

Further information:

Code of Conduct for Responsible Fisheries

<http://www.fao.org/fi/agreem/codecond/codecon.asp>

FAO Technical Guidelines for Responsible Fisheries - Precautionary Approach to Capture Fisheries and Species Introductions

<http://www.fao.org/DOCREP/003/W3592E/W3592E00.HTM>

Code of Practice on the Introduction and Transfer of Marine Organisms, 1994

<http://www.fao.org/DOCREP/003/W3592E/w3592e0b.htm#bm11.1>

Database on Introductions of Aquatic Species

<http://www.fao.org/fi/statist/fisoft/dias/index.htm>

FishCode Programme

<http://www.fao.org/fi/projects/fishcode/default.htm>

Asia Regional Technical Guidelines and Beijing Consensus

<ftp://ftp.fao.org/docrep/fao/005/x8485e/x8485e00.pdf>

Inland Water Resources and Aquaculture Service

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Cover photo: a Bangladesh farm with African catfish,
F. Hoogervorst, Photographer

INTRODUCED SPECIES IN FISHERIES

Responsible use and control



INTRODUCED SPECIES IN FISHERIES AND AQUACULTURE

Introduced species, also known as alien species, are a proven means to increase production and value from aquatic systems. However, they are now recognized as a serious threat to aquatic biodiversity, and may also cause socio-economic disruption.

*Policy-makers must balance benefits and risks. One should not ban all introductions, nor allow them to occur unregulated, but rather a **framework should be used** to decide when an introduction may be appropriate, and when it may not be.*

FAO, with assistance from member countries and other partners, has developed such a **framework** that consists of:

- **the Code of Conduct for Responsible Fisheries (CCRF)** – an overarching agreed international instrument;
- **the International Council for the Exploration of the Sea (ICES) Code** – protocols for implementing the CCRF and other international agreements;
- **the Database on Introductions of Aquatic Species (DIAS)** – a valuable information source on species introductions and impacts;
- **the Asia Regional Technical Guidelines and the Beijing Consensus** – tools for dealing with introduced pathogens risk through transboundary movement of live aquatic animals;
- **the precautionary approach** – a means to handle uncertainty and incomplete information.

The Code of Conduct for Responsible Fisheries (CCRF) was developed by FAO and its partners. Articles 7 and 9, among others, of the CCRF apply to introduced species: Article 9.3.1 calls on states to conserve genetic diversity and maintain integrity of aquatic communities and ecosystems by appropriate management; Article 7.5 calls on states to apply the **precautionary approach** widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment.

The CCRF provides several guidelines to help minimize the risks from alien species and calls on states to cooperate in managing alien species by:

- consulting with and notifying neighbouring states when an introduction is being planned (9.2.3);
- complying with other international instruments (9.3.2);
- adopting measures to reduce the risk of the spread of disease (9.3.3).

ALIEN SPECIES – SOCIO-ECONOMIC IMPACTS

The introduction of species is an established means to increase productivity and generate income in aquaculture and capture fisheries.

- The production of African tilapia in Asia is more than 1 000 000 metric tonnes; much of this is used by rural and poor communities.
- Introduced salmonids in Chile provide over US\$1.6 billion to the aquaculture industry and provide about 30 000 jobs for local people.

However, alien species may also cause socio-economic disruption.

- The introduction of alien species may change access to aquatic resources. In Bangladesh, high value Indian major carps were stocked into oxbow lakes; former users of the lakes were excluded in order to protect the new and more valuable resource.



FAO/D. Bartley

Tilapia originally from Africa being sold in a Chinese fish market



FAO/D. Bartley

Introduced Atlantic salmon in Chile

changed a primarily small-scale artisanal fisheries into a multimillion dollar commercial fishery that supports industrial processing and foreign export. The effects of an introduction can take a long time to develop and might not be sustainable. The Nile perch fishery took 20 years to develop and may now be collapsing.



Oyster culture in Yerseke, The Netherlands

- The re-introduction of European flat oyster from North America to Europe destroyed the European oyster industry. A blood-parasite, carried along with this re-introduction, rendered European flat oyster production economically unfeasible in affected areas. Now oyster production in Europe is based on the introduced Pacific oyster.

ALIEN SPECIES - BIODIVERSITY IMPACTS

Alien species have been identified as one of the most significant threats to aquatic biodiversity. They may adversely affect ecosystems and their biodiversity through:

- Basic species interactions such as **predation** and **competition**. In the Philippines and Pacific islands the Mozambique tilapia, which can tolerate brackish water, competes for algae and other resources and has displaced mullet, brackish-water shrimp and milk fish in brackish-water bodies.
- **Genetic impacts**, such as hybridization and loss of genetic diversity, through reduced population size from predation and competition. Hybridization between escaped farmed Atlantic salmon and native brown trout in Scotland has been shown to reduce the reproductive efficiency of these species.
- **Habitat alteration**. Many species of freshwater animals greatly modify aquatic habitats when placed in a new area. Notorious in this regard are crayfish, common carp and grass carp.
- **Disease impacts**. New species may bring new pathogens. The introduction of crayfish from North America to Europe also introduced the crayfish plague to European crayfish species. North American species are resistant carriers that also outcompete native European crayfish as a result of higher reproductive rates. The plague gives the invaders an additional competitive advantage by weakening stocks of native European crayfish.



Life stages of a parasitic worm (illustration) accidentally introduced into California abalone farms from South Africa. The photo shows various degrees of infestation of California red abalone – the lightly infected abalone on right appears normal.

D. Hubbard/Courtesy of California Sea Grant College Program



C. Culver/Courtesy of California Sea Grant College Program

WHAT CAN YOU (AS A DECISION-MAKER) DO?

Decisions to introduce alien species have far reaching social, economic and ecological implications and should be based on careful assessments of long-term benefits and risks. Through application of mechanisms described in this brochure, objective science-based assessments of benefits and risks can be achieved and responsible decisions regarding alien species can be made.

- **Balance benefits of an introduction against the risks.** Accurate information on the species, its history of impacts when introduced, and how and where it will be used will be crucial for informed decisions. The **ICES Code of Practice** on the Introduction and Transfer of Marine Organisms provides a mechanism for gathering and evaluating such information.
- **Investigate available information.** To facilitate decisions on the introduction of alien species, FAO offers through the **Database on Introductions of Aquatic Species (DIAS)** information needed for a first risk benefit analysis (<http://www.fao.org/fi/statist/fisoft/dias/index.htm>). DIAS contains information on experiences of species introductions and their socio-economic and ecological impacts.
- **Monitor and report actions and experiences.** Data on the introduction process and its effects should be collected and made available to the international community, so that lessons can be learned from positive or negative experiences. FAO's DIAS gives the possibility to share experiences with the international community and represents a point of reference for considered introductions in the future.
- **Raise awareness** and increase the involvement of the general public and the industry. Many bad introductions are made out of simple ignorance. The aquaculture industry should be particularly concerned as many of the most severe economic impacts have happened to aquaculture.



FAO/M. Halwart

Resource managers in Cambodia monitoring native and introduced fishes in the Mekong River Basin

ASIA REGIONAL TECHNICAL GUIDELINES AND THE BEIJING CONSENSUS

The Asia Technical Guidelines provide guidance for national and regional efforts in reducing the risk of introducing pathogens due to transboundary movement of live aquatic animals. The Beijing Consensus deals with the implementation of the Guidelines. Key elements of the Guidelines are:

- disease diagnosis
- health certification and quarantine
- disease zoning
- disease surveillance and reporting
- contingency planning
- import risk analysis
- capacity building

These Guidelines can serve as models to be used in other parts of the world.

WHAT CAN FAO DO?

FAO has pledged to help its member countries achieve three overarching global goals:

- access of all people at all times to sufficient, nutritionally adequate safe food;
- continued contribution of sustainable agriculture and rural development to economic and social progress and well-being; and
- the conservation, improvement and sustainable use of natural resources for food and agriculture.

The responsible use and control of alien species will help to achieve these goals. Specifically, FAO can assist with:

- developing national and regional policies regulating the introduction of species;
- assembling groups of experts from many disciplines to address technical, political, social and economic issues;
- assembling information sources such as DIAS;
- helping to implement the CCRF and the ICES Code of Practice on the Introduction and Transfer of Marine Organisms; and
- raising awareness of risks and benefits associated with the use of alien species through web sites, publications and other media.

This assistance can be requested through FAO's Regular Programme, FAO's Technical Cooperation Programme, FAO Regional Representations and the FishCode Programme of Global Partnerships for Responsible Fisheries.

ICES CODE OF PRACTICE ON THE INTRODUCTION AND TRANSFER OF MARINE ORGANISMS

Introductions may have undesirable ecological and genetic effects in the receiving ecosystem as well as potential economic impacts. The Code of Practice provides recommendations to reduce the risks of adverse effects that could arise from such movements.

The Code contains the following elements:

- Proposal to introduce
- Independent review of the proposal
- Advice on the proposal
- Decision on the proposal

If the decision is taken to introduce then the Code requires:

- Quarantine
- Monitoring and reporting

PRECAUTIONARY APPROACH

Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The precautionary approach requires prudent foresight and the need to take action with incomplete knowledge. It involves, *inter alia*:

- Consideration of future generations
- Prior identification of undesirable outcomes and measures to correct them
- Prioritization of conserving resources when impacts are uncertain
- Prior management authorization and review of development activities
- The appropriate placement of burden of proof