



The mission of the European Platform for Biodiversity Research Strategy (EPBRS) is to ensure that research contributes to halting the loss of biodiversity by 2010.

Recommendations of the meeting of the European Platform for Biodiversity Research Strategy

held under the French presidency of the EU
Montpellier, France 4th - 6th December 2000

concerning **The Biology of Invasions**

Indicative list of topics of strategic importance

An *ad hoc* specialist working group met at the request of the European platform for biodiversity research strategy to review and assess detailed priorities for future research on invasive taxa in Europe.

The working group prepared a glossary and definition of terms, also provided in annex.

The specialist working group agrees that the following research topics are of strategic importance.

1. Understanding Biological Invasions: Building a Knowledge Base

Develop methods and techniques to recognise and characterise organisms that may be invasive and ecosystems that may be particularly vulnerable to invasion; and develop predictions of invasive behaviour and ecosystem vulnerability to invasion.

Research topics of high priority include:

- 1.1. Establish metrics to describe the ecological, socio-economic and other impacts of invasions through space and time, and how these are influenced by biotopes. Develop measurements of impact that distinguish between invasive and non-invasive non-indigenous organisms through space and time.
- 1.2. Investigate and compare invasive with non-invasive organisms. Establish sets of characteristics of invasive organisms and invaded ecosystems.
- 1.3. Compare the ecology and genetics of invasive organisms in their native and invaded habitats and their evolutionary implications.
- 1.4. Identify the factors and processes that encourage or permit established taxa to become invasive. Understand factors limiting the spread and the geographic distributions of taxa. Establish what factors limit the abundance of invasive taxa, including the interaction with global and land use changes. Identify the factors that determine the delay (lag phase) before introduced taxa become invasive.

Other important research topics include:

- 1.5. Establish what evolutionary and genetic events influence invasions, and what are the evolutionary consequences of invasions.
- 1.6. Assess the relative contribution of anthropogenic factors, natural factors, and their interaction, to the process of biological invasions.

- 1.7. Understand the potential influence of invasions on ecosystems and climate change and the potential impact of global change, habitat fragmentation and fire on the vulnerability of ecosystems to invasion.
- 1.8. Establish how inoculation size or propagule pressure influences the success of invaders.
- 1.9. Develop predictive models on the invasive potential of organisms and of habitat vulnerability to invasion.

2. Management: Assessment, prevention and control

Improve monitoring methodology to detect potentially invasive organisms early; to track invasions; and to evaluate their ecological and socio-economic impacts, and, where appropriate, to control them.

Research topics of high priority include:

- 2.1. Extend systematics and update taxonomic knowledge of invasive taxa and organisms.
- 2.2. Develop methods to detect and manage invasive taxa in the major pathways such as trade, transport, tourism, travel, with emphasis on shipping and airlines.
- 2.3. Develop detection and control measures to manage non-indigenous taxa transported in ballast water tanks and hulls of ships and vessels.
- 2.4. Establish criteria that indicate the development of an invasion at an early stage. Identify pathways and vectors for potentially invasive taxa, and investigate how they are changing. Establish methods leading to early detection of the presence of potential invaders.
- 2.5. Develop methods to value the impact or potential impact of introduced taxa on biodiversity and ecosystem goods and services.
- 2.6. Develop an ecosystem approach to the control or eradication of invasives.
- 2.7. Develop methods to mitigate the impact of invasives.
- 2.8. Develop environmentally benign and appropriate methods of control or eradication of invasives.
- 2.9. Develop methods for restoration and sustainability following control.
- 2.10. Develop methods to identify, assess and allocate the costs and benefits of events and actions for potentially invasive taxa and invasions. Assess who pays the costs and who benefits from the action.

3. Institutional Aspects and Communication

Develop multi-disciplinary scientific support for appropriate policy on prevention, management for control, and legislation, public awareness and information.

Research topics of high priority include:

- 3.1. Provide scientific advice and methods to help strengthen international legal frameworks and implement national legislation and develop guidelines to minimise invasions within EU Member States and between the EU and other countries.
- 3.2. Investigate community values and attitudes towards biological invasions.

- 3.3. Develop methods to improve awareness of invasive taxa within the general public and for the major sectors including horticulture, agriculture, forestry, agroforestry, aquaculture, pet, aquaria and aid trade,
- 3.4. Establish efficient and scientifically based rules and standards for transport, trade, tourism and travel.

Other important research topics include:

- 3.5. Develop methods to assess the feasibility and success of legal, social, biological, physical and chemical strategies for control.
- 3.6. Investigate alternatives to the introduction of non-indigenous taxa (e.g. utilisation of native taxa in erosion control, restoration efforts, etc.)
- 3.7. Prepare the basis for bioengineering approaches to controlling invasive taxa.
- 3.8. Develop scientific programmes and experimental frameworks commensurate with the time scales of invasions.

4. Invasive aspects of Genetically Modified Organisms (GMO): Develop methods to predict and prevent invasive behaviour of GMOs released into the environment.

- 4.1. Quantify genetic exchange between fields as a function of the structure of the landscape.
- 4.2. Quantify genetic exchange between cultivated and wild taxa, the phenotypic expression of that genetic exchange and the impact on Darwinian fitness of the wild population.
- 4.3. Understand the dynamics of populations of cultivated taxa outside the fields where they are cultivated.
- 4.4. Quantify the changes of the dynamics in such populations of plants that are resistant to commonly used herbicides, to herbivorous insects or to plant pathogens, particularly in view of potential invasive behaviour.
- 4.5. Assess the impact of transgenes conferring resistance to pathogens or predators on the populations of target and non-target organisms.
- 4.6. Understand and quantify the environmental impact of combinations in space and time of various transgenic organisms, including cultivation sequence and the effect of other transgenic organisms in the neighbourhood.

This document is intended for further discussion via internet and by extended scientific review