



INVASIVE ALIEN SPECIES

► Meeting the challenge of invasive species



IN FOCUS

► Invasive alien species – a threat to Europe's economy & biodiversity



nature



EUROPEAN
COMMISSION



environment

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Natura News



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Cover photos: invasive species (left to right)
Pseudorasbora parva, *Rana catesbeiana*,
Heracleum lehmannianum, *Oxyura jamaicensis*

Theme of this issue: INVASIVE ALIEN SPECIES



Editorial

Invasive species: an outside threat to our biodiversity



Exotic invasive, water hyacinth (*E. crassipes*)

Biodiversity loss is driven by five major threats. But while habitat loss, climate change, over-exploitation and pollution are already high on EU and national agendas, the issue of invasive species has not yet received the attention it deserves. By out-competing native species, invaders from outside an ecosystem can cause significant damage. Together with the other threats to biodiversity this issue needs to be addressed if we are to have a realistic chance of halting biodiversity loss in Europe.

The economic impact of invasive species can be massive. Species including the zebra mussel (*Dreissena polymorpha*), American red swamp crayfish (*Procambarus clarkii*), American mink (*Mustela vison*), water hyacinth (*Eichornia crassipes*), and giant hogweed (*Heracleum mantegazzianum*) cause hundreds of millions of Euros of damage every year. Unless action is taken to eradicate or control these invasive species the damage they do will only increase – and the trend is almost certain to be exacerbated by climate change.

Invasive species do not recognise national boundaries and a concerted effort is required to get them under control. Europeans of today are more mobile than ever before. This has many benefits, but it also increases the number of points of entry for new species. Some highly invasive species are intentionally imported as pets or ornamental plants, while others arrive as 'hitchhiker' or contaminant organisms through trade. Given the single market and frontier-free travel a European approach is needed to protect European ecosystems – but while parts of Europe have good legislation and established practices to deal with invasive species a common approach is missing. The fragmented measures that are in place are unlikely to make a substantial contribution to lowering the risks that are currently faced.

Tackling the threat of invasive species was identified as a priority in the 2006 Biodiversity Action Plan that was adopted by the European Commission. The Action Plan was endorsed by Member States and to respond to this mandate the Commission is working to develop a strengthened EU strategy on invasive species.

Stavros Dimas

Environment Commissioner, European Commission

Invasive alien species: a threat to Europe's economy and biodiversity

Europe's biodiversity is under threat from invasive alien species (IAS), such as American mink (*Mustela vison*) and Japanese knotweed (*Fallopia japonica*). IAS can disrupt ecosystems and cause considerable damage to nature, the economy and human health. While the European Commission prepares an EU strategy for invasive species, this article examines the background to the growing problem.

Ecosystems are dynamic by nature, and many species become established far from their place of origin. Invasions of non-native or 'alien' species are often the result of human actions. Rhododendrons originated in the Himalayas, and staples of the European diet such as tomatoes, potatoes and maize originated in the Americas. But while many introduced species bring considerable benefits to local economies, others upset the ecological balance and proliferate in ways that are highly destructive to the environment and to economic and human interests.

Introductions of invasive species are often linked to trade and international mobility. Common causes include species escaping from gardens or aquariums, from captivity, or from fish farms. The deliberate stocking by anglers of freshwater alien fauna is

another cause. For example, the introduced North American brook trout (*Salvelinus fontinalis*) is threatening European freshwater fish (salmomids) and could replace brown trout (*Salmo trutta*) in river mountain ecosystems. In the marine environment, harmful aquatic organisms are often introduced via ballast water in ships, taken on in one part of the world and released at some distant location.

As elsewhere in the world, the number of invasive alien species in Europe has increased significantly in recent years and is now a major cause of biodiversity loss.

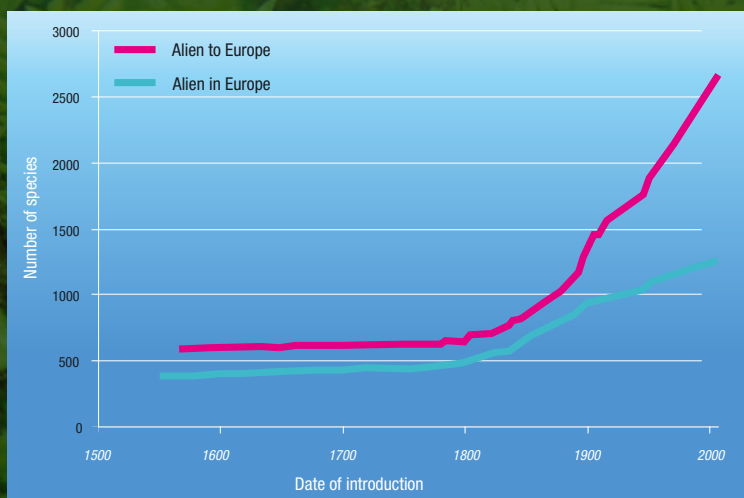
Ecological impacts

The environmental consequences are considerable – ranging from wholesale ecosystem changes and

The North American bullfrog (*Rana catesbeiana*) has been widely distributed via aquaculture and the aquarium trade

the near extinction of native species, such as the European mink (*Mustela lutreola*), which is threatened by the American mink (*Mustela vison*), to more subtle ecological changes and decreased biodiversity.

Increase of alien species into and within Europe



The graph from the DAISIE project, supported by the 6th EU Research Framework programme, shows the exponential growth of alien species both into Europe and within Europe. The DAISIE research delivered an inventory of invasive alien species in Europe
<http://www.europe-aliens.org/index.jsp>

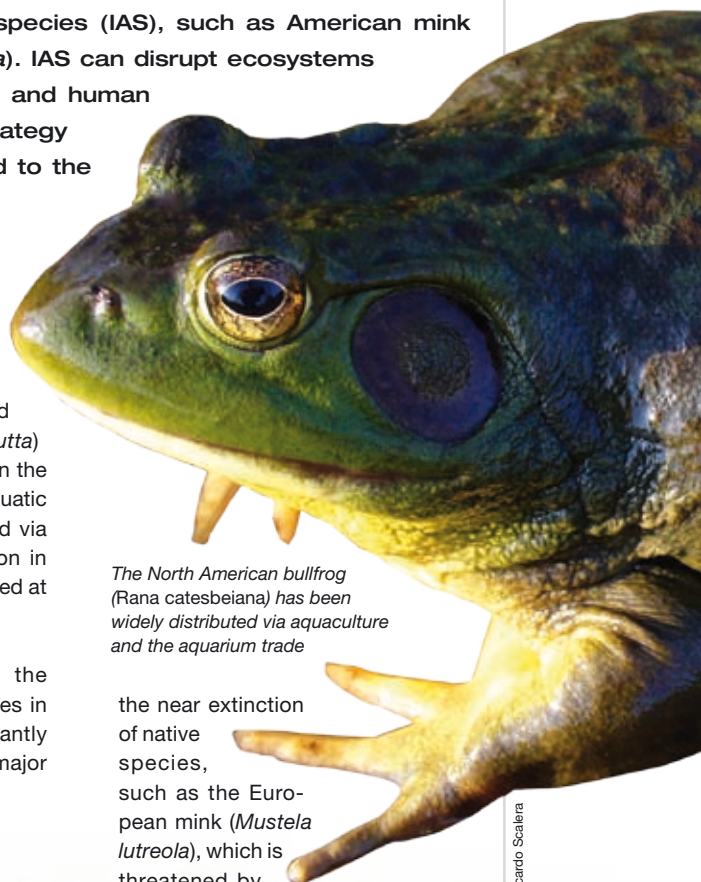


Photo: Riccardo Scalera

Photo: Richard Ling

The Mediterranean Sea has suffered extensive damage from the toxic algae, *Caulerpa taxifolia*. Much of Western Europe has suffered serious environmental and economic damage due to the zebra mussel (*Dreissena polymorpha*), which clogs power plant intakes and competes with native freshwater mussel populations. The Asian topmouth gudgeon (*Pseudorasbora parva*) has spread rapidly throughout Europe since being introduced into Romanian ponds close to the Danube in the 1960s, with serious consequences for native species due to the parasites it brings.

Another potentially serious impact is the possibility of hybridisation with native species, which has occurred for example, between the introduced ruddy duck (*Oxyura jamaicensis*) and the white-headed duck (*Oxyura leucocephala*).

High cost of invasions

Invasive alien species are also a major economic and social concern. According to a recent report¹, the estimated damage and control cost of IAS amounts to around €12 billion each year in Europe. And, these are conservative estimates, based on available documented costs.

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1 Assessment of the impacts of IAS in Europe and the EU (June 2008) M. Ketunen, P. Genovesi, S. Gollasch, S. Pagad, U. Starfinger, ten Brink, P. & Shine, C.

The zebra mussel (*Dreissena polymorpha*) is a huge pest clogging pipes and competing with native freshwater mussel populations



Photo: Gene Wilburn

Escape of the American mink

When mink fur farms were closed in the late 1950s on the island of Lewis in the Western Isles of Scotland, some American mink (*Mustela vison*) escaped or were released into the wild spreading southwards down the chain of islands. The invasion of this species has not only had an adverse affect on the native *Mustela lutreola* populations, but it has also damaged bird populations, aquaculture, crafting and tourism. A LIFE Nature project (LIFE00 NAT/UK/007073) was launched to eradicate the mink from the southern part of the island chain. Numbers of mink caught during the project decreased, showing that the project had a significant impact on the total population.

Mink farm escapees threaten native mink populations



Photo: Riccardo Scallera

The real costs are likely to be much higher, as many countries have only recently started to document costs in relation to IAS. The strongest evidence is for alien pests and weeds that cause damage in agriculture, forestry, fisheries and aquaculture.

In addition, IAS can negatively affect human health – functioning as vectors for diseases or causing allergies and skin damage. The toxic sap of the giant hogweed (*Heracleum mantegazzianum*) for example, contains a substance that causes painful blisters, and the common ragweed (*Ambrosia artemisiifolia*) can trigger attacks of asthma and hay fever.

IAS a global and EU concern

Because IAS are a global problem, cooperation at international, regional and local levels is required to develop compatible approaches. A number of international conventions, agreements and treaties already deal with IAS issues. For example, the Convention on Biological Diversity - CBD (1992) establishes that Parties, including the European Union, should introduce measures to control and eradicate existing harmful alien species, as well as preventing further introductions. In 2002, the CBD adopted specific 'Guiding Principles'² (more p.5) to help Parties to prioritise the development of their IAS strategies. The Bern Convention (1979) also requires strict control of the introduction of non-native species.

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2 Decision VII/23 on 'Alien Species that threaten ecosystems, habitats and species' (COPVI, The Hague, April 2002)

A European Strategy under the Bern Convention aims to facilitate implementation of international commitments and best practice and to support development of IAS policies.

Despite these and other efforts, Europe still lacks a coherent strategy to tackle IAS, and the fragmented measures that are in place are unlikely to make a substantial contribution to lowering the

Ruddy duck - a major concern

The ruddy duck (*Oxyura jamaicensis*), a species native to North America, came to Europe in the 1940s. It has, however, aggressively interbred with the white-headed duck (*Oxyura leucocephala*), which is now threatened with extinction. In the UK, where there is a significant population of the ruddy duck, the government has announced a total cull of the species. The white-headed duck breeds in Spain, North Africa and western and central Asia. A number of LIFE projects have been carried out to diminish the threats to this native duck, notably LIFE00 NAT/E/007311 in the region around Valencia, and LIFE97 NAT/F/004266 in Corsica. An ongoing project, LIFE05 NAT/UK/000142, is also looking to eradicate ruddy duck in the UK, and to exchange information on control methods.



risks posed by IAS to European ecosystems. However, this is set to change with the development of a new comprehensive EU strategy for invasive species. A recent web-based survey has revealed widespread backing among Europeans for such action on a European scale on this issue (see p.11).

LIFE support

The problem of invasive alien species is, however, being tackled on-site throughout Europe, in particular by nature managers working within the Natura 2000 network. Since 1992, the EU has spent over €38 million through the LIFE programme, supporting more than 180 projects dealing with the problem of alien species. More projects, both within and outside the network (in the latter case, to limit or prevent damage within an area neighbouring a Natura 2000 site) are also earmarked under the new LIFE+ Nature component of the LIFE+ programme.

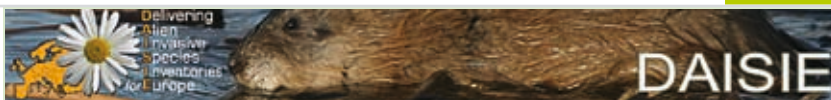
Prevention better than cure

Once established, invasive species are often very difficult to eradicate. It is, therefore, best to prevent their arrival in the first place or to catch the problem very early on. The CBD Guiding Principles (decision COPVI/23) set out the following 'Three-stage hierarchical approach' as the basis for all action on IAS:

- **Prevention** of IAS introductions between and within States is generally far more cost-effective and environmentally desirable than measures taken after IAS introduction and establishment
- If an IAS has been introduced, **early detection and rapid action** are crucial to prevent its establishment: the preferred response is often to eradicate the organisms as soon as possible
- Where eradication is not feasible or resources are not available, **containment and long-term control** measures should be implemented.

Spreading knowledge of IAS

Reliable, detailed information on invasive alien species in Europe is an essential tool for preventing their spread and impact, and for applying effective and appropriate control strat-



DAISIE – a pan-European inventory of IAS

Funded under the EU's 6th Research Framework programme (FP6), the DAISIE project provides a 'one-stop-shop' for information on biological invasions in Europe on its website. Delivered via an international team of leading experts and an extensive network of European collaborators and stakeholders in the field, the site hosts an inventory of invasive species that threaten European terrestrial, fresh-water and marine environments. Continually updated, users can search for information on any one of the 10 822 alien species currently found in Europe. Species accounts provide information on their biology and ecology, habitat and distribution (including detailed maps), introduction pathways, invasion trends, impacts and management methods, including ways of prevention.

For further details, visit the website: www.europe-aliens.org

egies. Several regional and European institutions and organisations have produced lists of alien species causing impacts on health, economic activities and biological diversity. These include: the European and Mediterranean Plant Protection Organisation (EPPO), the North European and Baltic Network on Invasive Alien Species (NOBANIS), the initiative Streamlining European 2010 Biodiversity Indicators (SEBI 2010), and the project, Delivering Alien Invasive Species Inventories for Europe (DAISIE).

Of these, the pan-European DAISIE project (see box) is especially significant – identifying the 100 worst European invaders and creating a database of all alien species in Europe.

NOBANIS

This network provides information on alien and invasive species in North and Central Europe. Covering marine, freshwater and terrestrial environ-

ments, one of its products is a database identifying 'actual' and 'potential' invasive species. Factsheets are also produced for the 55 species currently identified as most invasive.

For further details, visit the website: <http://www.nobanis.org/>

SEBI 2010 biodiversity indicators

This pan-European initiative, led by the European Environment Agency (EEA) within the framework of the project on Streamlining European 2010 Biodiversity Indicators (SEBI 2010), is compiling a set of indicators to assess progress towards meeting the 2010 targets for halting the loss of biodiversity in Europe. In 2007, it published a list of the 168 IAS posing the greatest threat to biodiversity in Europe.

For further details, see: http://reports.eea.europa.eu/technical_report_2007_11/en/

Heracleum lehmannianum (one of some 60 hogweed subspecies) – a serious invasive weed in many areas of Europe

Photo: Vibe Kjaerdegård





Photo: Dave Miller

Effective border control (left) can help to halt, or prevent the spread of IAS. Sign advising boaters (right) on how to prevent zebra mussel (*Dreissena polymorpha*) spread

Reducing the impact of invasive alien species

In line with the 'Guiding Principles' adopted by the CBD, prevention, early detection and rapid response are the best means of tackling invasive species. Applying these principles requires increased understanding of the pattern of establishment and spread of invasive alien species.

Some habitats are naturally more vulnerable to invasion than others. A recent Europe-wide study¹ shows that plant invasions are most common in nutrient-rich habitats such as coastal and riverine habitats, as well as in man-made environments such as farmland and urban landscapes. By contrast, invasion levels are low in harsh climatic environments and nutrient-poor habitats, including mountains, cliffs, bogs, dry grasslands and coniferous woodlands.

As part of the study, researchers in the Czech Republic, Spain and the United Kingdom gathered information from three very different European regions – Catalonia, in north-eastern Spain, with a predominantly Mediterranean-sub-Mediterranean climate; the Czech Republic located in central Europe, with a sub-continental climate; and the UK, with an oceanic climate – and found that, despite large differences in species,

these patterns of habitat invasion were consistent across regions.

The results of this work, carried out under the project, Integrated Assessing Large-scale Risks for biodiversity with tested Methods (ALARM)², can be used to help project the risk of

invasion of other European regions. The study's findings can also make a considerable contribution to modelling future scenarios of land-use and climate change to help identify those areas at greatest risk of invasion.

Invasion pathways

There is increasing awareness that the different means by which alien species

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2 www.alarmproject.net

Invasions by alien plant species are lower in harsh climatic environments such as mountainous regions



Photo: LIFE99 NAT/F/006299

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¹ *Habitat invasions by alien plants: a quantitative comparison among Mediterranean, subcontinental and oceanic regions of Europe.* Chytrý, M., Maskell, L.C., Pino, J. et al. (2008). *Journal of Applied Ecology*. 45: 448-458.

are introduced from one location to another, play a crucial role in the subsequent likelihood of biological invasion. Accounting for these 'pathways of introduction' should help scientists to better understand the role of species and ecosystem traits in biological invasions, aiding also the prediction of future trends and identification of management options.

Another study³, also carried out under the ALARM project, involved the design of a new framework that analyses invasion pathways used by a wide range of species – vertebrates (mammals, reptiles and birds), invertebrates (insects), plants and micro-organisms – in both land and aquatic environments. This simplified framework reduces the variety of pathways identified by the CBD down to a manageable six classifications:

- Deliberate release – game animals, biocontrol agents or plants used to shape landscapes
- Escape – from gardens, aquaculture or zoos
- Contamination – plants, pathogens and pests that are unintentionally transported
- Stowaway – in ballast water, cargo and airfreight
- Corridor – (e.g. roads, canals) which highlights the role transport infrastructures play
- Unaided – the natural spread of an alien species from another region where it is not native.

The CBD has identified a significant number of pathways that are currently not subject to legislation. These include hull-fouling, air transport, scientific research, tourism and the pet trade. Developing legislation for each one of these pathways would be extremely challenging. Instead, the researchers suggest that a simpler means of regulation would be to integrate each pathway into one of the proposed six categories. Overarching legislation could then be developed, based on the shared properties of the pathways in each category. This would take account of the type of invasion pathway and means of transport, as well

³ Grasping at the routes of biological invasions: a framework for integrating pathways into policy. Hulme, P., Bacher, S., Kenis, M. (2008). *Journal of Applied Ecology*. 45(2):403-414.



Photo: Olivier Garne, Bretagne Vivante - SEPNEB

Capture of the American mink (*Mustela vison*) in Brittany, France

as identifying who is responsible for the species introduction (exporters, carriers, or infrastructure developers) and the subsequent impacts.

Prevention

Prevention at source – that is at the place of origin or export, and on arrival (via effective border control and quarantine measures) – are the best means of halting the spread of IAS. According to the CBD Guiding Principles, prevention at source is particularly important where there are known disease outbreaks and where interception of 'hitchhiking' species may be difficult. For example, where consignments are packed into containers in a source country and transported to other destinations, often remote from traditional inspection sites at entry points. At the point of import, border controls and quarantine measures are necessary to prevent or minimise the risk of introducing alien species that are or could become invasive.

Eradication

Where possible, eradication is often the best course of action to deal with already established invasive species and the best opportunity for this is in the early stages of invasion, when populations are small and localised. These findings were highlighted in

a 2006 report on IAS carried out for the Commission by the Institute for European Environmental Policy (IEEP)⁴. The IEEP report notes that early-detection systems focused on high-risk entry points can be critically important, while post-eradication monitoring is also necessary.

At present, responsibility for eradication rests largely with individual Member States. There is, therefore, a risk that efforts taken in one Member State may be undermined by a lack of action in a neighbouring country. The report highlights the need for coordination between Member States, warning that without this: "reinvansion will often be a continuing problem and make eradication impossible".

⁴ Scope options for EU Action on invasive alien species (IAS), Miller C., Kettunen M. (June 2006). http://ec.europa.eu/environment/nature/invasivealien/docs/2006_06_ias_scope_options.pdf

Article continued on p.10 ►

Controlled eradication – knotweed (*Fallopia sachalinensis*) is injected with herbicide in order to safeguard nearby endemic plant species



Photo: Dr. Drahoslav Rázník / LIFE06 NAT/02/000121

Natura 2000 BAROMETER - June 2008

Nota Bene:

- The Natura Barometer is managed by the European Topic Centre for Biodiversity and based on information officially transmitted by Member States.
- Numerous sites have been designated according to both nature directives, either in their entirety or partially. It is therefore not possible to combine the numbers implemented under the two directives to get an overall figure for Natura 2000.
- The surface area percentage relates only to the terrestrial area that has been designated, which is the overall SPA (Birds Directive), proposed SCI, SCI or SAC (Habitats Directive) area, not including the marine area. Some Member States have designated substantial portions of their marine waters. These are included in the number of sites and areas proposed but not in the percentage surface area. The sufficiency of national proposals for several marine habitats and species cannot be determined, as further work is needed for the successful application of Natura 2000 under both directives, especially in the area of offshore marine environment.
- Several Member States have proposed large areas including "buffer zones", while others have proposed only the core areas. In both cases, Article 6 of the Habitats Directive also applies to new activities, which are foreseen outside a Natura 2000 site but likely to affect it.
- The 12 new Member States that acceded to the EU on 1 May 2004 and 1 January 2007, had a duty to classify SPAs and propose SCIs by the date of their accession. All countries have submitted their lists and evaluations are ongoing.
- The global assessment of national lists may be revised upwards or downwards, following more complete scientific analysis of the data, particularly at the relevant biogeographical seminars.

-  notably insufficient
-  incomplete
-  largely complete
-  recent significant progress




























MEMBER STATES	SPECIAL PROTECTION AREAS (SPAs) Birds Directive					
	Number of sites	Total area sites (km ²)	Terrestrial area (%)*	Number of marine sites	Marine area (km ²)	Progress
BELGIË/BELGIQUE	234	3,282	9.7	4	315	
BULGARIA	114	23,217	20.4	14	539	
ČESKÁ REPUBLIKA	38	9,653	12.2	-	-	
DANMARK	113	14,709	5.9	59	12,173	
DEUTSCHLAND	568	48,102	8.9	14	16,216	
EESTI	67	12,592	13.1	26	6,654	
ÉIRE/IRELAND	131	2,815	2.9	66	810	
ELLÁDA	163	16,755	12.3	16	567	
ESPAÑA	565	97,266	19.1	23	634	
FRANCE	371	46,194	7.8	62	3,260	
ITALIA	594	43,827	13.6	42	2,719	
KÝPROS**	7	788	13.4	1	21	
LATVIJA	98	6,766	9.7	4	520	
LIETUVA	77	5,435	8.1	1	171	
LUXEMBOURG	12	139	5.4	-	-	
MAGYARORSZÁG	55	13,519	14.5	-	-	
MALTA***	12	14	4.5	0	0	
NEDERLAND	77	10,125	12.6	6	4,895	
ÖSTERREICH	98	9,744	11.6	-	-	
POLSKA	124	50,407	14.1	4	6,463	
PORTUGAL	50	9,956	10.1	10	622	
ROMÂNIA****	108	0	0	1	0	
SLOVENIJA	27	4,656	23.0	1	3	
SLOVENSKO	38	12,236	25.1	-	-	
SUOMI	468	30,838	7.5	66	5,567	
SVERIGE	530	28,872	6.2	107	3,033	
UNITED KINGDOM	265	15,988	6.2	4	901	
EU	5,004	517,896	10.5	531	66,084	

Photo: Pedro Monteiro





Photo: LIFE02 NAT/UK/008541

SITES OF COMMUNITY IMPORTANCE (SCIs) Habitats Directive

Number of sites	Total area sites (km ²)	Terrestrial area (%)*	Number of marine sites	Marine area (km ²)	Progress	MEMBER STATES
280	3,239	10.0	2	198		BELGIUM
228	33,430	29.6	14	592		BULGARIA
858	7,251	9.2	-	-		CZECH REPUBLIC
254	11,136	7.4	118	7,959		DENMARK
4,617	53,294	9.9	48	18,086		GERMANY
498	11,429	16.8	36	3,854		ESTONIA
423	13,553	10.7	96	6,010		ÉIRE/IRELAND
239	27,641	16.4	102	5,998		GREECE
1,434	123,716	23.4	94	5,548		SPAIN
1,334	52,174	8.5	94	5,688		FRANCE
2,286	45,211	14.3	160	2,243		ITALY
36	711	11.5	5	50		CYPRUS**
331	7,663	11.0	6	562		LATVIA
267	6,664	9.9	2	171		LITHUANIA
48	399	15.4	-	-		LUXEMBOURG
467	13,929	15.0	-	-		HUNGARY
27	48	12.6	1	8		MALTA***
142	7,552	8.4	10	4,067		THE NETHERLANDS
168	8,889	10.6	-	-		AUSTRIA
364	28,904	8.1	6	3,594		POLAND
94	16,503	17.4	23	490		PORTUGAL
273	32,833	13.2	6	1,353		ROMANIA
259	6,360	31.4	3	0.2		SLOVENIA
382	5,739	11.8	-	-		SLOVAKIA
1,715	48,552	12.7	98	5,460		FINLAND
3,972	62,784	13.7	326	5 850		SWEDEN
616	26,365	6.8	44	9,724		UNITED KINGDOM
21,612	655,968	13.3	1,294	87,505		EU

- notably insufficient
- incomplete
- largely complete
- recent significant progress

The Natura 2000 Barometer: commentary on progress

The existing barometer monitors progress in the implementation of both the Habitats and the Birds Directives in all 27 countries up to June 2008.

Bulgaria and Romania have extended their lists of sites for both SPAs and SCIs. A seminar for the 5 biogeographical regions present in Bulgaria and Romania was held on 9-12 June, 2008 in Sibiu, Romania. These technical discussions have concluded that Annex I habitat types and Annex II species in the two Member States are still insufficiently represented in their national site proposals.

The SCI list for Ireland has been extended, including 4 large offshore marine sites.

With regard to evaluating the completeness of national SPA networks, there is no biogeographical screening process, but the Commission makes use of different scientific references, including national inventories, where they exist, and the Important Bird Areas' (IBAs) publications of BirdLife International.

* % of SCI or SPA terrestrial area compared to MS terrestrial area

** The area of the MS and the % corresponds to the area of Cyprus where the Community acquis applies at present, according to protocol 10 of the Accession Treaty of Cyprus

*** Several marine sites, but no information on marine areas provided in the database

**** No surface areas provided in the Romanian database

Strategies for eradicating IAS were explored in a study on the cost-effective management of invasive predator species⁵. Using a modelling approach, researchers identified the following five strategies:

- immediate eradication – targeting the complete removal of predators as soon as possible
- fixed-number control – removing a set number of predators (often chosen when finances are limited); it may eradicate predators if numbers are small
- fixed-rate control – the annual removal of a fixed percentage of predators which limits the growth in population
- upper-trigger harvest – occurring when the predator numbers rise above a certain level (used to keep predator populations at an acceptable level)
- lower-trigger harvest – occurring when the predator numbers fall below a predefined level and is used to eradicate small populations of predators.

The researchers found that given adequate funding, the immediate eradication of invasive alien predators was the most effective strategy for reducing the threat to native species. This was the case even if the predator was not completely eradicated. Where complete removal of predators is not possible and there are limited funds available, the research suggests that the 'upper-trigger harvest' method is the preferred option. This is because high density alien predator populations have the greatest impact on native species.

Research into invasive species on estuaries and coasts suggests that in these areas eradication is usually less expensive than a prolonged control programme, provided the invasion is in the early stages. Examples of successful eradications in such areas include the seaweed *Macrocystis pyrifera* in the United States and the mussel *Mytilopsis sallei* in Australia.

Containment

When eradication is not appropriate, or no longer possible, the study

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5 Cost-Effective Suppression and Eradication of Invasive Predators. Baxter, P. Sabo, J.L., Wilcox, C. et al. (2008). *Conservation Biology*. 22(1):89-98.



Introduced crayfish such as this red swamp crayfish (*Procambarus clarkii*) have displaced European native crayfish in thousands of locations

of the cost-effective management of predator species (see reference 5) suggests that limiting the spread ('containment') of invasive alien species is often an appropriate strategy, in particular where the range of the organisms or of a population is small enough to make such efforts feasible. In these situations, regular monitoring is essential and needs to be linked with quick action to eradicate any new outbreaks.

Early warning

Most studies on IAS in Europe underline the need for the implementation of an early warning system, the development of which is taken up in the EU's Biodiversity Action Plan, and has been endorsed by the European Council of Ministers. The aim is to facilitate the prompt exchange of information between neighbouring countries on the emergence of IAS and cooperation on control measures across national boundaries.

Such a system would involve regular surveillance of high-risk areas such as: (i) main entry points for commercial or tourist arrivals (airports, ports,

harbours, stations, etc); (ii) entry points for spontaneous spread (e.g. coasts, border crossings of shared water systems); (iii) areas adjacent to containment facilities for potential IAS; (iv) highly disturbed areas (e.g. land clearance, construction, storm damage); and (v) isolated ecosystems and ecologically sensitive areas.

A number of European research projects and networks, such as DAI-SIE, SEBI 2010 (supported by the EEA), NOBANIS, and ALARM are contributing to work in this area. The online publication "Aquatic Invasions"⁶ for example, is an open access, online journal focusing on biological invasions in European inland and coastal waters, and potential donor areas of aquatic invasive species for Europe. Developed by ERNAIS (European Research Network on Aquatic Invasive Species) and funded under the FP6 ALARM project, the journal facilitates the timely publication of first records of biological invaders for consideration in risk assessments and early warning systems.

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6 www.aquaticinvasions.eu

Exchange of best practice for islands



A co-operative LIFE Nature project was launched in 2002 to share know-how gained through LIFE projects (12 in total) fighting invasive alien vertebrate species on the islands of Spain and Portugal. The biodiversity of the islands have been threatened by the introduction of non-native species. The project (LIFE02 NAT/CP/E/000014) set up networking mechanisms among island administrations for the early warning monitoring and exchange of technical information. It also raised awareness of the scale of the problem and the need to carry out preventative measures to limit the introduction of alien species. A reference manual for the management of IAS, containing experiences and tips for combating invasive species, is available from the project website (Spanish only). This is a useful tool for other islands dealing with similar problems, and is already being used as an international reference document by the IUCN.

For further details, visit the website: www.gobiernodecanarias.org/cmayer/servlet/ViewDoc?id_documento=4971&id_pagina=5

EU policies for combating invasive alien species

Invasive alien species (IAS) are recognised as a serious threat to biodiversity and economic development in Europe, and are identified as a priority area for action in EU environmental policy.

The EU's Sixth Environmental Action Programme and the Communication from the European Commission on Halting the Loss of Biodiversity by 2010 and Beyond¹ and its associated Biodiversity Action Plan, highlight action on IAS as a priority objective.

The Biodiversity Action Plan calls for an EU-wide strategy to address IAS and supports the development of an early warning system to enable swift exchange of information and expertise between Member States on the emergence of invasions, and to ensure full cooperation on control measures across national boundaries. It also calls on countries to develop their own national strategies for dealing with IAS, and to implement the International Convention for the Control and Management of Ship's Ballast Water and Sediments under the International Maritime Organisation.

The Commission is now preparing, in two stages, a strategy on invasive species. This builds on existing activities and research already carried out under a number of EU-funded

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1 COM/2006/0216 final

The red-eared slider (Trachemys scripta elegans) is a popular pet. However, as a result of its release into the wild, it has become a threat to native aquatic turtles

Photo: João Pedro Silva



The American grey squirrel (Sciurus carolinensis) has been introduced into the UK, Ireland and Italy, where it threatens the local extinction of red squirrel (Sciurus vulgaris) populations

projects, such as DAISIE and ALARM, and networks including NOBANIS, ERNAIS and EPPO, and is in line with the CBD Guiding Principles, as well as a pan-European strategy on IAS, adopted by the Bern Convention.

The first stage of the process is a Communication, "Towards an EU Strategy on Invasive Species". This describes the issues at stake and explores a range of options, includ-

ing actions to address specific gaps highlighted in recent European studies². It also examines broader strategies and operational issues. Depending on the outcome, the Commission may proceed to a second stage of policy development.

Meanwhile, from March until May 2008 the Commission held a public consultation on the problem of biological invasions. The online poll³, which attracted 880 replies, revealed widespread backing for action at EU level: 91% of respondents agreed there was a need for new measures to prevent the spread of such organisms, with 85% agreeing on the importance of preventing the introduction of IAS in the wild. The majority of respondents (90%) also welcomed an EU-wide early warning system, while 86% thought that Member States should be legally obliged to take action against the most harmful IAS. The results of the public consultation are being used to better define the problems to be addressed.

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2 http://ec.europa.eu/environment/nature/invasivealien/docs/2006_06_ias_scope_options.pdf

3 http://ec.europa.eu/environment/nature/invasivealien/index_en.htm

Photo: Riccardo Scallera



Photo: LIFE00 NAT/E/007355



Aerial view of Minorca showing the spread of the non-native succulent, Cape fig or 'Carpobrotus' (*Carpobrotus edulis*)

Boosting biodiversity in the Balears

Minorca in the Spanish Balears boasts an impressive number of endemic plant species unique to the island. However, many of these species have become endangered as a result of the invasion of an introduced species, Cape fig or 'Carpobrotus' (*Carpobrotus edulis*), and the expansion of tourism.

Several Sites of Community Interest (SCIs) that form part of the Natura 2000 network are located on the island and these contain eight plant species listed in the Habitats Directive, four of which are considered priority for conservation. But the spread of *Carpobrotus*, a low-growing succulent, has severely reduced the rich biodiversity of the island, which was designated a UNESCO biosphere reserve in 1993.

Young climbers and other volunteers have been recruited to help with the removal of the plant from rocky headlands



Photo: LIFE00 NAT/E/007355

Following initial attempts by an ecological group, known by its Spanish acronym, GOB (Grup Ornitológic Balear), to remove the invasive species from certain areas, in 2001, a wide-reaching campaign was launched to completely eradicate *Carpobrotus* from Minorca. This initiative took the form of an EU co-funded LIFE Nature project, undertaken by the Consell Insular de Menorca. Pere Fraga i Arguimbau, a technician who was employed full-time by the regional authority to manage the project, says that the eradication work was successful in removing *Carpobrotus* from most of the island. Work is still continuing, even after the end of the project, to remove the plant from the remaining areas where it is present, and also to check for its reappearance.

Earlier efforts in the 1990s to remove *Carpobrotus* were small in scale and the plant was simply bundled up into mounds, which were then able to spread their seeds and thrive again. While pulling up *Carpobrotus* plants

is relatively easy work, the difficult part of the operation is its removal. Up to 2004, work to remove the plant covered around 142 hectares, giving rise to a vast amount of waste material. In those areas which were accessible to trucks, the uprooted plants could simply be taken away to landfill sites in the woods (the waste product does not make good compost and it is not easy to burn.) However, *Carpobrotus* thrives on rocky headlands, and its removal from these areas was a little more complicated. Young mountain climbers assisted in these areas and in some places a helicopter, normally used for fighting forest fires, was employed.

Local communities were also involved in the removal of the plant. In addition to ecological volunteers, the task was also assigned to unemployed persons by the social services. Fraga says that spring is the best time of year to continue the eradication work, in order to remove the plant before it flowers and also before it gets too hot. In one area, the use of machines was tested, but

their use inevitably led to the uprooting of endemic species as well as the intended plants.

Control of *Carpobrotus*

Carpobrotus, which is native to South Africa, was introduced to the island in the 1950s. While its colourful flower makes it popular with islanders, it has had a disastrous effect on the area's unique habitats. According to Fraga, there has been an 80% loss in endemic plants since its invasion. *Carpobrotus* is an aggressive species that climbs over other plants and kills them. Most islanders have been sympathetic to the attempt to eradicate it from the island. "We asked the homeowners, who have gardens where it is found, and around 80% agreed to let us remove the plant," says Fraga. However, there has been some resistance among private landowners and for this reason Consell Insular de Menorca has requested that the government officially declares *Carpobrotus* as a pest. Discussions are ongoing, but the government is reluctant to discriminate against private gardeners and growers.

Before beginning the eradication initiative, it was first necessary to find out more about the spread of the invasive species on the island. Obtaining good maps of the plant populations would make it easier to coordinate the eradication work. In shale areas mainly found in the northerly and easterly parts of the island, the plant tends to grow more

flowers but fewer branches than in limestone areas. As a result, in those areas, monitoring following removal is more frequent – every six months as compared to every two years in limestone areas. The regional authority is also checking on the effects of the removal on endemic species. In fact, it has drawn up management plans for all of the endangered species, several of which have now been approved.

The control of *Carpobrotus* represents an important step forward in the following Natura 2000 network SCIs: Costa Nord de Ciutadella, La Mola i s'Albufera de Fornells, D'Addaia a s'Albufera, S'Albufera des Grau, De s'Albufera a la Mola. These littoral areas are especially wealthy in endemic and threatened flora species such as *Anthyllis hystrix*, *Daphne rodriquezii* and *Femeniasia balearica*. The most endangered species population, *Apium bermejoi*, has also improved and is being closely monitored.

Continuing influence

While some areas have been free of *Carpobrotus* for several years now, the eradication work is ongoing as the seeds of plants in private gardens can easily be transported by the wind or ingested by rabbits and deposited up to a kilometre away. But the island's rich biodiversity is already benefiting from the removal efforts and the authorities are optimistic that it will return to its natural state before the arrival of the invasive species.



The island's rich biodiversity is already benefiting from the removal efforts

The actions taken in Minorca have also generated interest outside the island. The initiative qualified as a demonstration project for future control of invasive species initiatives in Europe in two technical events: an international workshop on invasive plants in the Mediterranean type regions of the world, held in Herault, France, in May 2005; and in the Bern Convention group of experts on invasive alien species, held in Majorca in June 2005. Initiatives for the removal of *Carpobrotus* are also taking place in the region of Valencia.



Project reference:
LIFE00 NAT/E/007355
Website:
<http://lifeflora.cime.es>



Pulling up Carprobrutus (left) is relatively easy - the difficult part is its removal. Despite its attractive flowers (right), Carprobrutus is an aggressive alien that climbs over and smothers other plants



EU Biodiversity Action Plan: mid-term review confirms need for much greater efforts to halt biodiversity loss by 2010

A first comprehensive evaluation of implementation of the EU Biodiversity Action Plan reveals that the European Union will not meet its target of halting the loss of biodiversity in Europe by 2010 on the basis of current efforts. Significant additional commitment by the European Community and its EU Member States is required over the next two years, if we are even to approach this objective.

In May 2006, the European Commission adopted a Communication on "Halting Biodiversity Loss by 2010 – and Beyond". The Communication (COM/2006/0216-final) underlined the importance of biodiversity protection as a pre-requisite for sustainable development as well as setting out a detailed Action Plan to achieve this.

Biodiversity is now higher than ever before on the EU political agenda. The spring 2008 European Council restated its commitment to strengthen efforts aimed at halting biodiversity loss by 2010 and beyond and highlighted the essential role of Natura 2000 in achieving this objective. At the global level, biodiversity loss now features as a key indicator of the Millennium Development Goals. It has recently become a regular item of the G8 summits and G8 environment ministers meetings.

However, has this high level political interest been matched by effective action to halt its loss?

This mid-term assessment represents the last real stock-taking opportunity before 2010 on progress at both European and Member State levels. It summarises the current progress for each of the four main policy areas, 10 objectives and four supporting measures, set out in the 2006 Biodiversity Communication. It outlines the most important activities that have been undertaken to implement the Biodiversity Action Plan and identifies key priorities for further action.

It reveals that it is highly unlikely that the EU will meet its 2010 tar-



Photo: LIFE00 NAT/D/007085

Some species, like the marsh fritillary, have been adversely affected by the decline in grasslands habitats

get of halting biodiversity decline based on current efforts. This will require intensive efforts over the next two years, both at the level of the EU and by the Member States, if we are even to approach this objective.

At the global level, biodiversity loss is catastrophic, with ecosystems frequently being degraded to the point where natural processes are undermined with severe economic and social impacts.

The EU biodiversity policy framework will need to be further

strengthened as there are still important gaps, such as addressing invasive species. There is also a need to put in place an effective legal framework for the conservation of soil structure and functions.

The integration of biodiversity considerations into other sectoral policy remains a key challenge. However, a problem encountered in many policy areas is the difficulty to obtain precise figures for the amount of money actually spent on biodiversity. This is often due simply to the inadequacy of recording and reporting procedures.

The Commission will continue to closely monitor the implementation of the Biodiversity Action Plan, with a view to providing in 2010 a full evaluation of the extent to which the EU has met its 2010 targets.

The report on the mid-term evaluation of the Biodiversity Action Plan is available at:

http://ec.europa.eu/environment/nature/biodiversity/comm2006/index_en.htm

Human induced fragmentation of habitats must be minimised by ensuring that infrastructure is compatible with the protection of biodiversity



Photo: istock

Natura 2000 network extended considerably



Photo: ImagOPIC/JFontes

Offshore areas are now being added to the Natura 2000 network

As this issue goes to press, the European Commission is in the process of adopting (December 2008) eight decisions that considerably extend the Natura 2000 network – adding 769 new sites of Community importance and a total area of 95 522 km² (about the size of Portugal).

The Black Sea (Bulgaria and Romania) and Steppic (Romania) biogeographical regions are new additions to the Natura 2000 network, with respectively 40 and 34 sites or 10 316 and 7 283 km² added in these regions. The decisions also extend the Natura 2000 network in the other biogeographical regions, except the Macaronesian region: Alpine, Atlantic, Boreal, Continental, Mediterranean, and Pannonian; adding the recently proposed sites of Community importance both in the Member States that joined the EU in 2004 and in several 'old' Member States that are still completing their national proposals.

The extended list of sites of Community importance also includes 36 new marine sites with a total area of 6 031 km² added to the Natura 2000 network. The Commission is planning a further update of the EU lists by the end of 2009.

For more information:

http://ec.europa.eu/environment/nature/index_en.htm

Valuing nature – TEEB report at IUCN World Conservation Congress

A special session at the recent IUCN World Conservation Congress highlighted the importance of a joint German/European Commission study, "The Economics of Ecosystems and Biodiversity (TEEB)" in enhancing the importance of biodiversity.

The report – TEEB Phase 1 (see Natura 2000 News: Issue 24 – July 2008) offers economic tools to assess the value of nature in order to better protect it. It provides first steps towards a general framework for the evaluation of biodiversity loss and conservation. It also acknowledges that major scientific challenges remain. The second phase of TEEB, which started in autumn 2008, aims to address several of these challenges.

Meanwhile, a new Call for Evidence on the economic consequences of biodiversity loss has been launched. Submissions are welcome from all sectors including scientific and research institutions, governments, local authorities and managers of natural resources, the private sector, NGOs and other experts in Europe and world-wide. The call will remain open until 31 March 2009. See:

http://ec.europa.eu/environment/nature/call_evidence.htm

Pavan Sukhdev, TEEB study leader



Photo: European Commission

Conference on ecological restoration



Photo: J. Toland

Ladislav Miko from the European Commission

Over 300 practical examples of ecological restoration were showcased at the recent SER 2008 – Sixth European Conference on Ecological Restoration, which took place in Ghent, Belgium from 8-12 September 2008.

In addition to the case studies, posters and site visits, a distinguished list of guest speakers were invited to make presentations at the plenary sessions from 9-12 September, including leading academics in the field and representatives of environmental NGOs such as the Society for Ecological Restoration (SER) and the International Union for Conservation of Nature (IUCN).

On behalf of the European Commission, Director, DG Environment, Directorate B, Ladislav Miko, spoke on the topic of "Habitats Restoration in the framework of the European conservation policy". Mr. Miko pointed to the need to strengthen links between the scientific community and the policy level. "We need conclusions and recommendations based on your experiences," he said.

LIFE and endangered plants – conserving Europe's threatened flora



Europe is endowed with a high rate of plant diversity, but despite their undeniable importance and aesthetic value, plants everywhere are under threat. This new publication explores the challenges for conservation of Europe's endangered plants and highlights the role of the LIFE programme in helping to halt biodiversity loss, and to restore threatened habitats and natural systems.

<http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/plants.pdf>

Updated hunting guide available in 22 languages



This updated document aims to clarify the requirements of the Birds Directive (79/409/EEC) relating to hunting, within the existing legal framework and

case law. In particular, it examines the issue of the timing of recreational hunting under the directive and identifies the possibilities and limitations for flexibility in fixing hunting seasons. The decision by the Commission to update the earlier version of the guidance document on hunting follows a number of key rulings related to hunting under the Birds Directive by the European Court of Justice (Cases C-79/03, C-344/03, C-135/04, C-60/05). The necessary amendments have now been made to the new version of the guide.

http://ec.europa.eu/environment/nature/conservation/wildbirds/hunting/index_en.htm

Best practice in managing Natura 2000 habitat types

The Commission has provided 25 different management case studies of Natura 2000 sites with selected habitat types and their related species that are in need of active management. The exam-

Photo: Riccardo Scalera



Invasive knotweed, Reynoutria japonica

Report on EU spending on alien species

A new report on "EU funding for management and research of invasive alien species in Europe" shows that over the last 15 years, despite the lack of a specific strategy or a dedicated financial instrument to deal with invasive alien species (IAS), the EU has contributed to financing 187 LIFE projects which address this issue. In fact, the total budget devoted to IAS has exceeded €44 million.

The report was prepared by the European Environment Agency (EEA) as part of its work on "Streamlining European 2010 Biodiversity Indicators" (SEBI 2010).

The report shows that the contribution of the LIFE programme has been characterised by an overall positive trend over the years, in terms of both the number of projects and the budget spent. On average, each year over the period 1992-2006, the EU financed 12 IAS related LIFE projects, for an average cost of €230 000 each, corresponding to a budget of almost €3 million.

The EEA report also analyses the contribution of the Framework Programmes for Research and Technological Development (RTD) to funding IAS. This showed that the number of LIFE projects dealing with IAS was higher in comparison to RTD projects, although the budget spent was lower.

<http://biodiversity-chm.eea.europa.eu/stories/eu-funding-management-and-research-invasive-alien>

ples are drawn from the latest available information, including results of management models, implemented over the course of LIFE-Nature projects. The aim is to enable site managers to apply best practice methodologies to similar habitat types in different biogeographical regions. Further information is available at:

http://ec.europa.eu/environment/nature/natura2000/management/best_practice_en.htm

Awareness raising on large carnivores

New awareness raising material on large carnivores in Europe – brown bear (*Ursus arctos*), Eurasian lynx (*Lynx lynx*), wolf (*Canis lupus*) and wolverine (*Gulo gulo*) – is available in English at the Commission's nature website:

http://ec.europa.eu/environment/nature/conservation/species/carnivores/index_en.htm



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For details on LIFE and LIFE-Nature projects see: <http://ec.europa.eu/environment/life/>



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