness to protect nesting seabirds. Biological Conservation 14: 1716-1727.
Capizzi, D. *et al.*, 2016. Fifteen years of rat eradication on Italian islands. In. F.M. Angelici, (Ed.) Problematic Wildlife, pp. 205-227. Switzerland: Springer International Publishing.
Celesti-Grapow, L. *et al.*, 2017. Control of invasive species for the conservation of biodiversity in Mediterranean islands. The LIFE PonDerat project in the Pontine Archipelago, Italy. Plant Biosystems-An International Journal Dealing with all Aspects of Plant Biology, 151: 795-799.

Maintaining islands free of invasive species through biosecurity measures is one of the major challenges of Life PonDerat

LIFE14 IP/IT/000018

LIFE IP - GESTIRE 2020
Nature Integrated Management to 2020

Duration From 01/01/2016 to 31/12/2023
Total budget €17,345,496.00 (EC co-financing 58%)
Website www.naturachevale.it
Coordinating beneficiary Regione Lombardia (Italy)
Other partners Ente Regionale per i Servizi all'Agricoltura e alle Foreste (ERSAF), Carabinieri Forestali, Lega Italiana Protezione Uccelli (LIPU), WWF Italia Onlus, Comunità Ambiente srl, Fondazione Lombardia per l'ambiente (FLA) (Italy)
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Target species

All Invasive Alien Species of flora and fauna that pose a major threat for the conservation of Natura 2000 species and habitats.

Background and aims

The presence of IAS is a major threat for conservation of biodiversity in Lombardy: more than 650 alien species of flora and fauna are recorded in the region. Until recent, several projects in Lombardy, including LIFE projects, have addressed specific emergencies and the management of individual invasive species. LIFE GESTIRE 2020 project aims at defining a regional strategy on IAS, a unified framework of the priority actions of prevention, dissemination and contrast to the spread of invasive species. Priorities are defined taking into account the level of criticality of the impact of invasive species on Natura 2000 species and habitats, the risk of further spread, and technical and economic viability along with social acceptance of eradication and control activities. The project also focuses on prevention and early detection of IAS at the airport premises of the international airport of Orio al Serio. The overall aim is therefore to work on the three types of interventions defined by EU Regulation on IAS, building a regional framework for prevention, early detection and rapid eradication, and management of IAS.

Key measures and relative costs

LIFE GESTIRE 2020 project develops a regional strategy on IAS for Lombardy. The key measures involve prioritization of actions based on the most effective measures for the management of the species. The viable management option for each relevant species or group of species is defined and applied during the project. Actions already defined in the first phase involve the eradication activities to remove invasive squirrels *Callosciurus erythraeus* and *Sciurus carolinensis* and the drafting of an action plan for control of exotic tortoises (*Trachemis sp. pl.*) along with the definition of 5 protocols of intervention for flora species such as *Sycios angulatus*, *Prunus serotina*, *Ludwigia grandiflora*, *Elodea Canadensis*, *Reynoutria japonica*, etc. Prevention and early detection actions focus on the International Airport "Caravaggio" in Orio al Serio, where operating procedures of control of the entry of alien species will be defined and airport personnel will be trained in order to create an integrated office to contrast the entry of alien species. Awareness raising actions are an essential measure and involve public meetings, specific working groups to solve social conflicts and an information campaign addressed to passengers at the airport. The project is ongoing so a cost estimation can be given: €225,250 (Defining interventions to limit the spread of alien species of flora and fauna); €452,095 (Design and establishment of an integrated office at the International Airport "Caravaggio"); €515,400 (Actions to control the spread of the alien species); €276,520 (Awareness raising activities).

Results

The results foreseen are a definition of priority actions and management options, aimed at reducing the risk of entry of new alien species and address technical and economic efforts in the direction of the most suitable management option for single IAS. Lessons learnt – The LIFE Integrated project gives the opportunity to work on the definition of a regional strategy for IAS, therefore shifting from specific issues related to the presence of alien species to a broader and structure approach. Capacity building activities and involvement of stakeholders in this process are an integral part of this process and essential to share common approaches on IAS.

Sustainability of results

The interventions foreseen in the project, involving monitoring, eradication and controlling of species need on the one part, knowhow and technical expertise, on the other funding. The timespan of the LIFE integrated project gives the opportunity to raise awareness and involve specific stakeholders in training actions (e.g. volunteers and airport personnel and, more in general, citizens through citizen science) and mobilize different types of funding. In the project ERDF funds are being mobilized for training and regional funds for controlling activities.

Recommendations

Many IAS have been introduced for ornamental and commercial purposes. Legislative instruments like trade bans extended not only to the targeted species but to similar species (e.g. *Trachemys*) should be established, involving the economic sectors. Dedicated funds should be envisaged for the application of the EU Regulation, involving not only LIFE Nature funds, but also other EU and national funds that should be readily available for early detection and rapid eradication of species.

References:

www.naturachevale.it/en/invasive-species/regional-strategy-for-alien-species/

Sciurus carolinensis

LIFE15 GIE/IT/001039

LIFE ASAP - Alien Species Awareness Program

Duration From 30/09/2016 to 30/03/2020
Total budget €3,140,305.00 (EC co-financing 59%)
Website www.lifeasap.eu
Coordinating beneficiary Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) (Italy)
Other partners Regione Lazio - Direzione Ambiente e Sistemi Naturali; Federazione Italiana dei Parchi e delle Riserve Naturali Europarc Italia; LEGAMBIENTE ONLUS; NEMO srl; Università degli Studi di Cagliari; UNICITY SPA (Italy).
Contact Mr. Piero Genovesi (ISPRA)
e-mail piero.genovesi@isprambiente.it.

Target species

List of IAS of Union concern under EU Regulation 1143/14 already present in Italy: *Baccharis halimifolia*, *Impatiens glandulifera*, *Alternanthera philoxeroides*, *Eichhornia crassipes*, *Myriophyllum aquaticum*, *Pueraria montana var. lobate*, *Heracleum mantegazzianum*, *Pennisetum setaceum*, *Lagarosiphon major*, *Elodea nuttallii*, *Ludwigia grandiflora*, *Ludwigia peploides*, Asclepias syriaca, Hydrocotyle ranunculoides, Vespa velutina nigrithorax, *Orconectes limosus*, *Pacifastacus leniusculus*, *Procambarus fallax f. virginalis*, *Procambarus clarkia*, *Eriocheir sinesis*, *Lithobates catesbeianus*, *Trachemys scripta*, *Pseudorasbora parva*, *Oxyura jamaicensis*, *Threskiornis aethiopicus*, *Alopochen aegyptiacus*, *Nyctereutes procyonoides*, *Myocastor coypus*, *Procyon lotor*, *Sciurus carolinensis*, *Callosciurus erythraeus*, *Tamias sibiricus*, *Ondatra zibethicus*.

Background and aims

LIFE ASAP's general aim is to reduce the introduction rate of alien invasive species and their impacts by increasing the Italian public awareness and promoting the active participation of the society. Specific objectives are:

- increase the public awareness on IAS, also by training the "knowledge multipliers" (ex. teachers, people working in protected areas, zoos, botanical gardens);
- promote voluntary approaches, also through the circulation and adoption of the different European codes of conduct and guidelines available;
- support public administrations responsible for implementing the EU Regulation 1143/14;
- involve Italian scientific community to support the implementation of the EU Regulation 1143/14.

Key measures and relative costs

All the actions of the project are aimed to address the IAS problems, focusing on the IAS of Union concern. LIFE ASAP includes training, information and communication actions and national campaigns (photo contest, citizen science...) addressed to several target groups and stakeholders:

- public administrations responsible for the application of the Regulation 1143/14 (ex. Ministers, Regional governments, protected areas, borders inspection posts);
- hobbyists (anglers and hunters);
- professionals involved in IAS management (ex. floriculturists, pet retailers, veterinary, green architects);
- visitors of protected areas, zoos and botanical gardens;
- airport passengers;
- scientists (zoologists, botanists and marine biologist);
- citizens.

Results

Expected results of LIFE ASAP are:

1. adoption of code of conducts or voluntary practices by the different stakeholders and target groups (at least one national hunter association and one national angler association and 30% of freelancers, commercial operators, professionals engaged on information activities);
2. adoption of guidelines on IAS management in at least 4 protected areas;
3. appropriate implementation of the EU regulation due to the training/information activities for the people working at the public administrations responsible for the application of the EU Regulation (at least 115 people only considering Ministers and Regional Governments);
4. drafting of a national blacklist of IAS and a document with ideas/proposals, developed during the activities of horizon scanning and priority setting, for the Italian government as contribution for implementing the EU Regulation (at least 50 scientists trained);
5. increased public information and awareness in order to reduce the voluntary/accidental introductions by (a) national communication campaigns (at least 800 people participating photo contest, citizen science activities) and (b) information/education activities by trained people (at least 300, considering people working in protected areas, zoos, botanical gardens, museums, besides freelancers, teachers, professors/researchers) that will act as multipliers of the projects messages to citizens and students.

Lessons learnt

We plan to deliver a detailed Replicability Plan as a specific project action with the scope of transferring the project approach to other EU countries. The "Handbook for Replicability" will be promoted and discussed during a number of international meetings that will take place within the project lifetime.

Sustainability of results

We aim at contributing to the future sustainability in particular by training a high number of people that will act as "knowledge multipliers" (ex. teachers, people working in protected areas, zoos, botanical gardens) also after the end of ASAP. Moreover public partners involved in ASAP (particularly ISPRA and REGIONE LAZIO) will continue to support public administrations responsible for the application of the EU Regulation 1143/14.

Recommendations

Communication on this issue is particularly changeling, considering the presence of stakeholders with various perceptions or opposite interests. The main challenges are (a) identifying clear and attractive messages for non-specialists audience focused on the impact of IAS and the problems related on, (b) defining an effective communication strategy able to change public behaviour and increase the support on essential management activities addressed to IAS.

One of the information event organised by the project.

LIFE15 NAT/IT/000914

CALMARSI - Measures of integrated conservation of *Calendula maritima* Guss., a rare threatened plant of the Sicilian vascular flora

Duration From 01/11/2016 to 31/10/2020
Total budget €1,020,982.00 (EC co-financing 58.98%)
Website www.lifecalmarsi.eu
Coordinating beneficiary CNR – Istituto di Bioscienze e Biorisorse (Italy)
Other partners Regione Siciliana - Assessorato del Territorio e dell'Ambiente, Dipartimento Regionale dell'Ambiente (Italy)
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Target species

Carpobrotus edulis and *Carpobrotus acinaciformis*.

Background and aims

Calendula maritima Guss. is a herbaceous plant species, with annual or short perennial life cycle. It plays a key functional role within a variety of coastal habitats in western Sicily in a small area of Trapani province. Despite its notable ecological amplitude and adaptability to disturbed environments, *C. maritima* has a very discontinuous distribution. During the last 150 years its range has been concerned by strong regression, mainly due to intensive anthropogenic pressure caused by changes in land use and urbanization. The main goal of the project is the conservation of the few remnant populations by the removal/mitigation of the main threats: 1) reduction and fragmentation of distribution area and degradation of current habitats; 2) genetic pollution; 3) disturbances related to seasonal touristic use; 4) competition by IAS. The Trapani province is historically famous for wine production and vineyards still occupy the most part of the cultivated lands. In recent time, tourism is replacing the agricultural activities leading to the overexploitation of agro-ecosystems, especially along the coastline, often causing habitats destruction and native species extinction. Moreover, the diffusion of alien species such as *Carpobrotus* spp., usually used as ornamentals in private gardens, can represent one of the main threats for the native flora. Due to its invasiveness and its great adaptability to dry and salty environment of coastal habitats, this species competes in space occupation and resources with *C. maritima* and other important endemics or rare species such as *Limonium* spp., becoming also a major natural factor for habitat degradation. Accordingly, habitats where *Carpobrotus* spp. is widespread (e.g. 1210, 1240, 1420, 2110) become more and more degraded and poorer in biodiversity.

Key measures and relative costs

To preserve *C. maritima* from IAS, the project foresees the eradication of invasive alien plant species (e.g. *Carpobrotus* spp.) for a budget of €28,664. Eradication activities of *Carpobrotus* ssp. have been programmed before fruiting to prevent dissemination, but after seed dispersal of *C. maritima*. Due to limited extension and difficult accessibility to the intervention sites, the eradication will be done manually. Litter will be removed to reduce the presence and persistence of *Carpobrotus* seeds and limit future recolonization. All removed plants will be accumulated in "compost areas" and then destroyed by means of shredding or covered with black plastic film before burning or composting. Containment activities will be carried out all along the project duration. Regular monitoring of the short and medium term effects of containment actions will be carried out to assess the conservation status of the target species and the of the eradication program.

Results

It is expected that the removal of IAS from *C. maritima* habitats will increase the naturalness and the continuity of the target plant populations and the related plant communities. This action will achieve the mitigation of space competition by *Carpobrotus* spp. on some populations of *C. maritima* and, hopefully, the reduction of this IAS in public and private green areas, also thanks to dissemination activities. The latter activities will also increase the awareness by customary and seasonal users about the vulnerability and the naturalistic value of the sites concerned by the project actions. The increase of awareness about the topics related to biodiversity loss and the involvement of local people in conservation policies of their own territory will trigger the development of sustainable and environmental friendly touristic activity.

References

Chenot J. et al., 2014. Consequences of iceplant (*Carpobrotus*) invasion on the vegetation and seed bank structure on a Mediterranean island: response elements for their local eradication, Acta Botanica Gallica, 161:3, 301-308.
Podda L. et al., 2015. Different approaches for the eradication of *Carpobrotus* spp. (Aizoaceae) from coastal dune ecosystems. International Conference Ecological Restoration in the Mediterranean region: Challenges and Opportunities. Beirut, 14-16 October 2015.

Plants of *Calendula maritima* included in a dense nucleus of *Carpobrotus spp.* at Tonnara S. Giuliano (Trapani, Sicily)

LIFE12 NAT/MT/000182

LIFE SAVING BUSKETT - Soil stabilisation measures to protect Annex I habitats in Buskett-Girgenti Natura 2000 site

Duration From 01/07/2013 to 31/05/2018
Total budget €2,778,772.00 (EC co-financing 50%)
Website www.lifesavingbuskett.org.mt
Coordinating beneficiary Parks Afforestation, Countryside Restoration and Initiatives (P.A.R.C.) Directorate within the Ministry for Environment, Sustainable Development and Climate Change as part of the Government of Malta
Other partners
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Target species

Ailanthus, Ricinus communis , Agave spp., *Vitis sp*., *Arundo donax*, *Acacia saligna*, *Acacia karroo*, *Leucaena leucocephala*, *Hylocereus undatus*, *Opuntia ficus-indica*, *Chasmanthe bicolor*, *Mirabilis jalapa* and *Nicotiana glauca*.

Background and aims

Proliferation of IAS is negatively affecting Annex I habitats through competition with characteristic plant species for already limited resources, whilst preventing the establishment of indigenous saplings and altering the ecological composition of such habitats. Restoration of areas cleared of IAS, along with the implementation of environmental protection measures, is expected to improve natural production and habitat functions, including increased carbon sequestration, nutrient uptake and conversion to living biomass, preservation of biological and genetic diversity, as well as regulating water flow and providing sources of food and raw materials (to a lesser extent).

Key measures and relative costs

As of December 2016, approximately 25,960 m² of IAS coverage has been removed. Since 2014 until December 2016, labourer and officer salaries totalled €51,060 (covering 4,475.44 total work hours). Additionally, €243.87 was spent on consumables (hand tools and basic equipment). Therefore, unit costs (employee salaries and consumables), for the duration of the project up to December 2016, amounted to €19,763 per hectare.

Results

As of December 2016, 76% of specified IAS coverage has been removed from the project area, amounting to a total of 25,960 m² of 34,200 m². Current progress has proven difficult to monitor accurately, as a result of multiple interventions being carried out at the same time and in the same area, as well as regeneration of removed IAS. Follow-up and repeated interventions may be required to fully eradicate IAS. Areas where IAS has been removed shall be allowed to vegetate naturally and indigenous plant species, compatible with nearby habitats, shall be planted as an intervention of habitat restoration.

Lessons learnt

With regards to strategies and approaches to reduce the risk of IAS, project staff advise caution during and following works to avoid further contamination owing to improper transportation and disposal of material, as well as the need to prepare a detailed eradication or control plan for target IAS which considers the plant life cycle, site difficulties and climatic factors which may adversely affect works. In addition, educational and public awareness campaigns, followed by implementation and enforcement of legislation, shall limit the accidental or intentional re-introduction of IAS.

Replicability

An interesting and well received dissemination methodology was the involvement of students and elderly people being involved in removal of IAS and planting of seedlings within the project site. This knowledge of removal of IAS and planting seedlings provided for replicability extending further the project's effectiveness.

Demonstration

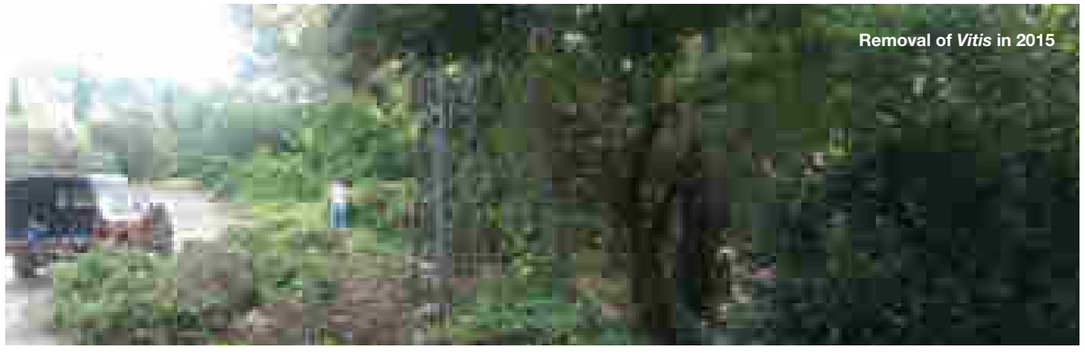
The project is a leading example of how restoration and upgrading of a Natura 2000 site should be undertaken, in as far as removal and/or containment of invasive alien species and soil stabilisation measures is concerned.

Sustainability of results

A contractor (EcoServ Ltd.), specialising in environmental consultation, was engaged to monitor the removal of IAS and ensure the sustainability of achieved results. Prior to commencement of works, the contractor carried out an assessment of the vegetation in the targeted area (approximately 241,742 m²). Once IAS removal works are completed, the contractor shall survey the project area and ensure the successful removal of IAS, whilst updating the site map accordingly. Post-work monitoring shall contribute towards continued control of IAS, which could regenerate and require follow up control and/or eradication interventions. The project team are still discussing final details to be included within the after-LIFE conservation plan, which covers repeat and follow-up IAS removal interventions. These discussions revolve around identification of alternative funding sources, engagement of employees, as well as creation and implementation of a post-project work programme. Since IAS removal interventions are still being carried out as part of the project, there is currently no definitive plan for post-project actions, including control and eradication of IAS. Therefore, currently the project cannot share information on methods to assure the success and sustainability of the project. However, said information should be available in the near future, and shall be made available upon request.

Recommendations

Project implementation could have been expedited had more detailed discussions been held with the respective permitting authorities (PA, ERA and Superintendent for Cultural Heritage, etc.) prior to the submission of permitting applications. This would have reduced the processing time for permits, owing to forewarning of the prerequisite for permits prior to the start of interventions within the highly protected and sensitive area. The project could have provided further training, IAS technical data and instruction on removal based on past research, as well as written instruction for labourers removing IAS. Although a work programme was devised, which took into account seasonal issues relating to IAS (e.g. flowering and seed producing period, climatic conditions), delegation of work was usually carried out through word of mouth. Oral delegation of daily work schedule was sometimes necessary, since some of the labourers involved had limited reading and writing skills. Spoken commands may be misinterpreted resulting in improper IAS removal and disposal, as well as contamination of unaffected sites. Although the project made reference to established methods of IAS removal, based within national and EU policy, no research has been carried out into the utilisation of innovative technologies and modern procedures utilised to facilitate the sound management of IAS. However, IAS control and eradication works have not been completed which, in addition to the required five year monitoring campaign, provides ample time for the project to research new control and management techniques. The constant presence of a qualified onsite officer would have assisted the project manager and the supervising architect in the design and managing of works, prevent bad workmanship or activities undermining the project objectives, whilst keeping to project specifications and schedule. Removal and management of IAS within Buskett was not constrained by any EU and national policy or legislation. The project regularly referenced established national legislation and consulted with regulatory entities to identify and select IAS for removal, whilst also referring to international, EU and national guidelines on methods of IAS removal.



Removal of *Vitis* in 2015

LIFE11 NAT/NL/000777

Peelvenen - “Let the raised bogs grow”

Duration From 01/06/2012 to 31/09/2018
Total budget €6,391,380.00 (EC co-financing 35.74%)
Website www.peelvenen-in-uitvoering.nl
Coordinating beneficiary Provincie Noord-Brabant (Netherlands)
Other partners Staatsbosbeheer, Waterschap Aa&Maas (Netherlands)
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e-mail JvLeijsen@brabant.nl

Target species

Vaccinium corymbosum.

Background and aims

After the peat cutting most of the raised bogs (EU priority habitat) in the Netherlands were transformed into agricultural land. Only a few areas of disintegrated and active raised bogs remained. Deurnsche Peel – Mariapeel is one of those areas located in the south of the Netherlands. The habitats of active raised bogs and regenerative raised bogs are currently threatened by eutrophication, dehydration and invasion by an exotic plant species: the Highbush Blueberry. In the 1950s the Highbush Blueberry, originated from Northern America, was introduced on nurseries in the Netherlands. The nurseries are located on former peatland close to the last remaining raised bogs in the east and south of the country, because the Highbush Blueberry develops at its best on peaty moist soil with al low PH (4-5). Birds ate the berries from the nurseries and dropped the seeds into the nature reserve where the Highbush Blueberry covered an area of more than 1,200 ha in the last 50 years. The strongest plants survive the winter and can grow up to 2-3 m of high. The leaves and branches taste bitter so they are not eaten and can grow freely. The plants dry the raised bogs, overshadow and yield excessive supplies of nutrients through leaves falling. Therefore, removing the IAS is necessary for the development of raised bogs in the Peelvenen. LIFE+ Peelvenen project aims to restore the active raised bogs in that area.

Key measures and relative costs

To remove the Highbush Blueberry, the most effective method was selected. No grazing, cutting, mowing or use of chemicals was foreseen, but the plants were extracted one by one, by hand or by crane. Costs:

- Total removal of the IAS on 450 ha: €1,200,000;
- Extracting solitary plants on raised bog: €50/plant;
- Removing clustered plants with different abundance: €750-4700/ha.

Results

The main expected results are:

- Removal of all the Highbush Blueberry plants from the nature reserve;
- The tested method can be used in other raised bogs areas;
- Reduction in dehydration, eutrophication and overshadowing of raised bogs.

Lessons learnt

- To immediately act on the first plants. The impact on the area is much smaller when only a few plants have to be removed;
- To combine the removing of the plants with measures that hinder the conditions for new plant to develop.

Sustainability

The sustainability of the project is guaranteed by the following aspects:

- The project is changing the water system, creating higher water levels, so it will be harder for new Highbush Blueberry plants to develop again in this area. The plants develop well on dehydrated peat land and not on wet soil;
- The costs of the maintenance in the next five years will be guaranteed by the province Limburg. Extracting young Highbush Blueberry plants is part of the Natura 2000 conservation plan. The first round of maintenance has started in 2017;
- By removing all the plants at once the major source of Highbush Blueberry seeds within the area is eliminated;
- Currently, only sterile species are used at nurseries in the area surrounding the nature reserve Mariapeel. Therefore, the source is no longer present.
- In other parts of the Netherlands the problem is not yet solved and actions have to be taken to prevent the Highbush Blueberry from threatening other raised bogs areas.

Recommendations

To act as soon as possible and do not let the problem grow and to take complete measures at once, removing the plants with all the roots.

Highbush Blueberry *Vaccinium corymbosum*

LIFE00 NAT/PT/007097

Freira da Madeira - Conservation of Zino's Petrel through restoration of its habitat

Duration From 01/04/2001 to 30/04/2006
Total budget €1,696,748.00 (EC co-financing 70%)
Coordinating beneficiary Serviço do Parque Natural da Madeira - Autoridade Governamental (Portugal)
Contact Ms. Dília Menez (Institute for Forestry and Nature Conservation)
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Target species

Mus Musculus, *Rattus rattus*, *Felix silvestris*, *Capra hircus*.

Background and aims

The Maciço Montanhoso Oriental (eastern mountain massif) on the island of Madeira hosts all the known nesting sites of Zino's or Madeira's petrel (*Pterodroma madeira*), thought to be extinct at the beginning of the 1970s but since rediscovered. The world population of this species is estimated at 30 pairs, and it is classified as extremely endangered. The site has been classified as an SPA and also as a pSCI, since it includes areas which display a high degree of biodiversity, with an especially wide variety of mountain flora: around 33 endemic species out of a total of 77. The Laurissilva of Madeira, which is also an SPA and pSCI, is a very large area of humid forest dominated by laurel (*Laurus novocanariensis*) and lily of the valley (*Clethra arborea*), which hosts many varieties of flora and is the habitat of the longtoed woodpigeon or Madeira laurel pigeon (*Columba trocaz*). Habitats and wildlife are threatened by soil erosion resulting from excessive grazing, predation by cats and rats, the pillaging of eggs and skins by collectors and uncontrolled tourism.

Key measures and relative costs

Monitoring and surveillance: Monitor the listed target populations, species and communities and follow up the recovery actions. Cost: €168,070.00.

Awareness campaign: Develop a general public awareness programme on the natural resources of the Eastern Mountainous Massif and the importance of its conservation. Cost: €191,814.40.

Long-term control and containment: Control and eradication of introduced herbivores, rodents and mamals (cats). Cost: €745,005.00.

Results:

- Elimination of grazing stock in Madeira's Petrel breeding area, with a positive effect on vegetation.
- Acquisition of 'Montado do Areeiro' (though through a litigious process). Discovery of a new breeding colony for the species.
- Implementation of a monitoring network for the study of fauna and flora. Introduction of a wide and comprehensive environmental programme.
- Internal approval and implementation of 'Maciço Montanhoso Oriental' and 'Floresta Laurissilva', both Natura 2000 sites.

The population of Madeira's Petrel has increased from 30-40 to 65-80 breeding pairs mainly through the discovery of new nests, but also due to management actions carried out by the project. It contributed to the improved conservation status of Madeira's Petrel and its habitat. The increase in individuals raised its status from 'critically endangered' to 'endangered'. Moreover, the draft of a comprehensive and adequate management plan and the purchase of the area where its main population breeds allow for effective conservation of the species in the future. Management actions have also been effective in helping the natural recovery of autochthonous vegetation and to the control of predation.

Lessons learnt

This project was developed in accordance with the strategies defined by the European Union for the protection and conservation of biodiversity. It contributed to the conservation of endangered species and the regeneration of indigenous habitats, replacing an invasive vegetation, made up of introduced species with little ecological significance, by a diverse indigenous vegetation, unique in the world.

The eastern mountainous massif holds an important diversity of natural resources. The activities carried out added value to the landscape and promoted a differentiated touristic product.

An effective awareness-raising campaign has greatly helped to disseminate project actions. This campaign has also promoted the presence of the Madeira's Petrel as a tourist asset for the area. Other projects could learn from the change of attitude that this project has achieved. This project has been selected as one of the 26 "Best" LIFE Nature projects in 2007-2008.

Sustainability of results

Since 2006 this project continues to be developed, essentially through support from the region's regional budget as well as from small financing resulting from other projects.

References:

https://ifcn.madeira.gov.pt/

LIFE06 NAT/PT/000184

SOS Freira do Bugio - Urgent measures for the recovery of Bugio's petrel, *Pterodroma feae*, and its habitat

Duration From 01/02/2006 to 31/12/2010
Total budget €966,468.00 (EC co-financing 74.88%)
Website www.ifcn.madeira.gov.pt/biodiversidade/projetos/freirado-bugio.html
Coordinating beneficiary Serviço do Parque Natural da Madeira (Madeira Nature Park Service, SPNM) (Portugal)
Other partners Sociedade Portuguesa para o Estudo das Aves (Portuguese Society for the Study of Birds, SPEA) (Portugal)
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Target species

Mus musculus, *Oryctolagus cuniculus*, *Capra hircus*.

Background and aims

This LIFE project was developed in Bugio, an island belonging to Desertas Islands, Madeira Archipelago, Portugal. Desertas Islands is classified as Special Conservation Area and Special Protection Area. It harbors 4 habitat type, 12 plant species and 40 animal species listed (part as priority species) in the EU Habitat and Bird Directives. Faced with the negative impacts of these invasive species, mice, rabbit and goat on Bugio island species and their ecosystems, especially on Bugio's petrel population and its habitat, such as disturbance and destruction of nests caused by rabbits; habitat degradation and fragmentation due to the introduction of vertebrates; disappearance of the vegetation cover, loss of regeneration capacity and erosion increase; this project was launched with a systematic effort for eradicating or control them, which worked successfully, resulting on these three fauna invasive species eradicated from Bugio Island. Based on phylogenetic studies, Bugio's petrel Pterodroma feae, was recently classified endemism Desertas's petrel, Pterodroma deserta. The project's long-term aim was to conserve a sustainable population of the targeted seabird and its breeding habitat, where many important species listed in the Habitats Directive Annex II can be found.

Key measures and relative costs

Long-term control and containment: Control of IAS in Bugio; Evaluation, control and eradication of introduced herbivores and rodents. Cost: €180,555.
Monitoring: Monitor the listed target populations, species and communities and follow up the recovery actions. Cost: €304,699.
Awareness campaign: Develop a general public awareness programme on the natural resources of Bugio Island and the importance of its conservation. Cost: €228,809.

Results

A Management Plan for the Desertas and an Action Plan for the target species, were developed. The project allowed the definition of a new taxonomic status for the Desertas species (now named Bugio's petrel), which is now recognised as an endemic species. Equally successful were the results obtained for the recovery of the habitat, after the implementation of the tasks tackling the control of the erosion and of the goat, mice and rabbits, present on the islands.
Conclusion of field monitoring tasks showed continued absence of rabbits, goats and mice from the southern plateau of the island of Bugio; conclusion of the studies to evaluate the response of faunal groups; the reproductive biology of the target species was studied pointing to the successful recovery of the population. The 2010 survey estimated a population of between 160 and 180 pairs; a total of 252 Bugio's petrel individuals were tagged during the project; four accesses to the Bugio's south plateau were created or improved; some 1200m of coconut meshing was put in place to control erosion in the main breeding areas of Bugio; to increase the vegetation cover and aid the retention of soil, seeds of 10 different species collected in the project area were directly dispersed on the south plateau; eradication of rabbits was particularly successful with no individuals reported in the project area since 2008; confirmation of the presence of 11 active nests of Bugio's petrel on the island of Deserta Grande and confirmation of no species at the northern plateau of Bugio; from the 24 artificial nests built during the project, during the 2010 breeding season 12 were occupied by couples; a total of 21 tracking devices were used on 14 individual birds. Results showed that during the breeding season the individuals extended their flight areas from the African coast to the Azores region. During the wintering season migration occurs to four main areas: Cape Vert archipelago; Northeast and Central coastal areas of Brazil and Vale Beaufort (USA). Between 2006 and 2010, more than 2,000 hours of monitoring were undertaken for an area covering a total of more than 29,000 km. During this period, more than 93,000 bird specimens (65 different species) and 2,000 cetacean specimens (seven different species) were identified. The project's awareness and dissemination campaigns attracted a very high number of participants and have helped to increase the knowledge about the species among the local people. Over 2,000 local people took part in more than 140 visits organised by the project. A strong awareness-raising campaign in Madeira, as well as significant media coverage of the project in newspapers and with several regional TV and radio reports, have helped to improve knowledge about an important endemic seabird species that was little known locally, before the launch of the project.

Lessons learnt

It is in line with EU policies, aligned with EU protection strategies and biodiversity conservation, preserving the most important habitats and species by reducing the impact of invasive alien species. This project is geographically located in one of the ultra-peripheral regions of the European Union, so the contributions given to nature conservation in this region are necessarily reflected in the sustainable economy and development of nature tourism, which plays The increased value of this project is used to safety measure the most important EU habitats and species as they are directly covered by the project, one of which occur exclusively in the project intervention area. The project involved the application of methods and techniques, which are susceptible of being replicated elsewhere, namely island and in the territory of the European Union, where the control of invasive species and the recovery of degraded natural habitats is a priority. LIFE funds are used in a project which will also use assets acquired under previous LIFE projects, which is a clear demonstration of compliance with the Community provisions underlying them financing. The development of the project allowed the creation of direct and indirect jobs in the region, with the application of about €333,918 of European funds in Madeira.

Sustainability of results

There are no doubts that the eradication/control campaigns carried out in Madeira and Selvagens Archipelagos are a very useful conservation tool. Although the success of eradication of mice, goat and rabbit invasive alien species on Bugio Island, stringent quarantine measures are implemented and primordial to reduce the chances of reinvasion of the island.

Recommendations

Many European countries face similar problems in their efforts to control IAS and should include in their policies the following: Increase public awareness about IAS; Promote, coordinate and support research that has in view a better understanding of the IAS; Increase access to scientific information (species identification, risk analysis, detection and mitigation measures, etc.); Prioritization of joint actions between countries and institutions; Promotion of better methodologies for monitoring IAS; Maintain the IAS legislation updated.

Freira do Bugio before (up) and after (above) the LIFE project

LIFE09 NAT/PT/000041

LIFE+ ILHÉUS DO PORTO SANTO - Halt the loss of European Biodiversity through the recovery of habitats and species of the islets of Porto Santo and surrounding marine area

Duration From 01/09/2010 to 31/12/2015
Total budget €1,150,016.00 (EC co-financing 49.67%)
Website www.lifeportosanto.com
Coordinating beneficiary Serviço do Parque Natural da Madeira (Portugal)
Other partners Sociedade Portuguesa para o Estudo das Aves (Portugal)
Contact Ms. Dília Menezes (Chefe de Divisão da Conservação da Natureza)
e-mail diliamenezes@gov-madeira.pt

Target species

Fauna species: *Oryctolagus cuniculus*, *Mus musculus*. Flora species: *Nicotiana glauca*, *Coronopus dydimus*, *Lycopersicon esculentum*, *Agave americana*.

Background and aims

At the beginning of the project, several threats directly or indirectly related to current or past human activities were identified. These could lead to the degradation of a range of habitats found in the Natura 2000 network site and the species of seabirds listed in Annex I of the Birds Directive and species of terrestrial molluscs and plants listed in Annexes II and IV of the Habitats Directive. Since the discovery of Porto Santo Island, these species and habitats have come under increasing threat from the spread of invasive alien species and human activities. Appropriate habitat management is therefore essential for the long-term conservation of biodiversity on and around these islands.

Key measures and relative costs:

Prevention:Implementation of a quarantine regime that prevents the reintroduction of vertebrate species introduced in the study areas. Cost: €3,324.61.
Long-term control and containment: Control of IAS in Ilhéus Porto Santo (IPS); Control and eradication of introduced herbivores and rodents, and eradication of alien invasive plants species. Cost: €9,1795.26.
Monitoring: Monitor the listed target populations, species and communities and follow up the recovery actions. Cost: €108,886.32.
Awareness campaign: Develop a general public awareness programme on the natural resources of the IPS and the importance of its conservation. Cost: €8,9376.47.

Results

The project Life Ilhéus do Porto Santo carried out a series of measures to control and eradicate introduced herbivores and rodents, as well as invasive alien flora, in order to create conditions for the establishment and expansion of local endemic flora. The measure also helped increase knowledge of biology/ecology and taxonomy of the target species, while monitoring showed how the target groups respond to the removal of invasive alien species. It also identified key marine and land areas for the target species. Specifically, the project eradicated rabbits in Ilhéu de Cima and mice in Ilhéu da Cal, along with other introduced rodents. It furthermore removed introduced invasive alien plants such as agave (*Agave americana*) in Ilhéu de Cima and tree tobacco (*Nicotiana glauca*) in Ilhéu de Cima and Ilhéu de Ferro. The project also increased vegetation cover on two islets (Cima and Cal) were the invader rodents were removed. These measures led to an increase in the population size and distribution area of the target species of terrestrial molluscs.

Lessons learnt

There were several lines of action implemented, but most importantly, these lines of action contributed to the recovery of a habitat that was ecologically degraded / unregulated, which allowed, not only the recovery of the 14 target species of the project, but also of a set of flora and fauna species with unfavorable conservation statuses. In the case of EU-wide good environmental practice, the project could serve as an example in eradication of introduced rabbits without the use of open-pit venom and alien invasive plants were as much as possible eradicated through mechanical methods, which minimized the use of chemicals with potential environmental risks and losses.

Sustainability of results

Habitat recovery, with the control and eradication of invasive vegetation. The eradication of the invader rodents produce visible effects in a short term. Future action towards the control of IAS regeneration is obligatory, at least until indigenous vegetation is well established and not negatively affected by the IAS.

Recommendations

Many European countries face similar problems in their efforts to control IAS and should include in their policies the following:

- Increase public awareness about IAS;
- Promote, coordinate and support research that has in view a better understanding of the IAS;
- Increase access to scientific information (for species identification, risk analysis, detection and mitigation measures, etc.);
- Improve the dissemination and knowledge about IAS;
- Increase public awareness campaigns
- Prioritization of joint actions between countries and institutions;
- Promotion of better methodologies for monitoring IAS;
- Maintain the IAS legislation updated.

LIFE11 NAT/PT/000327

LIFE Maciço Montanhoso - Recovery and conservation of species and habitats on the Madeiran Central Massif

Duration From 02/07/2012 to 02/10/2017
Total budget €1,225,022.00 (EC co-financing 48.45%)
Website www.lifemm.madeira.gov.pt
Coordinating beneficiary Instituto das Florestas e Conservação da Natureza, IP-RAM (Portugal)
Contact Ms. Luísa Gouveia
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Target species

Cytisus scoparius subsp. scoparius, *Ulex europeus subsp. latebracteatus*.

Background and aims

This project was developed in the Eastern Mountainous Massif of Madeira. This region holds an important diversity of natural resources, with unique species, communities, as well as habitats in the world and with special conservation interest. Various anthropogenic pressures (more or less permanent unregulated grazing, associated with accidental fires and a high rate of soil erosion) led to a serious deterioration of the original plant cover and its corresponding original habitats. Those changes enabled various introduced plant species to occupy vast stretches of land: the broom (*Cytisus scoparius* subsp. *scoparius*) and the gorse *(Ulex europaeus* subsp. *latebracteatus*) are the most aggressive. Broom - this species is widespread along the eastern mountainous massif. It directly affects five habitats and 13 species listed in the Nature directives. On Madeira Island, the introduction of broom may have been intentional, for decorative purposes. Subsequent dispersion may have occurred spontaneously and accidently enabled through reforestation. Gorse - this species is mostly dispersed on the southern throughout the mountainous massif. It directly affects five habitats and 13 species listed in the Nature directives. The species may have been introduced in Madeira Island intentionally, the primary motive being the creation of hedges to control cattle.

Key measures and relative costs

1. Prevention - the distribution of the project target species and habitats, as well as IAS, was mapped. Costs: €96,091.49.
2. Long-term control, containment and capacity building - control of IAS in 6 ha. Foster the establishment and expansion of the target habitats by recovering areas of climax distribution in those habitats dominated by IAS. Costs: €316,634.33.
3. Monitoring and surveillance - monitor the listed target populations, species and communities and follow up the recovery actions. Costs: €28,761.40.
4. Awareness campaign - develop a general public awareness programme on the natural resources of the Eastern Mountainous Massif and the importance of its conservation. Costs: €69,486.62.

Results

1. Foster the recovery of native vegetation in 6 ha, through the destruction and control of broom and gorse plants, exclusively with mechanical and manual tools. The project intervened in: 1.25 ha of the habitat Endemic forests with Juniperus spp; 1.25 ha of the habitat Mediterranean forests of Taxus baccata; 3 ha of the habitat Endemic Macaronesian heath, specifically of Erica arborea forest; 0.6 ha for the habitat of *Sorbus maderensis*.
2. Plantation of around 20,000 plants of 19 indigenous species.
3. Reintroduction of 1,000 plants of Madeira cedar, 100 yew trees, 120 Madeira mountain ash and 120 plants of Madeira barberry.
4. Involvement of volunteers in IAS control activities in protected areas.
5. Production of promotion products (calendar, notes book, bookmarks, video, book and others) with information on IAS.
6. More than 400 lectures and events in schools, which focused on the project, its aims and developments, as well as the natural resources of the Eastern Mountainous Massif of Madeira, covering around 10,000 participants.

Lessons learnt

This project was developed in accordance with the strategies defined by the European Union for the protection and conservation of biodiversity. It contributed to the conservation of endangered species and the regeneration of indigenous habitats, replacing an invasive vegetation, made up of introduced species with little ecological significance, by a diverse indigenous vegetation, unique in the world. The activities carried out added value to the landscape and promoted a differentiated touristic product. This project considered an ecological approach to the habitat regeneration, with the control of IAS plants done without the use of pesticides. The development of the project allowed the creation of direct and indirect jobs
in the region, with the application of about €250,000 of European funds in Madeira.

Sustainability of results

Habitat recovery, with the control of invasive vegetation and its replacement by an indigenous vegetation, is a complex and a mid to long term assignment. Although destruction and eradication of invasive vegetation may produce some visible effects in the short term, the IAS species tackled in this project have a high recovery rate. Plants produce a large amount of seeds and shoots sprout from stalks of cut plants. Thus, future action towards the control of IAS regeneration is obligatory, at least until indigenous vegetation is well established and not negatively affected by the IAS. Regional funding sources are available to maintain these actions, namely PRODERAM 2020.

Case study before and three years after the intervention: detail of the endemic Macaronesian heath habitat project

LIFE12 NAT/PT/000195

LIFE RECEOVER NATURA - Recovery of the species and land habitats of the Natura 2000 sites Ponta de São Lourenço and Desertas Islands

Duration From 01/10/2013 to 31/03/2019
Total budget €1,344,044.00 (EC co-financing 49.02%)
Website www.liferecovernatura.madeira.gov.pt
Coordinating beneficiary Institute for Forestry and Nature Conservation, IP-RAM (Portugal)
Other partners Other partners: Portuguese Society for the Study of Birds (SPEA) (Portugal)
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Target species

Fauna: *Mus Musculus*, *Rattus rattus*, *Felis silvestris*, *Oryctolagus cuniculus*, *Capra hircus*, *Linepithema humile*. Flora: *Phalaris aquatica*

Background and aims

The intervention areas of this LIFE project are Ponta de São Lourenço (Desembarcadouro and Farol islets) and Desertas Islands (Desertas and Chão Islets). The main threats present in the project's intervention areas are essentially linked to the presence of exotic species (animals and plants), the lack of knowledge about some aspects of the biology and ecology of some target groups and the impacts caused by man or natural erosion processes. The goat, rabbit, mice and rats cause degradation and fragmentation of habitats. Their direct action on the species leads to the disappearance of the vegetation cover, loss of regeneration capacity (ex: seed predation) and erosion increase. One other IAS is the Argentine ant. This specie is one of the most harmful invaders at the global level. It directly damages native species and interferes with natural processes. Degradation of habitats caused by invasive plants species (eg Phalaris aquatica) are also a threat to natural habitats, affecting the functioning of ecosystems.

Key measures and relative costs

In this project some measures are taken to prevent the degradation and fragmentation of habitats caused by introduced vertebrates (goat, rabbit, mice and rats), such as the use of rodenticides and the killing of individuals using firearms. For the control of introduced invasive plants 33.9 ha, mechanical means will be used (for starting and destruction of plants) and when this method does not work, chemical methods will be used in order to carry out effective control. For the control of the argentine ant population, tests with formicide will be carried out. We also have preventive measures - Implementation of a quarantine regime that prevents the reintroduction of vertebrate species introduced in the study areas by using watertight containers for the transportation of materials and food clothing among others. The costs for the actions specifically aimed at IAS amount to €43,638.

Results

Currently, all the data point to a great effectiveness of the measures of control and eradication of rats and mice, applied to the islets (Desembarcadouro and Farol), and actions are still underway for the Chão islet. Regarding the measures applied to the remaining groups of invasive species, they are on the right track, and up to now, about 45.70% of the total area of occurrence of invasive plant species has been practiced. As work is still ongoing, it is premature to have conclusive results in relation to some target groups.

Lessons learnt

- It is in line with EU policies, in particular with the communication from the Commission "Our life insurance, our natural capital: an EU biodiversity strategy to 2020", demonstrating alignment with EU protection strategies and biodiversity conservation, preserving the most important habitats and species by reducing the impact of invasive species;
- This project is geographically located in one of the ultra-peripheral regions of the European Union, so the contributions given to nature conservation in this region are necessarily reflected in the sustainable economy and development of nature tourism, which plays an important socio-economic role in these islands. In this context, this contribution to sustainable economic development will benefit the cohesion objectives of the European Union;
- The increased value of this project is used to safety measure the most important EU habitats and species as they will be directly covered by the project: 36 taxa of fauna and flora present in the Natura 2000 network annexes, of which 2 priorities; 267 taxa endemic to Madeira or Macaronesia, many of which occur exclusively in the project intervention area.
- The project will involve the application of methods and techniques that have been tested and implemented under the LIFE Islets of Porto Santo project in Porto Santo (LIFE09 NAT/ PT000041), which are susceptible of being replicated elsewhere, namely island and in the territory of the European Union, where the control of invasive species and the recovery of degraded natural habitats is a priority;
- The project has a good cost-benefit ratio in the sense that LIFE funds are used in a project which will also use assets acquired under previous LIFE projects, which is a clear demonstration of compliance with the Community provisions underlying them financing.

Sustainability of results

The monitoring works of invasive plants will have to be continued in the field until the definitive disappearance of the seed bank in the soil. Therefore, future actions for this control are obligatory. All monitoring of the remaining groups should be continued by preventing in a timely manner and avoiding setbacks in the processes of recovery of protected fauna and flora.

LIFE12 NAT/PT/000527

Life Terras do Priolo - Active protection of the population of the Azores bullfinch (Priolo) and its habitats and sustainable management of Pico da Vara/ Ribeira do Guilherme SPA's

Duration From 01/07/2013 to 30/06/2018
Total budget €3,363,260 (EC co-financing 75%)
Website www.life-terrasdopriolo.spea.pt/en
Coordinating beneficiary Sociedade Portuguesa para o Estudo das Aves (SPEA) (Portugal)
Other partners Azores Regional Government by the Regional Secretariat of Energy, Environment and Tourism (Portugal)
Contact Mr. Rui Botelho (SPEA)
e-mail rui.botelho@spea.pt; project e-mail: acores@spea.pt.

Target species

Invasive plants targeted: *Hedychium gardnerianum*, *Clethra arborea*, *Pittosporum undulatum*, *Cyathea cooperi*, *Dicksonia antartica*, *Gunnera tinctoria*, *Acacia* melanoxylon, *Leycesteria formosa* and others. Invasive mammals targeted: *Mus musculus*, *Rattus rattus* and *Rattus norvegicus*.

Background and aims

The actions of the LIFE+ Lands of Priolo project take place in the Special Protection Area Pico da Vara/ Ribeira do Guilherme and the Site of Community Importance Serra da Tronqueira/Planalto dos Graminhais in an area of 6100 ha classified as a biodiversity hotspot. These protected areas host several priority habitats, one of the most threatened birds in Europe, the *Pyrrhula murina* and an important population of *Nyctalus azoreum*, the only endemic mammal to the Azores. Several species and habitats are already in danger of disappearing by the fast spread of alien plants that already dominate big areas in the Azores archipelago. These alien species also have a major impact on local populations, both due to the degradation of agricultural and forested areas, the degradation of resources such as water and soil, the increase of landslides and floods, and even the spread of diseases such as leptospirosis by rats.

Key measures and relative costs

Around 70% of the total amount of the project is allocated for IAS control and restoration of natural habitats degraded by them in the Laurel Forest. Since the project is still under implementation, we provide the foreseen budget allocated for them in the original proposal, based on the experience of previous projects ("LIFE Priolo" (2003-2008) and "LIFE Sustainable Laurel forest" (2009-2012)). Direct actions for addressing IAS problem (testing methods, multi-sectorial strategy for IAS prevention and control, IAS control actions, restoration actions, early detection): total of €1,278,188. Indirect actions or actions that partially address IAS problem (production of native species, training, planning, monitoring, awareness and education actions etc.): €1,160,950.

Results

One of the greater achievements was to reverse the danger of extinction of the Pyrrhula murina, classified as "Critically Endangered" in 2003, as "Endangered" by 2010 and reclassified as "Vulnerable" in 2016. Another success case is the Prunus azorica, which had a known population of only 18 trees in the wild in the entire island. 300 plants of this species were found during the conservation actions and used to produce 8,000 new plants for the ecological restoration actions, producing a big increase in the population of this species. In total, over 150,000 native plants have been planted and this number is expected to double in the next two years. So far, over 350 hectares of native habitats (peatbogs, humid Laurel forests, mesic Laurel forests) have been restored (further 80 ha are foreseen). All the ecological restoration interventions have been narrowly monitored and the data collected show an important success in the IAS control on the short term (from 98% success in Hedychium to 82% of success with Clethra). However, in the mid and long term, data shows the reemergence of the IAS targeted, mainly due to their presence in the seed bank and by reentering the area from nearby invaded spots. Therefore, if regular maintenance of these areas is not ensured, it is predictable that after a few years they may return to the pre-intervention state of degradation.

Lessons learnt

Monitoring and regular maintenance of restored areas are absolutely indispensable in order to ensure long term success. Ideally, IAS control interventions should be performed as soon as the first individuals are detected, otherwise those interventions will have much higher associated costs and less effectivity. Public awareness about the problems that IAS arise and the dispersion channels of these species are a key factor in order to control the spread of alien species. Also, a well-trained inspection and the establishment of Biosecurity plans in islands would be a necessary method to avoid the entrance of IAS (this lesson came from LIFE Safe Islands (2009-2012) for Seabirds project, also coordinated by SPEA. Multisectorial and multistakeholder strategies for the global management of the IAS problem are absolutely necessary and should be assumed and promoted at the highest level, but organized and coordinated at a more local scale in order to include the specificities of each area.

Sustainability of results

The main challenge for sustainability lies with ensuring maintenance of the restored areas in the medium and long term. In order to ensure the maintenance of the developed work, a team of 15 people should be permanently working in the area. This necessary maintenance work will always be cheaper and lighter than the initial restoration work and will be becoming even lighter in the long term, especially if the continuous area of restored habitat could be enlarged. The cost of maintaining this field team wasn`t possible to be assumed by the Azores Regional Government and so far, the only funding mechanism is the LIFE programme. Additionally, some small Interreg projects have also been implemented to address IAS problem. Presently, the Azores Regional Government is trying to apply to a LIFE Integrated Project, in which SPEA is a partner, in order to reduce the IAS problem along several protected areas in the archipelago.

Recommendations

One of the challenges we face, lies with the implementation of Directive 2009/128/EC, transposed into national legislation by the Law 26/2013. Since most of the herbicides marketed do not have as main purpose the fight against IAS, those species are not listed in their labels, despite being known and proved their fit for those uses. As a consequence, entities dealing with IAS control need to request a minor uses permit for each one of the targeted species. This increases bureaucracy and makes it more difficult to effectively address the problem. Maybe, including in this directive the creation of an exceptional situation for the use of those chemicals for IAS control could help resolve this problem. In line with this, the increasing social alarm about the application of the active compound, glyphosate is leading to its prohibition in a general matter. This compound is one of the most effective chemicals for the control of some IAS and, for this reason, we are trying to argue with national and regional policy-makers that it is very important to allow its use for the control of IAS, as long as all security protocols are in place in order to ensure that no traces of the product can reach human populated areas or waterlines. Many of the target IAS we work with, such as Hedychium or Pittosporum, despite being problematic in many parts of the world, are still not very spread in Europe and sometimes, when we try to replicate successful methodologies applied at these places (e.g. New Zealand, South Africa, Hawaii), we are faced with the fact that the herbicides used are not approved for Europe, requiring new tests, which often limits the use of these methodologies.

References

www.life-laurissilva.spea.pt; www.life-corvo.spea.pt; www.life-priolo.spea.pt.

Control of invasive alien plants in high slope areas

LIFE13 BIO/PT/000386

LifeBiodiscoveries - Invasive species control through public participation

Duration From 01/07/2014 to 01/07/2019
Total budget €1,322,947.00 (EC co-financing 50%)
Website www.lifebiodiscoveries.pt
Coordinating beneficiary Municipality of Barreiro (Portugal)
Contact Andreia Pereira
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Target species

Acacia sp., *Carpobrotus edulis*.

Background and aims

Mata da Machada is a national forest where in the beginning of the 20th century, *Acacia* sp. and *Eucaliptus* sp. were planted to dry some areas. Many years later the invasion is well established, and *Carpobrotus edulis* also appeared in less humid soils. All the area is occupied by poor and sandy soils, except for the areas that were periodically flooded, where managers made some drainage works and planted *Acacia* sp. and *Eucaliptus* sp. Today the area has a recreational use and natural interest, that are diminished by the presence of IAS. There are some humid habitats that remained, in a patchy and not much significant area, and the most valuable natural features are related with these humid areas that the project intends to enlarge.
Knowing that controlling IAS is a matter of maintaining a regular effort along time, the project does not have the aim to eradicate IAS during its execution, but to bring common people to the management, leading to its involvement in invasion control after the end of the funding.

Key measures and relative costs

The project is totally focused on long term control of IAS, involving common people in the management of the problem. Promoting volunteering is the project's main goal, so the actions are designed to achieve this objective, using soft techniques of control like pulling or stripping, which means more time needed to obtain results.

There is a technical support team (composed by prisoners as a way to reintegrate them in the society) and the area is divided into plots, varying in size and characteristics. Some plots are under the responsibility of the field work team and other are assigned to volunteers. The work team main task is to prepare the areas prior to the volunteer intervention. They also step in by ring-barking acacias, with a continuous and daily work effort, in comparison to the volunteer work that is periodic. Regarding the management of IAS using volunteer work, it is important to state that this is the project's main pillar and foresees the plot adoptions by several schools, associations, NGO's, scouts, families, companies and retired citizens. It is expected that they work at least twice per year on their plots.

Results

The invasion area already intervened corresponds to 177,8 ha (59,8 ha for volunteering and 117,8 ha for the work team). The area of the work team is quite larger not only because they have a continuous and daily work effort, but also because their plots have a much disperse invasion. At the beginning of the project, the invasion area occupied 44,1 ha of *Acacia* sp. and 25,62 ha of *Carpobrotus edulis,* which was reduced to 29,42 ha of *Acacia* sp. and 3,85 ha of C. *edulis* by September 2016. The project also foresees the monitoring of the result of the IAS removal and the monitoring of the habitat recovery. Regarding the first one, two parameters have been evaluated: 1) amount of work done; 2) visible effect in acacias. 120 plots were monitored so far and 75 of them reached the maximum value for both parameters, meaning that the work done increased, revealing the effort of the volunteers, but also the real impact on the trees and a strong impact in the reduction of invasive species presence.

Lessons learnt

The project aims to use volunteering as the main tool to launch a participated management that can lead to the control of the invasion, some years from now, surely after the end of the EU financing support. By now, we consider that people understood the problem of the IAS itself, and they feel good in contributing to its resolution.

Sustainability of results

It is too early to assess the sustainability of results, but we think that it would be easy to maintain a proper level of management after the end of the project.

Some acacia trees after control action

LIFE15 GIE/SI/000770

LIFE ARTEMIS - Awareness Raising, Training and Measures on Invasive alien Species in forests

Duration From 01/07/2016 to 31/10/2020
Total budget €1,091,953.00 (EC co-financing 60%)
Website www.tujerodne-vrste.info
Coordinating beneficiary Slovenian Forestry Institute (Slovenia)
Other partners Institute of the Republic of Slovenia for Nature Conservation, Slovenia Forest Service, Institute Symbiosis (Slovenia)
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Target species

Our project focuses on IAS in forests. We have developed an Alert list, which covers those alien species that are not yet present in Slovenia or are present only locally but have already proven to be invasive in countries with similar climate conditions and therefore pose a high risk of invasion in Slovenia. Currently there are 83 species on Alert list (fungi – 12, plants – 51, insects – 13, mammals – 7). The list is available at http://tujerodne-vrste.info/en/alert-list/.

Background and aims

In Slovenia almost every forth inhabitant is a forest owner and many depend on timber and non-timber forest products. Further, Slovenian tourism is an important economic activity, which is successful also due to highly conserved natural environment. However, Slovenia lies in a high-traffic corridor, bordering 4 countries and with the access to the sea, which all causes more IAS to enter the country. After a severe natural disaster (sleet) in 2014 many forests were damaged which gives IAS more opportunities to spread. Slovenia has a high level of biodiversity, since more than third of the country's territory fall under Natura 2000. Project LIFE ARTEMIS aims at increasing awareness of the general public of threats caused by IAS in forests, establishing an efficient national institutional framework for early warning and rapid response for IAS in forests and improving the national capacity for early detection of IAS in forests by mobilising and training professionals and volunteers. As a support tool for EWRR framework a dedicated national information system for IAS will be developed to document and share information on alien species. Project LIFE ARTEMIS directly contributes to the implementation of the EU Regulation No. 1143/2014.

Key measures and relative costs

Project LIFE ARTEMIS addresses IAS problems with many activities: for the general public we established a national awareness raising campaign through which we will increase the knowledge on importance of prevention and early detection. We are developing an Early warning and rapid response system which will ensure early detection and rapid eradication of new IAS on a national level.
With the national information system that we have developed documentation and information on IAS are available for monitoring and control. Specific training of professionals and volunteers is currently taking place for the capacity building in EWRR system. Project LIFE ARTEMIS is focused on information, communication and awareness raising actions, therefore it is hard to identify costs for each achieved result.

Results

Awareness of the general public on IAS is increased by at least 20 % (comparing the results of the initial and final survey poll). At least 27,000 people participate in campaign events. At least 450 professionals and 350 volunteers are trained to participate in EWRR system. Around 30,000 data are recorded in national information system. At least 80 volunteers participate in mitigating IAS impacts in site-based actions. IAS are removed on at least 20 hectares in chosen protected area. At least 225 forest owners participate in campaign events dedicated to canker on maple trees. At least 50 % of the maples infected with canker are felled by forest owners. At least 100 experts from the whole Europe will participate at the final EWRR International Conference. Project LIFE ARTEMIS is in line with the EU biodiversity policy. It will indirectly contribute to the conservation of species and habitats, specifically in forests.

Sustainability of results

Continuation of the activities will be ensured by inclusion into the annual work programmes of the beneficiaries. Work programmes which present the basis for the state financing are adopted by the competent ministries. Additionally beneficiaries will strive to secure further project funding for building on the results of the project.

Recommendations

Slovenia is required to implement EU Regulation on IAS and within the project we will carefully monitor developments in the EU and nationally and make sure that the legislative developments are adequately taken into account in the implementation of the project. We take care that results, useful for the competent authorities, are regularly communicated and as much as possible made relevant for further development of the national IAS system.

References

Information system for collecting data on IAS: www.invazivke.si.

Educating foresters and volunteers about invasive alien species and early warning and rapid response system in Slovenian forests

LIFE10 NAT/SK/000083

PANNONICSK - Restoration of Endemic Pannonic Salt Marshes and Sand Dunes in Southern Slovakia

Duration	From 01/09/2011 to 30/06/2017
Total budget	€2,367,530.00 (EC co-financing 74.9%)
Website	www.daphne.sk/pannonicsk
Coordinating beneficiary	DAPHNE – Institute of Applied Ecology (Slovakia)
Other partners	State Nature Conservancy of Slovak Republic, BROZ (Slovakia)
Contact	Ms. Viera Stanová-Šefferová
e-mail	stanova@daphne.sk

Target species

Ailanthus altissima, *Robinia pseudoacacia*.

Background and aims

Danube Lowland salt marshes and sand dunes are very rare remnants of original and historically more widely distributed native habitats in intensively managed lowland agricultural landscape. They are endangered endemic habitats of the Pannonian biogeographical region, located at the northern edge of their distribution in Slovakia. The project aimed to improve and maintain a favorable conservation status of the habitats of the European importance, thus preserving the integrity and quality of the Natura 2000 network. Essential for the successful results was the introduction of regular and appropriate management, including traditional agriculture practices (mainly grazing), elimination of invasive plant species and preserving appropriate hydrological conditions at the targeted sites. Open sand dunes were forested by non-native invasive species as black locust (*Robinia pseudoacacia*) and affected by one of the worst invasive plant species in Europe, tree of heaven (*Ailanthus altissima*), which was introduced in Europe as ornamental tree. Sites with occurrence of pannonian sandy habitats (6260*, 6120* and 91N0*) have in Slovakia only scattered occurrence on the northern border of Pannonian region, and they are very rare for Slovakia. The Special Area of Conservation - SKUEV 0067 Cenkov. is the only locality in Slovakia for critically endangered sand dune plant species. The invasion of *Ailanthus altissima* is here very progressive, more methods of eradication were used unsuccessfully at locality before the project realisation. *Ailanthus altissima* is the species considered by the Act No.543/2002 Coll. on Nature and Landscape Protection and relevant executive regulation as invasive. *Robinia pseudoacacia*. invades all xerothermic habitats but it is not considered as invasive in Slovakia by the law. This species is officially used as forest wood in Slovakia and neighboring Hungary, so the system approach for eradication cannot be used, only ad hoc on localities of nature conservancy interest, where it destroys original habitats. More methods of eradication were tested in the project to select the most effective one.

Key measures and relative costs

We focused on obtaining information on the best and most effective ways to eliminate invasive species *Ailanthus altissima* and *Robinia pseudoacacia* from the literature or by contacting the experts who have practical experience. Some of the control methods suggested including foliar spray, basal bark application, cut-stump herbicide application, hack-and-squirt method, and mechanical control. One consideration when selecting a treatment method was to control the remarkable resprout ability of the tree of heaven. *A. altissima* can resprout up to 70% the original number of stems only 16 weeks after herbicide treatment. We have developed a methodology for habitat mapping, taking into account specifics of focused sand dune habitats. Within the frame of project, chemical eradication by the stem injection method was applied in an area of 60 ha on two forest stands regardless of their age. Furthermore 1,385 scattered fertile individuals were eradicated. *Ailanthus altissima* stands were monitored for injection effectiveness at 2 weeks after treatment: the stem injection method is effective in producing stem mortality in a short time. Field inspection was carried out also in mid-April 2016 and it was found that the success of the intervention in 2015 was 90%. Repeated treatment of sprouts over 2 cm was done within the same plots in the late summer 2016 to eliminate surviving individuals by the same chemical method. The area of eradication was expanded to an additional 3 adjacent forest stands in 2017, with an area of 63 ha using the same method and approach by contractor. Simultaneously, additional dispersed fertile individuals (2,000) of *Ailanthus altissima* within the overall enkov forest complex were treated by SNC project staff.

Biodiversity monitoring: in 2015, within forest stands with planned eradication, four monitoring plots 20x20 meters were established and marked. At each monitoring plot phytosociological relevé were recorded and individuals of the species *Ailanthus altissima* in individual thickness category were counted. Then management intervention took place. On June 2016 and 2017, monitoring was repeated. Intervention aimed at destroying the species *Ailanthus altissima* can be considered successful, all individuals with a thickness of more than 5 cm were destroyed. Young individuals with a thickness up to 5 cm were not sufficiently affected, but out of these only a few dozen individuals remain alive in the monitoring area. On all monitoring plots significant decrease of scrub layer was recorded due to the clearing of tree of heaven trees. The coverage of herb layer was increased on 3 from 4 monitoring plots. Unit costs: appx. €1,000 per ha. This orientation number is average for larger area where density of *Ailanthus altissima* individuals varied. Area of about 60 ha was treated during appx. one month, but the further application is necessary. Our experiences could be used for counting costs, when it could be recount number of fertile individuals treated, days used and cost spent. We have not done this recount, but if we do, it could also be used only as orientation number. As an example, one person is able to do about 100 injection per hour.

Results

The total area of proposed protected area Čenkov is 254.62 ha; current protected area is 123.6 ha. Non-selected eradication of *Ailanthus altissima* was realised in the biodiverzity core zone on total area of 123 ha. Furthermore 3,385 fertile individuals were eradicated at the whole project site. Stem injection method was applied for the eradication which involves herbicide containing glyphosate into the cambium layer of the tree by an injection was used in accordance with the Regulation of the Ministry of Environment No. 24/2003 Coll (this method was included in the regulation thanks to the project). We have focused on the most valuable areas from biodiversity point of view with occurrence of priority habitats and annex species. Habitat 91NO* is occurring at only one site in Slovakia, with total area of habitat distribution about 80 ha. *Colchicum arenarium* and *Iris humilis subsp*. arenaria are both annex species, occurring only on this site within Slovakia. This area is the only locality for the rare species *Ephedra distachya* and *Alkanna tinctoria*, which has here its northern border of distribution range. Suppression of the alien species and rehabilitation of the mosaic structure of open scrub or woodlands with open sand steppe grasslands was realised within implementation of this activity. Additionally, grazing by traditional Hungarian grey cattle bread was introduced on forest parts, where eradication of tree of heaven was realised. It is for the first time in Slovakia, when grazing was allowed in the forest. After the end of the project, SNC will ensure eradication of *Ailanthus altissima* sprouts on the enlarged area of 120 ha and this commitment will be included in After- LIFE conservation plan. The core area of enkov locality is now cleaned from *Ailanthus altissima* individuals, monitoring and next activities will be necessary. Effectiveness of used method (stem injection) is about 90%, which is satisfying. In the core area of enkov locality is locality of Pannonian sandy habitats (6260*, 6120*, 91N0*) and species *Colchicum arenarioum* and *Iris arenaria* - HD Annex II species.

Lessons learnt Very successful method of *Ailanthus altissima* and *Robinia pseudoacaia* eradication – stem injection with appx. 90% of effectivity. Using the local people for eradication of fertile individuals – the best economy, and local community better understand values of locality. Cooperation with forest company, which is essential and is not regular in Slovakia. Interest of researchers to evaluate the effectivity of eradication and long term monitoring of locality.

Sustainability of results

Sustainability of results has to be solved in close cooperation of State nature conservancy and forest company. By both it is the problem of financial sources, good message is, that tools used during the project can be used in future. In the case of invasive alien species it is not good strategy to limit using of EU money only once for the same locality, because eradication of invasive alien species is long term activity usually overarching the period usual for projects. In the case of Cenkov locality it is planned to continue with eradication of *Ailanthus altissima* in surrounding area in the scope of another LIFE project.

Recommendations

In Slovakia a comprehensive system of elimination of invasive species and its risk analysis are still missing.

References

Chrenková M. et al. 2014 Removal of Non-Native Invasive Tree Species from Sand Dune Habitats. Životné prostredie 48, 2: 88 – 92 (In Slovak with English summary). http://147.213.211.222/sites/default/files/2014_2_65_66_uvodnik.pdf

LIFE09 NAT/ES/000529

LIFE TRACHEMYS - Strategy and demonstration techniques for the eradication of invading turtles

Duration From 01/01/2011 to 30/12/2013
Total budget €1,200,754.00 (EC co-financing 50%)
Website lifetrachemys.jimdo.com
Coordinating beneficiary Generalitat Valenciana (Regional Government of the Valencian Community, Spain)
Other partners CIBIO (Portugal), Biological Park of Gaia (Portugal), Rías-Aldeia (Portugal)
Contact Mr. Ignacio Lacomba Andueza (Servicio de Vida Silvestre, Generalitat Valenciana)
e-mail lacomba_ign@gva.es

Target species

Mainly *Trachemys scripta*, although during the project up to 10 more species of exotic turtles were captured in the field.

Background and aims

In Mediterranean aquatic ecosystems, especially in coastal wetlands, American pond turtle (*Trachemys scripta elegans*) is probably a paradigmatic case of invasive species that causes the greatest impact. These turtles, massively sold as pets, have been frequently abandoned in nature and cause serious damage to native endangered species of tortoises (*Emys orbicularis and Mauremys leprosa*), by competition for food and by basking places and even for transmission of diseases. Targeted habitats are mainly natural eutrophic lakes (3150), coastal lagoons (1150), calcareous oligo-mesotrophic waters (3140) and calcareous fens (7210). Although the commercialization of this species has been banned in Valencia since 2004, well in advance in the European context, the huge wild population requires urgent control actions and design and testing of cost-effective trapping protocols.

Key measures and relative costs

The project created an alert network for the detection of the presence of exotic turtles, involving volunteers, environmental agents, nature parks staff, town halls officials, etc. We tested new methods to detect nests, using trained dogs and georadars, and more than 10 different traps to capture turtles, instructing volunteers in trapping and the project dissemination. Social awareness was developed with special education teams and material around the message: you should never abandon a pet in the wild. Cost of traps (€10-150) and effort required is given in the Handbook referenced below. Unit (individual removed) cost depends on population status: one person can capture > 100 ex./day in heavily infected areas, and it may require 10 traps during one week to capture a few individuals in incipient populations.

Results

During the 3 years project 22,923 exotic turtles were withdraw from the natural environment, both in Valencia and Portugal. More than 250 activities involving 13,000 people have been done, as well as 282 press articles, reports in newspapers and magazines, and project presence in mass media (TV and radio broadcast channels). Alongside with the eradication campaign of *Trachemys*, an effort was made to improve the conservation status of *Emys orbicularis*, through a captive breeding program and a protocol for reintroduction and reinforcement in coastal wetlands.

Lessons learnt

During the project we realized that the invasion was much greater than previous estimates, with some areas well beyond eradication possibilities. Nowadays in Valencia the problem with Trachemys relies more in a buoyant free-ranging population than in the trade and captivity. Under these circumstances, only long-term commitment of local volunteer teams is able to stop population growth, or even reduce numbers. Only in recently invaded wetlands with incipient populations eradication is feasible in the medium term. Under these circumstances and considering the great effort required, eradication has ecological and social justification only in areas designated for native turtle conservation. The ban in Trachemys trade has stimulated the offer of other species (mainly *Graptemys* and *Pseudemys*) whose invasive potential has not been evaluated yet.

Sustainability of results

One of the main achievements of the project has been the involvement of local volunteer teams. Their long-term commitment is essential to maintain pressure over invaders, considering the limited public resources in charge of a growing number of IAS.

Recommendations

After evaluation of control methods and impact on populations, a new strategy against *Trachemys* is being considered, inside a revision of the Valencian strategy against IAS. Clearly, many invaders are completely impossible to eradicate at a regional level, so we must concentrate efforts in those areas recently invaded or in habitats that host vulnerable native species clearly outcompeted by exotics. In the rest of the territory we have to learn to live alongside these new species, but considering mitigation measures.

References

Hand book for control and eradication of invasive turtles (in Spanish):
www.agroambient.gva.es/documents/91061501/161549814/Manual+para+el+Control+y+Erradicaci%C3%B3n+de+gal%C3%A1pagos+invasores/af90059e-5137-42f1-aabb-6a26dd699d17.

Trapping of *Trachemys scripta*

LIFE09 NAT/ES/000534

Life Posidonia Andalucia - Conservation of *Posidonia oceanica* meadows in Andalusian Mediterranean Sea

Duration From 31/12/2013 to 30/11/2016
Total budget €3,562,125.00 (EC co-financing 69.68%)
Website www.lifeposidoniandalucia.es
Coordinating beneficiary Consejería de Medio Ambiemte y Ordenación del Territorio - Junta de Andalucía (Spain)
Other partners Ministerio de Medio Ambiente, Rural y del Medio Marino, Unión Internacional para la Conservación de la Naturaleza, Conservación, Información y Estudios sobre Cetáceos, Federación Andaluza de Cofradías de Pescadores, Federación Andaluza de Asociaciones Pesqueras, Consejería de Agricultura y Pesca (Spain)
Contact Ms. Rosa María Mendoza (Consejería de Medio Ambiemte y Ordenación del Territorio - Junta de Andalucía)
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Target species

Caulerpa cylindracea.

Background and aims

The main objective of the project was to study and conserve Andalusian marine biodiversity by applying protection measures in one of the eastern Mediterranean's most mature and speciesrich ecosystems, the *Posidonia oceanica* meadows (priority habitat 1120*: Posidonia beds). The project area included eight marine SCIs in Andalucía with well represented *P. oceanica* habitats. The project aimed to identify, diagnose and mitigate the main threats to the ecosystem and its associated habitats (pollution, boat anchoring, uncontrolled trawling and traditional local fishing, the expansion of IAS), thus guaranteeing the conservation of the species in appendix II of the Habitats Directive and of the priority species of the Birds Directive, to design a Management Plan for those natural areas in Andalusia. This document will allow to plan a regulatory framework over time and in the future which will guarantee conservation and sustainable use of those areas and of the related species. The first records of *C. cylindracea* in Andalusia were in 2008, probably expanded from Murcia (a region closed to Andalusia in the north) following a familiar expansion pattern for this species (with distance of 40-50 km between new records).

Key measures and relative costs

1. Early detection of marine IAS network in the project area (2011- 2013).
2. Control: eradication of the patches detected during the early detection, if the invasion was in a very early stage only.
3. Monitoring and surveillance: monitoring the behavior of *C. cylindracea* in three control stations in the project area (2011-2013).
4. Prevention: the most vulnerable areas to invasions were identified in the eight SCIs included in the project, thus making it possible to optimize the preventative measures to be performed by the Authorities
5. Update the map of the presence of IAS in the eight SCIs to have the most accurate information to be included in the Management Plans. Budget: €114,330.20.

Results

1. Early detection: the project has detected new records of Caulerpa racemosa in the study area and within a wide bathymetric range (-2/-30 m).
2. Control and eradication: during the project, tow eradication experience were developed. The first one, in a 4 m^2 patch of C. cylindracea found in the "early detection" phase. The second one, in 2 m^2 patch in the same Marine Protected Area. In both cases, during the later monitoring works, the species reinvaded the treated area.
3. Monitoring and surveillance: the results show a high variability in the behavior of this invasive species. In the first year of the study, there was a regression in the limits of the patches (-20 cm/limit); on the other hand, in the second and in the third years, there was a clear expansion of the patches (+46 cm/limit).
4. Prevention: the most vulnerable areas to invasions were identified, including the results in the Management Plans of the eight Natura 2000 networks areas included in the project.

Lessons learnt

In relation to marine IAS, when the invasive species is in the area (even in an incipient scenario) data show that controlling their expansion and dispersion is rather impossible. The efforts directed to the transferability of the experience, should be invested to prevent the invasion of new IAS in any area of study. Citizen science could be an useful tool for early detection. The beneficiaries gained a very positive experience in monitoring Posidonia oceanica habitat and had good collaboration with volunteers in detection of IAS in others areas of Andalucía.

Sustainability of results

The government of Junta de Andalucía makes a continuous effort in detection of marine IAS, including the implementation of IAS database. In 2016, the database contained 717 records of IAS in Andalucía, including 16 different exotic species. The regional government of Andalucía shares this IAS information with the National government for the correct implementation of Marine Strategy Framework Directive (MSFD). Moreover, beneficiaries information is crucial for the management of Marine Protected Areas. The collected information on IAS is important to develop strategies to avoid the degradation of some important habitats (e.g. 1120). We think that investing money in marine IAS eradication is not a feasible objective. Now, our resources come from the government's budget (Junta de Andalucía) but we think that good alternatives could be the European Maritime and Fisheries Fund (EMFF) or the LIFE Programme for the implementation of Prioritised Action Framework (PAF) for Natura 2000.

Recommendations

When the IAS is already present in the area (even if there are few individuals only or the species is scarcely represented), the results show that it is impossible to control its expansion. The efforts should be directed to prevent the diffusion of news IAS in the areas. We recommend to work with neighboring countries and regions, to share information, to develop best practices protocols and to invest in new technologies, mainly in the following sectors: transport (ballast water) and aquaculture (pathogens associated).

***Caulerpa cylindracea* in Isla terreros (SPAMI and SPA Levante almeriense), Almería - Spain**

LIFE10 NAT/ES/000565

LAMPROPELTIS - Control of the invasive alien species *Lampropeltis getula californiae* on the island of Gran Canaria

Duration From 01/09/2011 to 31/08/2015
Total budget €1,025,863.00 (EC co-financing 50%)
Website www.lifelampropeltis.com
Coordinating beneficiary Gestión y Planeamiento Territorial y Medioambiental, S.A. (Gesplan) (Canarias, Spain)
Other partners Dirección General de Protección de La Naturaleza del Gobierno de Canarias; Cabildo de Gran Canaria (Canarias, Spain)
Contact Mr. Ramón Gallo Barneto (Gesplan)
e-mail e-mail: rgalbar@gesplan.es

Target species

Lampropeltis californiae. Sinonim: *Lampropeltis getula californiae*.

Background and aims

The project is located on the island of Gran Canaria (1560 Km^2). Snakes are not part of the native fauna of the Canary Islands. The origin of the California kingsnake is in the southwestern United States and northwestern Mexico. Home breeding is significantly related to the introduction and spreading of this species in Gran Canaria, as a result of the accidental or deliberate release of individuals. The California kingsnake was first detected in 1998, in Barranco Real de Telde (La Solana) in the east of Gran Canaria. Currently there are three distribution areas: the primary distribution area (PDA), between La Solana (Telde) and San Roque (Valsequillo), the secondary distribution area (SDA), in the north-west of Gran Canaria (Gáldar), and the third area has been confirmed in the south of the island, in Montaña La Data (TDA). In 2016, the area covered by these three populations using the convex hull method totalled 107,58 sq.km (PDA: 75,79 sq.km; SDA: 27.05 sq.km; TDA 4,74 sq.km). The main objective of this Project is to reduce the density and abundance of the California kingsnake, *Lampropeltis californiae*, on Gran Canaria Island. The ultimate goal is to minimize their impact on the island's biodiversity, particularly on the species they mainly prey on, such as *Gallotia stehlini*, *Chalcides sexlineatus*, both exclusive species of Gran *Canaria*, and *Tarentola boetgeri*.

Key measures and relative costs

The implementation of the Early Warning System, E.W.S., (€244,540) has brought the project team closer to the affected community. It also provides up-to-date information on how the kingsnake distribution evolves in places where the project team cannot reach or is not present. Taking the citizens as a reference point, we have established five different communication channels: the technical field team providing immediate response, CECOPIN (Forest Fire Prevention Centre), 1-1-2 (emergency phone number), police forces, SEPRONA, and LAMPROPELTIS Project website and mobile app. Another important aspect of the project was the growing effectiveness of the trap systems (€131,368).

Results – From the beginning of the project to the present 5,021 snakes have been captured, the 52% (2,587) of the captures were able thanks to the Early Warning System, in comparison with the 38% of 2011. That year the percentage of captures with the different methods of traps was a 6%, in 2015 it reached its maximum with a 23%. An analysis of the risks of vertebrates, the *Handbook of Risk Assessments posed by Trading in Alien Vertebrate Species* has been drawn up under the auspices of this project. This is a very important publication which has been written as a tool for public administrations to evaluate the risks of establishment or infestations by alien species as a result of trading in them. This handbook sets a value for each individual species, determining their invasion and infestation risk, as well as their risk to public health. In 2015, a best practice handbook has been written that includes the feeding requirements, hygiene, handling and lighting conditions for the welfare of different alien species. It also addresses the necessary conditions for their safe keeping in captivity to avoid escapes to the natural environment. The project impact in terms of media resonance has been reflected in over 110 news articles, over 15 radio and TV interviews, both regional and nation-wide. By the end of the LIFE project, 28 professional contacts have been established from all over the world: United States, Sweden, Hungary, Australia, Denmark, Portugal, Italia, etc. It has also been possible to contact professionals from Spain who have similar problems or concerns in Ibiza, Valencia and Extremadura, among others.

Lessons learnt

The creation of an Early Warning System of invasive species for an undefined time should be a priority for the public administrations, as the best strategy to avoid the implementation of the invasive species is the prevention and a quick response at the initial moments. The participation, awareness and implication of the local population is essential for the success of the system and the fight against invasive species in general. The inclusion of smartphones applications and 1-1-2 emergency phone number should be a priority action to guarantee its effectivity. Sharing experiences with other similar projects and promote investigation to increase the effectiveness of control methods are also essential elements. In the islands, where the biodiversity is more susceptible to the impact of invasive species, involved administrations coordination is a priority, specially the ones in charge of the control of the transport between the islands and mainland.

Sustainability of results

Recently, the E.W.S. of the LIFE project has been used as a base for a regional detection system as part of a pilot project of the Canary Islands Government. The affection of the California kingsnake in Gran Canaria, with the social alarm generated by the presence of opossums facilitates the involvement of the administrations in the fight against the species and maintenance of the control actions. This snake species is used as a pet in many countries of the world, but it has only naturalized in Gran Canaria. This makes the human factor as fundamental to avoid the invasion of this species and the environmental awareness and volunteering indispensable. Though there was no economic direct entry in the Post-LIFE for the dissemination, for the past few years workshops have been held in schools, financed by the Ministry of Education of the Canary Islands Government.

Recommendations

There is a need for a specific legislation in the Canary Islands for the regulation of exotic invasive species and the inclusion of the list of potentially invasive species mentioned in the *Handbook of Risk Assessments posed by Trading in Alien Vertebrate Species*. In other aspects, it is necessary to regulate the euthanasia techniques. Additionally, the restrictions from its cataloging as an exotic invasive species should be accompanied by an increase of the controls in ports and airports. In invasive there should be a clear bet in R+D to allow finding innovative solutions in the capture techniques of the different species and particularly of the California kingsnake.

References

Protocols for snake capturing and data gathering: www.lifelampropeltis.es/images/pdf/A1_2013.pdf.
Handbook of Risk Assessments posed by Trading in Alien Vertebrate Species: www.lifelampropeltis.es/images/pdf/C7%20Manual%20riesgos%20vertebrados%20exoticos.pdf.

California Kingsnake. Striped morph
Author: Jorge Saavedra Bolaños

LIFE12 NAT/ES/001091

LIFE Potamo Fauna - Conservation of river fauna of Community interest in the Natura 2000 network sites of the Ter, Fluvià and Muga river basins

Duration From 01/01/2014 to 31/12/2017
Total budget €900,262.00 (EC co-financing 50%)
Website www.lifepotamofauna.org
Coordinating beneficiary Consorci de l'Estany (Spain)
Other partners Amics de la Tortuga de l'Albera, Consorci del Ter, Forestal Catalana SA, Departament de Territori i Sostenibilitat (Generalitat de Catalunya), Universidad del País Basco – Euskal Herriko Unibertsitatea (Spain)
Contact Mr. Miquel Campos (Consorci de l'Estany)
e-mail mcampos@consorcidelestany.org

Target species

Fish: *Micropterus salmoides*, *Lepomis gibbosus*, *Cyprinus carpio*, *Perca fluviatilis*, *Sander lucioperca*, and other exotic fish. Reptiles: *Trachemys scripta scripta*, *Trachemys sc elegans*, *Graptemys pseudogeographica*, *Pseudemys concinna*, and other exotic terrapins. Crustaceans: *Procambarus clarkii*, *Pacifastacus leniusculus* and *Orconectes limosus*. Indirect actions with many other invasive species of aquatic fauna, for instance *Dreissena polymorpha*.

Background and aims

The overall objective of LIFE Potamo Fauna is the conservation of 12 endangered native species of aquatic fauna, through a wide range of measures: captive breeding, population reinforcements, habitat improvement, control of invasive alien species (IAS), public dissemination and research. Among the planned actions, one of the main lines is the fight against several alien species of crayfish, fish, and freshwater mollusks, through a battery of different actions: population control, experiments against aphanomycosis, prevention, etc. Invasion by alien species is nowadays the main vector of native imperilment and habitats change in Mediterranean freshwater systems.

Key measures and relative costs

Although the project has invested some resources on prevention, mainly on species still not present in the project area, it has focused its main strategy on direct actions over IAS only on some localities. Overall foreseen costs in the project related to IAS are: €110,418, fight against exotic crayfish expansion and protection against afanomicosis of native crayfish; €26,539, intensive control of exotic terrapins in Ter River and Banyoles lake; €65,250, intensive control of exotic fish in Banyoles lake; €36,050, prevention of zebra mussel penetration in Banyoles lake; €18,708; general informative campaign over problem of IAS on freshwater systems.

Results

Alien terrapins: near 450 individuals of exotic aquatic turtles have been removed. In Banyoles, the reduction of the initial stock has been at least of 95%. Alien fish: in Banyoles Lake, near 180,000 fish of alien species captured until this moment. For *Micropterus salmoides*, initially, was achieved a reduction of more than 90% (only fraction above 40 cm). In the case of *Cyprinus carpio*, this initial reduction was of more than 80%. Alien crayfish: results are still under elaboration. The planned local eradication of a recently established IAS in the area, *Orconectes limosus*, has failed. Zebra mussel: in Banyoles Lake, the new disinfection station of boats is now operative.

Lessons learnt

Alien terrapins: in certain confined water bodies results with a relatively small but sustained capture effort can report high proportion of reduction of initial stocks, and long term sustainability of these results is not expensive. Alien fish: the big experience of a general operation to reduce alien fish density in a low land lake has reported partially successful results. One of the main results is not only the stock reduction of several IAS, but also the improvement of general know-how to face locally this huge problem. Alien crayfish: efforts have been allocated on the contention of the IAS expansion to protect last remaining populations of native crayfish. Big success in the identification of some native crayfish populations resistant to aphanomicosis pest was achieved. Zebra mussel: the new mobile disinfection station could be of high interest for other sites that should face urgently this risk.

Sustainability of results

Founding for the continuation of IAS management should come from national, regional and local public administrations which have the responsibility of natural heritage conservation. In fact, these administrations allocate regular financing to this issue, although those funds are still not sufficient. Moreover, more effective measures against IAS, and/or actions focused on most imperilled ecosystems, habitats or species should be prioritized.

Recommendations

There's a lack of an effective administrative frame and legal rules to face up this complex, increasing and huge problem. Most managers are nowadays completely overwhelmed by it, leading to wrong actions, or even to inaction. Prevention should be the first and most important strategy. Much more could be done to expand the public awareness around this problematic. There is still a narrow know-how to affront the management of either incipient invaders or widespread alien species. Therefore, applied research and experimental management should be a priority, too.

Some captures of perch (*Perca fluviatilis*) in the context of the fish control operations in Banyoles Lake

LIFE13 NAT/ES/000586

LIFE CONHABIT ANDALUCÍA - Preservation and improvement in priority habits on the Andalusian coast

Duration From 01/06/2014 to 01/06/2019
Total budget €2,654,268.00 (EC co-financing 60%)
Website www. lifeconhabitandalucia.es
Coordinating beneficiary Consejería de Medio Ambiemte y Ordenación del Territorio (Spain)
Other partners Agencia de Medio Ambiente y Agua de Andalucía (Spain)
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Target species

Oenothera drummondii, *Opuntia dillenii*, *Agave sisalana*, *Agave americana*, *Acacia saligna*, *Arundo donax*.

Background and aims

The overall objective of this project is to promote the improvement and conservation of priority habitats in SCIs in Andalusian coast (southern Spain), implementing Directive 92/43/CEE. The main actions are: 1) Restoration and management of different habitats, to meet the urgent needs of conservation derived from not ordained public use, waste, expansion of invasive exotic species, habitat fragmentation, sylvicultural work, forest fires. 2) Strengthen the role of society in the conservation of the coastal habitats through actions of raising social awareness.

Key measures and relative costs

Oenothera drummondii (Onagraceae): the project initially aimed at controlling the invasion at full scale. Given the environmental and social constraints of herbicide-based control, the initial strategy was considered unfeasible and was redefined towards containing the invading population by manual removal. Also, revegetation with native psammophilous plants was developed. Theoretical cost of the herbicide approach: €162,000/year; cost of plantation: €8,800; cost of the manualremoval approach: €15,600/treatment (four treatments per year are required).

Opuntia dillenii (Cactaceae): the project aimed at controlling its invasion. Cost of the mechanical removal: ca.€22,500. *Agave sisalana* (Agavaceae): the project aimed at controlling its invasion in sensitive habitats. The social opposition raised during the initial stages of the project led to develop an awareness campaign based on local meetings with different stakeholders and with the use of social networks (Facebook, Twitter and the project website). Cost of the mechanical removal: ca. €20,000. *Agave americana* (Agavaceae), Acacia saligna (Mimosaceae) and Arundo donax (Poaceae): the project aimed at controlling their invasion. The cost of controlling them along 200 m was ca. €5,000.

Results

Oenothera drummondii: 1) the minimum effective dose of herbicide was calculated (20 g gliphosate/litre); 2) the current degree of invasion was estimated (123 ha); 3) environmental and social constraints of herbicide-based control were assessed; 4) cost assessment for herbicide application at full scale was implemented (€1,317/ha/year); 5) Manual removal of 30 ha was carried out.
Opuntia dillenii and *Agave sisalana*: mechanical removal was carried out.
Agave americana: combination of mechanical removal and cover with geotextiles to prevent resprout development.
Acacia saligna and *Arundo donax*: combination of mechanical removal and selective application of herbicide to prevent resprout development.

Lessons learnt – *Oenothera drummondi*i: the experience highlights the difficulties and constraints of controlling advanced stages of invasions.
Opuntia dillenii: the methodology applied is highly effective. Annual monitoring allow an effective control of resprouts.
Agave sisalana: IAS can have a positive perception for local people. Awareness campaigns should be developed before, during and after the action. Loss of identity of native habitats and native plants can happen even for recent invasions (1940-1950).
Agave americana: the methodology applied is highly effective. Annual monitoring allow an effective control of resprouts.
Acacia saligna: one single application of herbicide is not enough for an effective control. Resprouts raise frequently. Monitoring every 6-12 months is recommended.
Arundo donax: geotextile cover of cut stems may be effective to control resprouts only if a double-layer is installed and covers more surface than the invaded area.

Sustainability of results

Oenothera drummondii: given the ability of this species to early produce flowers and fruits, manual removal will be effective if applied at a high frequency. The use of herbicides is not feasible within a protected area for large invasions (over 100 ha invaded). *Opuntia dillenii*: initial mechanical control followed by an annual monitoring (to remove small resprouts) is highly effective. The natural habitat revealed a positive recruitment of native plants in gaps created after removal of *O. dillenii*.
Agave sisalana: the frequency need for controlling resprouts is still unclear (the planned monitoring will shed some light on this knowledge gap).
Agave americana: mechanical removal is an effective method for removing this species.

Recommendations

In the particular case of *O. drummondii*, alternative methods should be explored. In the case of *Agave sisalana*, the loss of identity of natural structure and species composition of native ecosystems recommends to develop awareness campaigns not only during the course of the project but also prior to actions.

Fixed coastal dunes with herbaceous vegetation ("grey dunes") invaded by* Oenothera drummondii *(Onagraceae). Huelva, Spain

LIFE13 NAT/ES/000899

LIFE Miera - Biodiversity conservation in river Miera

Duration From 01/07/2014 to 31/12/2018
Total budget €1,650,105.00 (EC co-financing 50%)
Website www.lifemiera.org
Coordinating beneficiary Fundación Naturaleza y Hombre (Spain)
Other partners Consejería de Universidades e Investigación, Medio Ambiente y Política Social of Cantabrian Government and Spain MARE (Spain)
Contact Mr. Carlos Sánchez Martínez (Fundación Naturaleza y Hombre)
e-mail e-mail: fundacion@fnyh.org

Target species

Baccharis halimifolia, *Cortaderia selloana*, *Robinia pseudoacacia*, *Oenothera biennis*.

Background and aims

This project aims to improve the overall condition and surface of natural habitats and population status of the species of conservation interest in the Miera River basin. The project will take place along Natura 2000 areas of its course, from its headwaters (SCIs Montaña Oriental and Montes de Valnera), through its middle (SAC Río Miera) to its mouth (SAC Dunas del Puntal y Estuario del Miera).
Invasive alien species are predominantly present in Miera river mouth, affecting estuary habitats (1330 and 1410), dune ecosystems (2120 and 2130) and coastal heathland habitat (4040). Gardening is responsible of the arrival of these alien species. They are also present around Natura 2000 sites and they use antropic paths such as railway and freeway borders or places where traditional land uses have been abandoned. *Baccharis halimifolia* and *Cortaderia selloana* are displacing indigenous riverbank species, *B. halimifolia* specially affects estuary riverbank where salinity is higher. Places affected with IAS in Miera Basin and coastal ecosystems are economically damaged as no other natural use is possible and much money is invested to contain them and avoid spreading.

Key measures and relative costs

Elimination of IAS has been done using regional official protocols, which include concentrated and pulverized glyphosate. For *Baccharis halimifolia*, firstly 40% of the branches are cleared with a chainsaw, secondly a cut is done on the tree bark to let the tree sap flow, and then highly concentrated glyphosate is applied into the tree bark cut with a cotton gauze fixed with cellophane to avoid any pollution. This procedure is applied on each branch. The project efforts are not only focused on eradication but also on early detection, public awareness, environmental education and monitoring of the treated areas. As the procedure to treat *Baccharis halimifolia* is very laborious and the species is really spread and implanted in the territory, the costs of elimination are high.

Results

Expected results: 10 ha of the Santa Marina Island where *Baccharis halimifolia* and *Cortaderia selloana* are going to be eradicated. 2,000 specimen of *Erica vagans* heath planted on Santa Marina Island to restore 4040 Natura 2000 habitat. 4 ha of Cubas Estuary where *Baccharis halimifolia* and *Cortaderia selloana* are being removed. 5,000 leaflets distributed among local population about how to recognize and eradicate the six most dangerous IAS in the Miera basin. Five workshops about ecological gardening to avoid IAS imparted to local population. 10 ha of El Puntal Dunes (white and grey dunes) where *Baccharis halimifolia*, *Robinia pseudocacia* and *Cortaderia selloana* are being removed.

Lessons learnt

It is really important to fight IAS in a coordinated way, both in the administrative and in the territorial approaches. Coordinated eradication actions can be much more effective than atomized ones. Coordination would be also necessary in early warning monitoring. As there are already many places where IAS are present to focus on monitoring the ecologically most important sites could be interesting in order to limit damages and biodiversity loss in these sites. It is also important to work on improving existing protocols of elimination of IAS.

Sustainability of results

The fact that this project is carried out in an aquatic area, such as a river basin where territorial connectivity is complete, limits the success of the operations of elimination of IAS. The possibility of seeds dispersion through the river is elevated. That is the main reason to think that the solution should involve the whole territory and all the administrative figures fighting at the same time. Cantabria Regional Government has just approved its Management and Control IAS Strategic Plan, focused on 125 flora and 16 fauna species. 2,4 Million Euros will be invested every year to control the main species.

Recommendations

New lines of research on fighting IAS are really important as glyphosate has been used habitually and its utilization is very discussed beyond European Commission, ecologists groups and other stakeholders.

Santa Marina Island, Cantabria. *Baccharis halimifolia* and *Cortaderia selloana*a during elimination process

LIFE13 NAT/ES/001210

LIFE LimnoPirineus - Restoration of lentic habitats and aquatic species of Community interest in high mountains of the Pyrenees

Duration From 01/06/2014 to 31/05/2019
Total budget €2,619,047.00 (EC co-financing 55.13%)
Website www.lifelimnopirineus.eu
Coordinating beneficiary Agencia Estatal Consejo Superior de Investigaciones Científicas (Spain)
Other partners Conselh Generau d'Aran, Forestal Catalana, S. A., Generalitat de Catalunya, Sorelló Estudis al Medi Aquàtic S.L., Universitat de Barcelona (Spain)
Contact Mr. Marc Ventura (Centre d'Estudis Avançats de Blanes)
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Target species

Phoxinus sp., *Salmo trutta*, *Oncorhynchus mykiss*, *Salvelinus fontinalis*.

Background and aims

LimnoPirineus project is aimed at improving the conservation status of species and aquatic habitats of European interest in the high mountains of the Pyrenees. High mountain lakes are originally fishless due to natural barriers that have prevented the natural colonisation of fish species from lower streams. However, mainly during the last centuries, there has been a global process of fish introduction leading to the present situation: several lakes with introduced fishes. Introduced fishes become the top predators of these ecosystems leading to profound ecological changes. Predation on native fauna can lead to the elimination of amphibian and reptile species, to changes in zooplankton and benthic macroinvertebrate species composition and size structure, to alteration of ecosystem processes such as nutrient cycling and to indirect effects through resource depletion. Fish introductions are, therefore, a threat for the conservation of high mountain lake biodiversity in general and in particular for the most conspicuous animal groups. Introduced fishes in these habitats affect both the conservation status (EC Habitats Directive), but also in the case of *Phoxinus* sp. the water quality of the habitat (Water Framework Directive).

Key measures and relative costs

Eradication and control of the three salmonid species and one cyprinid (*Phoxinus* sp.). The expected cost for the actions related with IAS eradication and control amounts to €1,026,717 which is €128,340 per lake or €54,589 per ha of lake. At the end of the project it will be possible to estimate the cost per individual and it should be possible to provide new adjusted budgets on the basis of the operative experience and the results of our project.

Results

Expected results: complete eradication of salmonids in all lakes where they are present (five), complete eradication of *Phoxinus* sp. in two lakes and reduction and control of *Phoxinus* sp. in three more lakes. At present the eradication is almost concluded in one salmonid lake and in two *Phoxinus* sp. lakes, and close to a complete eradication in the rest. Current progress already assures favourable conservation of species and habitats and the improvement of the ecological status.

Lessons learnt

The project represents the first attempt to eradicate *Phoxinus* sp. from a high mountain lake. So far we have acquired an excellent knowledge on eradication techniques and the IAS ecology in these environments that was previously unknown. The project has served to warn stakeholders and the general public on the problematic of IAS in high mountain lakes. Both projects LIFE LimnoPirineus and LIFE BIOAQUAE organised an international workshop for exchanging methodologies for fish eradication in high mountain lakes and knowledge on their effects and dissemination to different stakeholders. At present other countries are considering eradication of fish, including *Phoxinus* sp. thanks to the knowledge gained in the project.

Sustainability of results

All lakes where eradication is concluded, will have complete sustainability of the results. Remaining lakes will need a periodic control that will be carried out by local authorities.

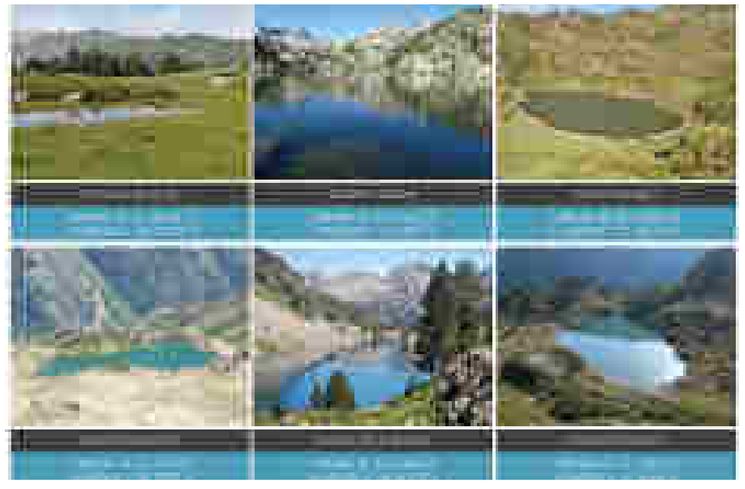
Recommendations

The spread of IAS in high mountain lakes needs urgent prevention measures, such as prohibition of live bait fishing that has been the responsible of *Phoxinus* sp. introduction in these lakes. These require international cooperation since high mountain areas, such as the Pyrenees, cover different countries. Potentially useful techniques for IAS eradication, such as the use of respiration inhibition chemicals that are being used in other zones of the world, are not allowed to be used within the EU due to the lack of adequate regulations. These techniques for IAS eradication have a huge gap of knowledge for being used routinely in eradication projects. The criteria for including IAS should include habitat types and not only the country of precedence of the IAS. For example, some IAS in high mountain lakes, such as *Salmo trutta*, are native of some mountain streams in Spain and France and, therefore, they are not included in the national lists of invasive species. However, these species are IAS in high mountain lakes. This makes it difficult to implement the Habitats Directive in these types of habitats.

References:

Miró A., Ventura M., 2013. Historical use, fishing management and lake characteristics explain the presence of non-native trout in Pyrenean lakes: Implications for conservation. Biological Conservation, 167, 17-24.
Miró A., Ventura M., 2015. Evidence of exotic trout mediated minnow invasion in Pyrenean high mountain lakes. Biological Invasions, 17, 791-803.
Ventura M. *et al.*, 2017. Why should we preserve fishless high mountain lakes? In: High mountain conservation in a changing world (eds. Catalan J, Ninot J, Aniz M), pp. 181-205. Springer-Verlag. (https://link.springer.com/chapter/10.1007/978-3-319-55982-7_8).

LIFE LimnoPirineus focuses, among other actions, on the eradication of non-native fish from eight high mountain lakes of the Pyrenees



LIFE14 NAT/ES/001213

CONVIVE-LIFE - Integration of human activities in the conservation objectives of the Natura 2000 Network in the littoral of Cantabria

Duration From 20/10/2015 to 20/10/2019
Total budget €1,325,680.00 (EC co-financing 60%)
Website www.convivelife.es
Coordinating beneficiary Fundación Instituto de Hidráulica Ambiental de Cantabria - FIHAC (Spain)
Other partners Ayuntamiento de Arnuero; Consejería de Ganadería, Pesca y Desarrollo Rural del Gobierno de Cantabria; Constructora de Obras Públicas San Emeterio S.A.; Sociedad Española de Ornitología; Aves Cantábricas S.L. (Spain)

Contact Mr. José A. Juanes de la Peña
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Target species

Baccharis halimifolia.

Background and aims

The project is being developed in four estuaries of two littoral SAC in Cantabria (northern Spain), where there are different anthropogenical uses (e.g. cultural-educational, tourism, aquiculture activities). Similar to other estuaries in the EU, one of the main risks in those study sites is the hidromorphological alteration due to dikes for agroforestry, aquiculture and tidal mills. The resultant changes in tidal inundation regimen and sedimentary characteristics favour the spread of the IAS *Baccharis halimifolia*, a non-negligible pressure for the preservation of estuarine biodiversity. *B. halimifolia* is a deciduous scrub adapted to succession pioneer stages that is invading large areas of upper salt marshes. In the Cantabrian estuaries, *B. halimifolia* is growing over salt meadows and halophilous scrubs, replacing the EU habitats of Atlantic salt meadows (1330) and Mediterranean and thermo-Atlantic halophilous scrubs (1420).

Key measures and relative costs

The main approach used to address the IAS problem in the project is the containment of *B. halimifolia* through the elimination of plants prior their flowering. Another complementary approach is the prevention through educational actions, such as environmental workshops for students and a training workshop for the elimination of *B. halimifolia*. Nowadays, the complete eradication of this IAS seems to be not possible in Cantabria. The total cost of the action directly related to the elimination and containment of the IAS is €147,241, with an estimated unit cost of 4,451€/ha. To this amount it must be added the cost of the training workshop (about€5,000).

Results

The IAS elimination actions have just started, therefore results are not yet available. However, the expected results are the elimination of a total surface of 27 ha of *B. halimifolia* in four estuaries along the Cantabrian Region (Tina Menor, Oyambre, Joyel and Victoria). The removal of the IAS will lead to the improvement of the conservation status of two different habitats (1330 and 1420), which nowadays present an unfavorable status in the Region. These habitats share the same ecological niche of the IAS, so the elimination of *B. halimifolia* will allow the habitats expansion in the released areas. Furthermore, the habitat 1150 (coastal lagoons) will improve its conservation status by the elimination of a pressure that compromises its favorable status through the vulnerability of its vegetal communities. In terms of the Water Framework Directive, the presence of an IAS negatively affects the biological status of the transitional water bodies, challenging the status of their angiosperm communities. So, the remotion of *B. halimifolia* will improve the biological status of the four transitional water bodies.

Lessons learnt

There is no doubt that fighting against alien species is a great challenge for public administrations. In Cantabria (Spain) we have the advantage of sensitive population against this problem when they are well informed and this facilitates the actions. However, in the case of *B. halimifolia*, there is a technical problem with its treatment. From public administrations we have proved the systemic herbicide treatment efficiency with high rate of translocation (in particular products with glyphosate formula) equally in foliage application as by means of bandage use or simply painting over the recently cut stump. Nevertheless, presently it exists a strong social pressure against the use of this product which has been included in the possible carcinogenic capacity products list of the World Health Organization. Because of this reality, it is under preparation a new treatment method based in the high concentrations application of salt through bandage in old specimens of *B. halimifolia* and foliage spraying in the earliest stages of germination. Results of these experiments will be achieved by 2018. Meanwhile, to stop the advance of this species, we are treating specimens with sealed herbicide bandages to avoid chemical product to extend to the environment.

Sustainability of results

The expected results are related with the control of the *B. halimifolia* distribution, but not with its eradication. Thus, it will be necessary to continue with future actions that would allow to control the expansion of the IAS and, perhaps, its future eradication.

Recommendations

Early detection of alien species is very important. It is needed to keep fighting this IAS every year to control its status.

Cut down of *Baccharis halimifolia* in the estuary of Tina Menor

LIFE14/NAT/ES/000699

LIFE Anillo Verde - LIFE Green Belt of Bay of Santander

Duration From 01/10/2015 to 30/09/2019
Total budget €2,568,132.00 (EC co-financing 60%)
Website www.lifeanilloverde.org
Coordinating beneficiary Fundación Naturaleza y Hombre (Spain)
Other partners MARE (Spain)
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e-mail fundacion@fny.org

Target species

Cortaderia selloana, *Baccharis halimifolia*, *Carpobrotus edulis*, *Cotula coronipifolia*, *Fallopia japonica*, *Eucalyptus globulus*, *Robinia pseudoacacia*, *Trachemys scripta*, *Procambarus clarkii*, *Micropterus salmoides*, *Azolla filiculoides*, *Ludwigia peploides* and *Vespa velutina*.

Background and aims

Santander's Bay is the most populated area of Cantabria. However, it has some natural areas of high ecological value, surrounded by urban infrastructures and communication lines. These areas form the embryo of Green Belt of Bay of Santander. The project works in six major types of habitats: coastal wetlands, inner wetlands, relict Cantabrian Holm oak forests, dune systems, gallery forests and agrosilvopastoral systems. The urban context of Green Belt causes that IAS reach high densities, creating large areas dominated by a single IAS. This situation displaces local species and creates problems, like proliferation of fires and pests. The economic damage of the presence of IAS affects the main economical driver of the area: the tourism.

Key measures and relative costs

IAS were mapped in Santander's Bay with the goal of knowing their status. The high diversity of target IAS of the project implies the implementation of different methodologies, always following the official protocols. The application of pesticides is the last option, however with some species is the only efficient method (e.g. *Fallopia japonica*, *Cortaderia selloana* and *Baccharis halimifolia*). With Cotula coronipofolia, each specimen is manually removed. With *Eucalyptus globulus* and *Robinia pseudoacacia*, aereal parts of the trees are cutted and later herbicides are applied to the stump. *Ludwigia peploides* is manually removed and later the plant residues are covered with matt tarp. *Azolla filiculoides* is manually removed.

Results

Expected results: 1) mapping of IAS in the delimited risk area; 2) eradication of IAS in 50 ha within the reserves of Green Belt; 3) eradication of IAS in 100 ha in the Bay of Santander.
Achieved results: 1) mapping of IAS in 50,170 ha. 2) IAS removed in 9 ha within reserves of Green Belt; 3) 5 workshops held. After the removal of *Azolla filiculoides* in the last year, no specimen was detected until this moment.

Lessons learnt

A quickly actuation in the case of first stages of colonization of new IAS is the key. So, the coordinate work between partners of the project is a good way of work. The implementation of a mix of different methodologies allows to reach good results. A program of environmental education focuses on the problems of IAS is necessary.

Sustainability of results

The continuous work in the eradication of IAS in and outside the reserves will ensure that the results are achieved. The project was born to be permanent. One of the goals of the project is to create an industrial lobby which act as economical support for Green Belt after the finalization of the project.

Recommendations

Before the possible ban of glyphosate, it is necessary to study new methodologies for eradicating IAS, hopefully without using herbicides. An interesting topic to be studied is the use of biological control. Improving our knowledge on trophic relationships and interactions of IAS in their natural distribution, allow us to recognize predators, parasitics and parasitoids. In this sense, is necessary to develop ex-situ experiments to test the effects of these organisms on potential hostages and preys within native species and the effect over the IAS in the new ecological parameters typical of the colonizated area.

Habitat of a huge number of waterfowl and temporary area for different migratory species, Alday Marshes is a coastal wetland that survives surrounded by numerous human infrastructures

LIFE09 NAT/SE/000344

MIRDINEC - Management of the invasive Raccoon Dog (*Nyctereutes procyonoides*) in the north-European countries

Duration From 01/09/2010 to 31/08/2013
Total budget €5,318,278 (EC co-financing 50%)
Website www.jagareforbundet.se/vilt/Mardhundsprojektet
Coordinating beneficiary Swedish Association for Hunting and Wildlife Management (Sweden)
Other partners Swedish Environmental Protection Agency (Sweden), Swedish University of Agricultural Sciences (Sweden), Finnish Wildlife Agency (Finland), Danish Nature Agency (Denmark)
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Target species – *Nyctereutes procyonoides*, *Procyon lotor* (after LIFE).

Background and aims

The raccoon dog (*Nyctereutes procyonoides*) is an omnivorous generalist predator introduced from the eastern parts of Asia to the European parts of former Soviet Union during the years 1929-1955. Since then the raccoon dog (RD) has spread over large parts of Europe by secondary expansion, threatening European biodiversity (mainly rare ground nesting birds and amphibians in wetlands), animal and human health (as vector of rabies and *Eccinococcus multilocularis*) and thereby straining affected states economies with a need to manage its effects. The RD is highly adaptable to climate and habitat but prefers rich wetlands. Soon after release in the Soviet Union the RD spread to Finland where it showed an exponential population increase. In 1980, 800 RD were shot in Finland, which had increased to 200,000 in 2016. The project aims to prevent the RD from establishing in Scandinavia, and where it has already invaded (northern Sweden and southern Denmark) to keep the population confined at a low level and stop it from further expansion. The RD was amended on the list of invasive alien species of Union concern (Regulation (EU) 1143/2014) on 12 July 2017 (Regulation (EU) 2017/1263).

Key measures and relative costs

Prevention: cooperation with neighboring countries.
Early detection: citizen science observation system, game cameras (also important for Rapid eradication, Management and Monitoring), genetic species identification, Judas animals (also important for Rapid eradication and Management).
Rapid eradication: professional hunters (also important for Early detection and Management), specialized hunting dogs (also important for Management).
Management: voluntary Hunters, traps.
Monitoring: game camera monitoring system, catch per unit effort models.
Awareness raising: active media strategy.
Support to governance: expert support to authorities on mammal and bird IAS.
Capacity building: education and involvement of local hunters.
The whole system cost approx. €850,000 per year in Sweden. During the LIFE project (2010-2013), approximately 100 animals were culled or captured annually (€8,500 per individual). From 2015 the raccoon (*Procyon lotor*) has been incorporated in the system, and during 2016 missions on both Siberian Chipmunk (*Tamias sibiricus*) and ring-tailed coati (*Nasua nasua*) have been conducted within the budget.

Results

Since the beginning of the LIFE project in 2010, the RD population has decreased significantly in Sweden and have not expanded its distribution area. In 2016 only 40 individuals were culled or captured. Norway still does not have an established population of RD. In fact, the confirmed RD records in most recent years are fewer than at the beginning of the project nine years ago. In the previous three years only one RD sighting has been confirmed annually in Notway due to the effective management in northern Finland and Sweden. In Denmark the population seems to have increased on the mainland (Jutland), connected to Germany, due to heavy immigration after the LIFE project ended 2013. The Danish population is however still confined on the mainland and have not been allowed to spread to the islands and further on to southern Sweden. If the measures initiated during the LIFE project (2010-2013) had stopped after the project, there would likely have been an exponential population increase and an expansion of the RD to mid Sweden and Norway from the north and south Sweden from Denmark.

Lessons learnt

- Scientific foundation, know the species biology to be able to find or invent effective measures to manage it.
- Applied research + practical experience = innovative and efficient solutions.
- Transnational cooperation essential for fast dispersing species.
- Professional foundation – employed personnel secures efficient management.
- Inform, educate and involve the public to gain acceptance. Citizen science.
- An active media strategy will help to spread the word correctly.
- Involve local stakeholders to gain acceptance and become more efficient.
- Be adaptive to become efficient.
- Ensure good relationship with responsible authorities as well as other authorities and organisations.
- Establish a steering- or reference group to discuss decisions and/or economy with.
- Monitor the IAS population as well as the efficiency of measures to confirm the results.

Sustainability of results

All member states involved in the LIFE project (Sweden, Denmark and Finland) and Norway, who were not allowed to participate in the EU-project, have after the end of the LIFE-project (2014 and onwards) funded the continuation of the successful project with national funding. State funding have been modest in Finland, but compensated with Norwegian funding to ensure that the RD does not spread to Norway. When the RD now have been incorporated on the list of IAS of EU concern we anticipate the funding will also continue in all countries. The project is continuously working on new and/or more efficient means to manage the RD. All countries are involved and share any new findings to the other countries.

Recommendations

Measures and management linked to the LIFE project are efficient mainly for small emerging populations at the invasion front. New and efficient measures are needed to be able to eradicate the RD and other mammalian IAS on a large scale, for example in southern Finland or mainland Denmark. New upcoming technologies such as gene drive is very promising and important for large scale eradications. Otherwise projects like the nordic RD project has to be indefinite, or until the RD have been able to break through the expansion front, e.g. due to climate change, and there is no way of stopping them. One measure of the RD project not mentioned above, but successfully practiced, and equally successfully banned by the EU, is the use of Leg hold traps in the EU. The leg hold trap was tested under strict control and evaluated against legal traps during two years in the project. The leg hold trap was found to be seven times as efficient as the best legal trap in Finland. Used together with game cameras to be able to cull the animal asap injuries were negliable. It has to be possible to take care of invasive alien species effectively, using the best means possible, but of course with consideration of the target animals welfare. The leg-hold is not a tool suitable for common use, but should be possible to use professionally, for example when states are trying to eradicate IAS.

References – See also annual reports and other published articles and material on the RD project website.

Judas raccoon dog in front of a KaNu-trap photographed by an automatic game camera

LIFE11 NAT/SE/000849

SandLIFE - Restoration of habitats on sandy soils in southern Sweden

Duration From 01/08/2012 to 31/07/2018
Total budget €7,850,305.00 (EC co-financing 49.98%)
Website www.sandlife.se
Coordinating beneficiary County Adminstrative Board of Skåne (Sweden)
Other partners County Administrative Board of Halland, County Administrative Board of Kalmar, Lund University and Kristianstads Vattenrike Biosphere Reserve (Sweden)
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e-mail gabrielle.rosquist@lansstyrelsen.se

Target species

Rosa rugosa, *Pinus mugo* (not discussed further).

Background and aims

Sand Life is a nature restoration project that restore sandy habitats in southern Sweden and make them more accessible, both to the general public and to rare plants and animals. The project also focuses on removing the IAS Japanese rose (*Rosa rugosa*) that was introduced to Sweden in 1920 and originally planted at the costal sand dunes to prevent the sand to drift. The IAS spread into the remaining open dunes and completely cover the ground. The micro-climate becomes dark, moist and cold, which disfavour the typical species-rich flora, fauna and funga of the sandy habitats. Many of the natural species are threatened and some of the species are of Community interest: the Tawny pipit (*Anthus campestris*), the Wooden lark (*Lullula arbores*) and the European nightjar (*Caprimulgus europaeus*) under Birds Directive, the Sand lizard (*Lacerta agilis*) and in some places the Sandy pink (*Dianthus arenarius* ssp. *arenarius*) under Habitats Directive. Dunes with roses are not accessible to the public for recreation and disfavour the summer tourism. Removal of IAS that threaten biodiversity is in line with the EU Regulation 1143/2014 on Invasive Alien Species, the Swedish national plan on invasive species and the Bern and Rio conventions that Sweden has ratified.

Key measures and relative costs

The restoration actions in Sand Life project show how difficult and costly it is to remove IAS. The budget for removing R. rugosa in the project is estimated to €454,156 for about 23,2 ha. However, there are also costs for information and discussions with the public as well as monitoring the effects on wild life.

Results

Removing *R. rugosa* turned out to be far more costly than expected. It was necessary to dig deeper than expected, more material needed to be destructed and it was necessary to remove remnants repeatedly. The restoration resulted in early successional stages with bare sand. This will favor the pioneer animals and plants in the sand dunes.

Lessons learnt

The easiest way to remove *R. rugosa* is by herbicides. However, this method is not supported by the Swedish nature conservation in protected areas and using herbicides is not a way to reach the national environmental goal of a herbicide-free environment. It is also possible to graze or broze the bushes with cattle, sheep or goats. The roses are still there and when brozing is not possible, the root parts need to be digged up, sorted out from the sand and transported out of the area. This process has been done on a large scale in the project that needed some development of the technology in collaboration with the contractors. The after-restoration managing may be done by green jobs. *R. rugosa* is an appreciated plant among some people, therefore information and communication is needed to avoid social conflicts before removing the plants. However, the dunes will be more accessible to visitors, so the actions are generally appreciated.

Sustainability of results

R. rugosa will quickly return if not all root parts have been removed. Furthermore, managing the sites (not restoring) will be possible by national funding. However, since there are roses growing outside the protected areas, there will still be high risks for spreading.

Recommendations

To prevent new spread of *R. rugosa*, information about the invasiveness of the species and a stop for trading the species are necessary. We will recommend the national EPA to suggest *R. rugosa* as a IAS of Union Concern to the European Commission.

Sand dunes with dense shrubbery of *Rosa rugosa* at Ängelholm in Skåne, Sweden

LIFE12 NAT/SE/001139

LIFE-ELMIAS - Saving wooded Natura 2000 habitats from invasive alien fungi on the Island of Gotland, Sweden

Duration From 01/07/2013 to 31/12/2018
Total budget €4,251,755.00 (EC co-financing 50%)
Website www.skogsstyrelsen.se/lifeelmias
Coordinating beneficiary Swedish Forest Agency (Sweden)
Other partners County Administrative Board of Gotland, Municipality of Gotland, Swedish Environmental Protection Agency, Swedish University of Agricultural Sciences, Swedish Public Employment Service, Swedish Transport Administration, Swedish Church, Committee for Gotland Meadows (Sweden)
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Target species

Ophiostoma novo-ulmi and *Hymenoscyphus fraxineus*.

Background and aims

Elm (*Ulmus* spp.) and ash (*Fraxinus excelsior*) make up almost 70% of the tree layer on Gotland. There, in the last few years, the threats from Dutch Elm Disease (DED) in combination with Ash Dieback (ADB) posed serious threats to the Annex I habitats 6530, 9020, 9070 and to a lesser extent to habitats 9080, 6210, 6280, 9180 and 8210, wherever they occur. Aims: 1) to eradicate the IAS of DED from Gotland; 2) to ensure favourable conservation status and sustainability of the wooded Annex I habitats affected by DED and ADB by implementing complementary management actions to make the habitats robust, and to secure sustainable population of trees; 3) to prepare a contingency plan if DED eradication fails; 4) to implement an information program to increase the knowledge and understanding of the problems related to IAS and the impact on biodiversity.

Key measures and relative costs

Key measures: entail rapid eradication, long-term control and containment, awareness raising campaign, monitoring and surveillance, and capacity building. IAS problems addressed:

1. DED will be eradicated by completing survey of distribution of both elm and DED, followed by destruction of infected trees; these efforts will be monitored for degree of eradication;
2. Restoration and revised management plans created, followed by their implementation;
3. Contingency plan produced in response to monitoring actions;
4. Intensive media and training campaign implemented to ensure that DED is not re-introduced to Gotland and to increase the understanding of the impact of IAS on biodiversity. Costs for the actions specifically aimed at IAS: €2,407,454.

Results

1. DED pathogen genotyped: fungus *Ophiostoma novo-ulmi* originating from mainland Sweden.
2. Its genetic diversity in Gotland is low, indicating few entries, and that the Island is well geographically isolated from the point of view of DED pathogen (e.g. in perspective of eventual future invasions).
3. During the project duration, adopted “seek and destroy” strategy allowed to maintain levels of DED infection to a stable level, approx. 4,000 infected trees on an area of approx. 1700 ha.
4. 123 dieback resistant ash trees GPS-mapped and “seed bank” plantation of established both as planted (1,032 trees) and as sawn seedlings.

Lessons learnt

LIFE-ELMIAS is probably the first project to be accomplished in Europe where such an active and “broad-ranged” activities are being implemented to eradicate and maintain DED. The approach taken to establish “seed bank” plantation of “presumably dieback resistant” ash was of low cost and performed in a way not been used before. So far, the plantation seems well established, and apparently unique of its kind (composed of both planted and sawn trees) to be used as a permanent research plot for years to come. In fact, when results were presented for professional tree breeders/geneticists in August 2017, the project’s progress and outcome were well received, and interest for similar practice raised international level. The Swedish Forest Agency (SFA) is being represented in the Gotland Meadow Committee. Cooperation with landowners and other stakeholders is being accomplished during regular meetings, along with information and knowledge sharing with other authorities on Gotland.

Sustainability of results

In case DED on Gotland will be kept on the control and repeated invasion avoided, this would provide basis for sustainable existence of Natura 2000 wooded meadow habitats on a long-term. In case of a negative scenario, if DED will persist, possible option to overcome the problem would be selection, propagation and breeding of resistant elm. Notable moment here is that population of DED fungi in Gotland is seemingly genetically uniform, narrowing possibilities of its diversification. Developing resistant elm could follow the example already established of seed bank of ash. In case such a work and other woodland preservation activities will be needed, alternative funding source has been secured from Swedish Environmental Protection Agency, as in any case there will be a continuation of ELMIAS activities in the after LIFE phase.

References:

Menkis A. et al., 2016. Dutch elm disease on the island of Gotland: monitoring disease vector and combat measures. *Scand. J. Forest Res*. 31:237-241.

Menkis A. et al., 2016. *Scolytus multistriatus* associated with Dutch elm disease on island of Gotland: phenology and communities of vectored fungi. *Mycol. Progress* 15:55.

An example of Natura 2000 site in Gotland: wooded meadow

LIFE05 NAT/UK/000142

ERDUK - Eradication of Ruddy Ducks in the UK to protect the White-headed Duck

Duration From 01/09/2005 to 31/03/2011
Total budget €3,770,771 (EC co-financing 48%)
Website www.nonnativespecies.org
Coordinating beneficiary Coordinating beneficiary: Central Science Laboratory (UK)
Other partners Dirección General para la Biodiversidad, Ministerio de Medio Ambiente (Spain)
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Target species

Oxyura jamaicensis.

Background and aims

Ruddy Ducks are of American origin and were imported into UK wildfowl collections. They breed on small/medium waterbodies with emergent vegetation but prefer larger waters during the winter. Following escapes, numbers increased rapidly between 1970 and the 1990s, when Ruddy Ducks reached parts of Spain where the endangered White-headed Duck occurs. This species is on Annex 1 of the Birds Directive and has a European population of around 2,000. Ruddy Ducks then began hybridising with White-headed Ducks, leading to concern that the latter might become extinct through genetic introgression. The project had two principal aims: protect the European population of White-headed Ducks by eradicating Ruddy Ducks from the UK, and promote the exchange and dissemination of information on control methods and progress with other European control teams and policy makers, leading to more effective control of Ruddy Ducks across Europe.

Key measures and relative costs

1. Control measures (€3,000,000, or €418 per bird removed).
2. Promotion of pan-European action to eradicate Ruddy Ducks in other European countries, to be achieved through increased awareness of the methods available and the importance of cross-border co-ordination (€120,000).
3. Promotion of the understanding and acceptance of the objectives of the project and its rationale in key local and national groups e.g. site owners and mass membership conservation organisations (€200,000).

Results

The UK population fell from 4,400 at the beginning of the LIFE project to around 100 at the end. Since 2011 the population has fallen further, to around 20 birds. No Ruddy Duck x White-headed Duck hybrids have been seen in Spain since 2007, and there was a reduction in the number of Ruddy Ducks reported there. In recent years, no more than 1-2 Ruddy Ducks have been recorded in Spain annually.

Lessons learnt

1. Research into the effectiveness of control methods is the key to an effective eradication strategy. The results from practical research allow models to better estimate timescales and costs.
2. Support from major NGOs in the field is important. It is important to take concerns into animal welfare concerns into account by deploying the most humane approach and being robust (including support from the most senior levels) in explaining why the action is necessary.

Sustainability of results

At the start of the project it was recognised that eradication from the UK might not be feasible within five years, but the UK Government committed to funding any additional work required to achieve full eradication. Since 2011, the UK has invested €814,000. This has led to a reduction in the UK population from around 100 birds in 2011 to around 20 individuals in 2017. The key to securing a successful outcome is now determined and robust action to control the Ruddy Duck populations in France and the Netherlands, for example through a successful LIFE project.

Recommendations

Compulsory access to sites with species of Union Concern to allow prompt and effective control. Better co-ordination between Member States at an early date, including contigency planning. Projects should be ambitious but based on good knowledge of the ecology of the IAS and how it responds to control.

References

Henderson, 2009. The progress of the UK Ruddy Duck eradication programme. British Birds 102: 680-690. https://www.britishbirds.co.uk/wp-content/uploads/article_files/V102/V102_N12/V102_N12_22_32.pdf

Robertson P. A. *et al*, 2014. Towards the European eradication of the North American Ruddy Duck. Biological Invasion 17.1: 9-12. DOI: 10.1007/s10530-014-0704-3.

Male White-headed Duck, United Kingdom

LIFE13 NAT/UK/000209

LIFE Shiants - Protecting and restoring the Shiant Isles SPA through rat removal, and safeguarding other seabird island SPAs in the UK

Duration From 01/10/2014 to 30/09/2018
Total budget €1,110,000 (EC co-financing 50%)
Website www.rspb.org.uk/ourwork/conservation/shiantisles/work/index.aspx
Coordinating beneficiary Royal Society for the Protection of Birds - RSPB (UK)
Other partners Scottish Natural Heritage; The Nicolson Family
Contact Mr. Charlie Main (RSPB)
e-mail charlie.main@rspb.org.uk

Target species

Rattus rattus.

Background and aims

The Shiant Isles are a small group of islands lying ca. 6 km off the island of Lewis and Harris in the Outer Hebrides, north-west Scotland. The islands are internationally important for hundreds of thousands of seabirds and are designated as a Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI). The project's core aims are to: 1) Eradicate black rats (*Rattus rattus*) from the Shiant Isles; 2) Actively encourage European storm petrel (*Hydrobates pelagicus*) and Manx shearwater (*Puffinus puffinus*) to breed at the islands; 3) Undertake an audit of current UK island biosecurity in place, and deliver a suitable programme of biosecurity training to island managers and stakeholders; 4) Enhance UK capacity to carry out eradications for the purposes of conservation. The islands are uninhabited, with only brief visits made by the island visitors and owners. At the Shiants, the rats additionally caused a nuisance for island visitors, who used the one standing structure, the "bothy", for accommodation. The removal of invasive species from the Shiants Isles is of great relevance to EU environmental policy and legislation because of the number of seabirds that this action will protect, but also because the project has provided opportunities to raise the profile of invasive species management and biosecurity of seabird islands at a national level.

Key measures and relative costs

The IAS problems are addressed through: 1) Rapid eradication of a IAS. The central aim was to eradicate Rattus rattus from the entire island group. This has been followed by: 2) Prevention (through biosecurity measures designed to keep the islands rat free). 3) Early detection with regular monitoring and surveillance at the islands will allow an incursion response team to react quickly to any rat sign at the Shiants. 4) Awareness raising about biosecurity through the project's programme of training and by communicating biosecurity needs for the Shiants as broadly as possible. Following an audit of biosecurity in place on UK seabird island SPAs, the project has subsequently embarked on a training programme in island biosecurity aimed at island managers and stakeholders. Biosecurity measures aimed directly at the Shiants include interaction with local boat operators to ensure that biosecurtiy best practice is followed. 5) The project has contributed to capacity building in the UK for conservation-based eradications. The Shiant Isles cover approximately 175 ha in total. Therefore, the entire project has cost approximately €6,300/ha. The bulk of funding secured by the project is directed at the actions aimed specifically at IAS eradication, biosecurity and capacity building for eradications. The budget for the eradication, including subcontract costs, associated travel and consumables (approximately €411,000) resulted in an approximate cost of €195 per rat removed.

Results

The eradication of rats at the Shiant Isles was undertaken over the winter of 2015-16. The project is currently in the post-eradication monitoring phase, before rat-free status can be officially declared in March 2018 at the earliest. There has been no rat sign at the islands following the main eradication campaign. Monitoring of the islands' seabird productivity, land bird abundance, vegetation and crawling invertebrates was carried out in the year immediately preceding the eradication, and for the following three years (two of the post-eradication years of monitoring now complete). Pre-eradication monitoring included an island-wide seabird census. There has been no significant increase in seabird productivity recorded to date following the eradication for all species and habitats studied. However, improved seabird productivity has been recorded post eradication, with certain breeding habitats being potentially more beneficially affected. It is too early to provide more conclusive findings as the post-eradication biodiversity monitoring is at present still ongoing.

Lessons learnt

Every eradication project is unique, but there are many core approaches that are transferrable between projects and countries. The RSPB undertook a full eradication contract debriefing with the subcontractors involved. Lessons learned from the exercise were recorded in a transparent process culminating in a document to be shared internally. Reporting on the process will be shared to the wider community through normal channels i.e. project publications, and these will be transferrable to other EU. One of the RSPB core aims was to produce easily accessible best practice advice on biosecurity and IAS eradication. A manual summarising best practice has been produced and is shared alongside the training workshops currently being undertaken. Social conflicts with members of the public appear to be best managed by the production of a clear communications plan which every partner should adopt from the outset. It is important to remain consistent with messages to do with eradications for conservation purposes. Managing stakeholder relationships can present challenges to do with individual and cultural views and values. Engaging stakeholders in decision making is important from the outset, and using clear communications channels, regular face to face meetings and allowing time for planning, implementation and contingency phases to be undertaken effectively.

Sustainability of results

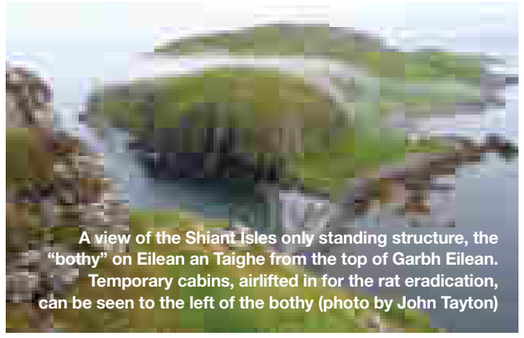
The risk of rat re-invasion at the Shiant Isles is perceived to be relatively low overall because the islands are ca. 6 km from the nearest mainland rat colonies and there is no infrastructure to allow easy boat access. However, the risk of animals swimming from a boat to the shore is significant.
There are sheep kept at the islands, hence landing craft will continue to make occasional contact with the islands. The long term sustainability of rat-free habitat depends on the successful implementation of biosecurity measures off the islands. This requires significant effort to be kept up in communications channels to anyone either visiting the Shiants or going within about a mile in a boat. The Minch is a busy international shipping lane, so the prospect of a shipwreck is also highly possible at some point in the future. The continuation and sustainability of biosecurity will benefit from further investment, and so the RSPB has submitted a bid to the EU LIFE fund to engage in a project that would follow on from current UK eradications by building capacity at a national and EU level to implement and maintain seabird island biosecurity measures and rapid incursion response capacity.

Recommendations

Success in eradication projects is usually a direct result of the individuals involved in implementing them. It is critical to be able to select a suitable team to work together in arduous conditions, close confinement or small intensely focused teams. The skills and personalities necessary will only evolve through time and experience. It is important to look to other projects and individuals for advice. Careful planning and project development, including the development of contingency strategies, careful budget preparation, staff time and roles are also among the lessons learned by the project experience. Communication, both internally and with external partners is important. Finally, the use of poison, and eradications in general to carry out conservation objectives can be a sensitive subject for certain members of the public. This need to be borne in mind, with a suitable communication strategy adopted and the need for mindful, evidence based justification of approaches and objectives of eradication projects.

References

Stanbury A. *et al.*, 2017. Prioritising islands in the United Kingdomm and crown dependencies for the eradication of invasive alien invertebrates and rodent biosecurity (2017) European Journal of Wildlife Research.
UK Rodent Eradication Best Practice Toolkit is available here: http://www.nonnativespecies.org/index.cfm?pageid=613



A view of the Shiant Isles only standing structure, the "bothy" on Eilean an Taighe from the top of Garbh Eilean. Temporary cabins, airlifted in for the rat eradication, can be seen to the left of the bothy (photo by John Tayton)

LIFE14 NAT/UK/000467

SciurusLife – Sciurosity – Evolving IAS Grey Squirrel Management Techniques in the UK

Duration From 01/11/2015 to 01/01/2020
Total budget €2,699,565.00 (EC co-financing 60%)
Website www.redsquirrelsunited.org.uk
Coordinating beneficiary Royal Society of Wildlife Trusts (United Kingdom)
Other partners Forestry Research, The Lancashire Wildlife Trust, University of Newcastle upon Tyne, Northumberland Wildlife Trust, Red Squirrels Trust Wales Ltd, Ulster Wildlife (United Kingdom)
Contact Mr. Gillian French (Royal Society of Wildlife Trusts)
e-mail gfrench@wildlifetrusts.org

Target species

Sciurus carolinensis.

Background and aims

Sciurus carolinensis was first introduced to the United Kingdom (UK) in 1876 with subsequent translocations into the 1920s. Established populations spread naturally (10km per annum). Accidental & deliberate human mediated translocation exacerbates incursion rates. The grey squirrel has a significant economic impact upon commercial hardwood timber production because of bark stripping behaviour. Annual revenue loss is in the Millions (£). The presence of populations is a major disincentive to the establishment new timber crops, stand species diversification and forest ecosystem future proofing in the face of climatic change and emerging pathogenic tree diseases. The species is implicated in the decline of a number of common woodland song-birds but further research is required. Studies have suggested populations alter the epidiomiology of infections (including zoonotic agents) and ecology of parasites naturally found in native species whilst also introducing novel infections (spillover). Finally, the grey squirrel competes for resources with native Eurasian red squirrels and is an asymptomatic carrier of squirrelpox virus which produces epidemic pathogenic disease in the congener. This has led to the regional extinction and decline of red squirrel.

Key measures and relative costs

Tackling Invasive Alien Species (IAS) colonisation prevention by developing:

- mechanisms to prevent the unintentional introduction of grey squirrels to currently uncolonised woodland landscapes;
- early warning/rapid response mechanisms to ensure a 720km2 island where grey squirrels have recently been eradicated is not recolonised;
- Developing rapid response/early warning approaches to mitigate the impacts of grey squirrels in urban woodlands with higher biodiversity and tourism value; to detect grey squirrels in sparsely populated rural landscapes.
- Maximising the impact of control/eradication approaches:
  - development of a more efficient strategic mechanisms to evolve community based grey squirrel management in the UK;
  - quantification of the financial and community based resources needed to achieve regional eradication of an IAS which has been present in the UK since 1876.
- Aiding the development of comprehensive IAS management frameworks:
  - sharing the learning associated with this project with other IAS management programmes across the EU;
  - using knowledge exchange and trust building processes to aid the development of a broader IAS management community across the UK;
  - testing the impact of measures to increase public awareness and community capacity associated with grey squirrel IAS management in and beyond geographical activity centres included in this project.

Costs: Urban squirrel management in Merseyside - €237,193; Island recolonisation prevention €417,695; Prevention of incursion into a key mainland forest matrix €348,499; New eradication and control initiatives in Northern Ireland €593,520.

Results

1. The establishment of trained volunteer networks allows rapid incursion detection and are being compared between regional landscapes which vary in features and human population density.
2. The efficacy of camera traps vs direct observation is being quantified.
3. Societal perspective and factors influencing opinion are investigated and have revealed lower support for grey squirrel control than previous study.
4. The relative efficacy of live & kill traps, shooting and natural control methods (Pine Marten) has been compared and preliminary results have demonstrated the need for a flexible and evolving approach tailered to local conditions.

Lessons learnt

1. Rement red squirrel population presence has been a key driver in the recruitment of local volunteers to become involved in grey squirrel control.
2. A proportion of people do not understand how grey squirrels affect reds and are unaware of wider ecological impacts despite the high media profile of the invasive species.
3. There are a range of techniques being developed helping us to control the grey squirrel species including: trap loan schemes to engage communities, novel use of kania traps to encourage community appetite for dispatch, use of additivies such as aniseed and nutnut oil to engourage grey squirrels and trapping inside frames to trap in urban areas.
4. New survey techniques to monitor grey squirrel dispersal and target actions according to least cost pathway research.

Sustainability of results

1. We anticipate that the evolution of local community volunteer based groups and increased community effort will assist in post project sustainability.
2. New techniques developed for the control of grey squirrels will evolve grey squirrel management practices and increase operator numbers and efficiencies
3. Modelling of grey control data will provide an understanding of required resource levels.
4. Ability to inform policy and practice development in control and management of grey squirrels through creation of a squirrel strategy.

Recommendations

1. Creation of standardised viable data collection methodologies across beneficiaries at an early stage of project.
2. Setting up regular reporting schedules for data from beneficiaries to collator.
3. Legislation to mandate invasive control by owners on their property.
4. To include a budget for project partner meetings to ensure face to face meetings happen more than once a year.

References

Shuttleworth, Lurz & Gurnell (eds) (2016) The Grey Squirrel: Ecology & Management of an Invasive
Species in Europe. ESI, 532pp. ISBN 978-0-954757-64-9.
www.theconversation.com/grey-squirrels-are-bad-for-the-british-countryside-full-stop-75470.

Grey Squirrel removed from Anglesey on 28-09-2017 following community reporting and volunteer trapping

LIFE16 NAT/UK/000582

RAPID LIFE - holistic management of Invasive Alien Species in freshwater aquatic, riparian and coastal ecosystems

Duration From 01/07/2017 to 30/06/2020
Total budget €1,136,663.00 (EC co-financing 59.97%)
Coordinating beneficiary Animal and Plant Health Agency (APHA) (United Kingdom)
Other partners Natural England; Bristol Zoological Society (United Kingdom).
Contact Mr. Dave Parrott (APHA)
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Target species

Invasive Alien Species management in freshwater aquatic, riparian and coastal ecosystems.

Background and aims

Globally, invasive alien species (IAS) are considered to be one of the most significant causes of biodiversity loss, second only to habitat destruction (CBD). Target 5 (Combat invasive alien species) of the EU Biodiversity Strategy recognises the severe impact that IAS have on biodiversity within Europe and the need for them to be managed more effectively. The economic impacts of IAS are also severe, with the IEEP estimating an annual cost of at least 12 billion Euros across Europe. These impacts led to the recent introduction of an EU Regulation on IAS (1143/2014). RAPID LIFE will deliver a package of measures to reduce the impact and spread of IAS in freshwater aquatic, riparian and coastal environments across England. It will help to conserve species protected under the Birds and Habitats Directives whilst assisting in compliance with the EU Regulation on IAS, Marine Strategy Framework Directive and the Water Framework Directive. The status of Natura 2000 sites will also be enhanced and/or protected. Project goal: Protect freshwater aquatic, riparian and coastal biodiversity by embedding a coordinated, strategic and evidence-based approach to managing Invasive Alien Species (IAS) across England whilst demonstrating the efficacy of this approach for replication across Europe.

Project objectives:

1. Establish a regionally-based framework across England to deliver more effective IAS management, facilitating the production of Regional IAS Management Plans.
2. Prevent the introduction of novel IAS to the project's target environments by increasing biosecurity awareness amongst target audiences through a coordinated programme of engagement at England-wide and regional levels.
3. Increase awareness and efficacy of GB-level early warning and rapid response systems within England and establish localised rapid response protocols.
4. Eradicate and control established IAS in high-priority areas whilst demonstrating strategic and best practice approaches.
5. Disseminate the exemplar approach throughout European and international networks. Main policies targeted: EU Regulation: No 1143/2014; Habitats Directive and Birds Directive; EU Biodiversity 2020 Plan targets 1, 2 and 5; 7th Environment Action Plan Priority Objectives 4 and 5; Water Framework Directive (WFD); Marine Strategy Framework Directive (MSFD).

Key measures and relative costs

RAPID LIFE will pilot an innovative approach to IAS management in freshwater aquatic, riparian and coastal environments across England. The project has two phases: the preparatory phase will mobilise regional stakeholders in the production of five Regional IAS Management Plans using templates and guidance produced by national IAS experts. A national IAS toolkit will also be prepared, along with revised and more effective materials to improve uptake of biosecurity. The delivery phase of the project will involve stakeholders utilising the materials produced in the preparatory phase to deliver consistent (but regionally tailored) prevention, early warning, rapid response, eradication and control of IAS throughout England. The approach is replicable throughout Europe, providing the first model for a countrywide, but locally adaptable, approach to IAS management. Natureparif, a French regional body, will initiate replication of the project's actions within France during the lifetime of the project and as part of the After-LIFE activities.

Improved Nature, Species and Biodiversity:

- 12.5% increase in number of white-clawed crayfish within South West region.
- 58.5% reduction in distribution Himalayan balsam in Bristol Avon and River Wensum catchments.
- 55% reduction in distribution Japanese knotweed in Bristol Avon and River Wensum catchments.
- 75% reduction of signal crayfish within South West region.

Communication, dissemination, awareness rising:

- 46% increase in number of anglers aware of IAS issues (anglers are a proxy measure for wider target audience).
- 240,000 visits to RAPID LIFE web pages.
- 33% increase of target audiences changing behaviour resulting in reduced IAS threat and increase of native biodiversity.

Results

RAPID LIFE will enhance management of IAS in target environments across England. It will give a strategic underpinning to IAS management at a local-level and increase the efficacy of biosecurity campaigns. Conservation actions delivered through the project will prevent the introduction of novel IAS, facilitate rapid responses to newly established IAS and better manage widespread IAS.

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Find out more
on the website

www.naturachevale.it

Regione
Lombardia