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IMPASSE

Environmental impacts of invasive alien species in aquaculture

The Challenge

Most fish species are indigenous to the area in which they are found but there are increasing numbers of non-native species being introduced throughout Europe. Some arrive through natural processes but the majority reach their destination as a result of human intervention, including aquaculture. Certain species are introduced specifically for breeding, others as accidental transfers, but all can influence the local environment, habitats and ecology.

There is a need for an overall environmental and economic assessment of the importance and impact of aquaculture-related, non-indigenous species and for the development of guidelines for minimising their effects.

Especially in view of the limited number of protocols for risk assessment and procedures for dealing with introductions, there is a need for a project to define and develop such knowledge.

The IMPASSE project is a CA designed to support the Community provisions concerning alien and locally absent species in aquaculture (see COM (2006) 154, 4.4.2006). Following a meeting with 40 technical experts in December 2003, DG Fisheries conducted a number of rounds of written consultations with the experts on drafts of the proposal. The draft entitled 'Rules governing the introduction of exotic species and on containment of stock in aquaculture' (FISH A3/RB/2004025-A3) was used as a reference point in drawing up this proposal. This draft is referred to at several points below. IMPASSE responds directly to Task 12, priority area 8.1. B.1.3.

Project Objective

The overall goal of the IMPASSE project is to develop guidelines for environmentally sound practices for introductions and translocations in aquaculture, guidelines on quarantine procedures and risk assessment protocols, and procedures for assessing the potential impacts of invasive alien species in aquaculture.

The project will mobilise a consortium of experts in the management of aquatic alien species, including persons who drafted the ICES and EIFAC Codes of Practice on Introductions and Transfers of Aquatic Organisms, and key contributors in complimentary EC projects.

Key Points

- Review of introductions and translocations in aquaculture and for aquaculture-based restocking and assess the economic importance of introductions and translocations resulting from aquaculture and aquaculture-based restocking in the Community;

EATiP Thematic Area of Relevance

TA1: Product Quality, Consumer Safety and Health

TA2: Technology and Systems

TA3: Managing the Biological Lifecycle

TA4: Sustainable Feed Production

TA5: *Integration with the Environment*

TA6: Knowledge Management

TA7: Aquatic Animal Health and Welfare

TA8: *Socio-Economics and Management*

Key Words

Alien species, invasive species, introductions, translocation, genetic interaction, wild populations, environmental impact, aquatic ecosystems, quarantine procedures, risk assessment, risk management

Project Information

Contract number:

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[http://www2.hull.ac.uk/science/](http://www2.hull.ac.uk/science/biological_sciences/research/hifi/impasse.aspx)

[biological_sciences/research/hifi/](http://www2.hull.ac.uk/science/biological_sciences/research/hifi/impasse.aspx)

[impasse.aspx](http://www2.hull.ac.uk/science/biological_sciences/research/hifi/impasse.aspx)



- Audit the state of knowledge of the results of operations concerning introductions and translocations of aquatic organisms for aquaculture purposes, particularly concerning environmental and economic impacts and genetic interactions with wild populations; to analyse the economic importance of restocking, particularly for community aquaculture enterprises;
- Develop risk assessment protocols for future aquatic species introductions and aquaculture, with specific models and sub-routine assessments to consider economic issues, the potential environmental and economic impacts of diseases in wild aquatic organisms and ecosystems, genetic interactions with wild populations, and the disruption of ecosystem structure and function. Special attention will be given to assessing whether modern land-based closed aquaculture facilities can be considered bio secure and to what extent movements into these facilities can be differentiated from movement into open aquaculture facilities under Community rules;
- Provide guidelines for quarantine procedures to account for phylum-specific peculiarities, developmental stages and risk levels, including procedures for containment and control where invasive species are identified as a problem; and
- Provide guidelines for environmentally sound practices for introductions and translocations in aquaculture and stock enhancement operations.

Output Highlights

Database

A central database was established to store all available information on when, where and for what purpose species were introduced into Europe. This was complemented by information on the impacts of these introductions on transfers of disease and pathogens, disruption of ecosystem functioning and ecological interactions, including biodiversity, and genetic interactions with wild populations. In addition, mechanisms for assessing the economic and social impacts of introductions were examined, because of the considerable societal implications of invasive species on ecosystem functioning and loss of biodiversity. The central database holds information about 1945 introduction events from all European countries, concerning 703 species introductions, of which 325 were indicated as target species, 295 as non-target.

Review of available information

A comprehensive review of available information indicated, unsurprisingly, most introductions, either deliberate or accidental, were found to have negative effects on indigenous fish communities and other fauna through predation, competition, loss of genetic integrity, reduction of biodiversity, introduction of pathogens and change in ecosystem dynamics.

Risk assessment protocols and guidelines for the responsible introduction of species for aquaculture

A review of existing risk assessment protocols relating to operations concerned with the introduction and translocation of species was undertaken and a scheme was developed using a modular framework approach. The scheme assesses the environmental and economic risks of species introductions, and provides managers and policy makers with the information necessary to develop mitigation measures to minimise adverse impacts. Primary versions of these risk identification toolkits are available here: <http://www.cefas.co.uk/projects.aspx>

The toolkits available packages are:

- Non-native risk assessment toolkits
- FISK (freshwater fish)
- FI-ISK (freshwater invertebrates)
- MFISK (marine fish)
- MI-ISK (marine invertebrates)
- AmphISK (Amphibia)

These modules remain in the preliminary stage of development and further resources are needed to make them readily accessible on the Internet.

EU legislation covering alien species

The extent of which invasive alien species and their impacts are covered by existing legislations was examined and found to be limited. There are no comprehensive instruments at an EU level to tackle invasive alien species; existing legislation suffers from incomplete coverage, legal uncertainty, variation in the level of response among Member States level of response and insufficient coordination. For that reason, Council Regulation (No 708/2007) was considered appropriate to cover introduction of non-native species for aquaculture purposes. However, strategies to implement the regulation are needed and a framework is provided.

The project has offered considerable support to the Commission, advising on species that should be included in Annex IV of the Council Regulation 708/2007, which allows them to be imported into the EU without a specific licence.

Quarantine procedures and guidelines for future aquatic species introductions and transfers

A report on quarantine procedures, in the broadest sense, for a range of organisms for use in aquaculture operations was prepared. Information on technical characteristics of facilities (open versus closed facilities), effluent and waste treatment and disposal, physical containment, biosecurity and personnel is provided.

Guidelines for future aquatic species introductions and transfers were developed specifically to minimise alien species impacts.

Guidelines for quarantine procedures, intended for use at country of origin or entry were produced to minimise spread of pathogens and disease. Furthermore, procedures were developed to assist eradication, containment and control procedures.

Stakeholder consultation

Considerable effort was put into consulting stakeholders over the proposed risk assessment protocols and guidelines and the information was presented at the final project conference held in Florence, Italy in November 2008 (see www.hull.ac.uk/hifi/impasse.html for details).

Dissemination of knowledge

An objective of the IMPASSE project was to develop guidelines and protocols for environmentally sound practices for introductions and translocations in aquaculture. It was recognised as important that these guidelines are accepted by the endusers and stakeholders. To meet this requirement, the outputs were delivered directly to the end-users through the Federation of European Aquaculture Producers (Partner 8).

Two of workshops were carried out: one for Eastern Europe, in Szarvas, Hungary in November 2007 and the second associated with the international conference for practitioners and stakeholders held in Florence Italy in November 2008. In addition, the outputs have been, and will continue to be, disseminated through numerous meetings, workshops and conferences involving the aquaculture sector.

The Full Report:

For a comprehensive description of the research project, visit: http://www2.hull.ac.uk/science/biological_sciences/research/hifi/impasse.aspx

Next Steps – Suggested Actions/Follow On



Policy

- IMPASSE will help deal with invasive alien organisms in the aquatic environment with specific relevance to the Habitats Directive (92/43/EC), GMO Directive (2001/18/EC), the EIA Directive (97/11/EC), and the Animal Health Conditions of Aquaculture Animals Directive (91/67/EEC).
- Guidelines produced by IMPASSE will help harmonise approaches to limiting the spread of non-indigenous species and pathogens throughout Europe and will also help policy-makers ensure that developments in European aquaculture take place in compliance with international treaty obligations.
- The economic risk assessment will provide models to help ensure a competitive European aquaculture industry.

Related Publications/Projects

Publications:

Angelopoulos, N., Cowx, I. G. & Nunn, A. D. (2008). Review of existing guidelines: advantages and constraints. Report to EC, 46 pp.

Britton, J. R., Midtlyng, P. J., Persson, G., Joly, J. P., Gherardi, F., Nunn, A. D. & Cowx, I. G. (2009). Assessment of mitigation and remediation procedures, and of contingency plans. Report to EC, 54 pp.

Copp, G. H., Areikin, E., Benabdelmouna, A., Britton, J. R., Cowx, I. G., Gollasch, S., Gozlan, R. E., Jones, G., Lapègue, S., MacLeod, A., Midtlyng, P. J., Miossec, L., Nunn, A. D., Occhipinti-Ambrogi, A., Olenin, S., Russell, I. C., Peeler, E. & Savini, D. (2008). Review of risk assessment protocols associated with aquaculture, including the environmental, disease, genetic and economic issues of operations concerned with the introduction and translocation of species. Report to EC, 91 pp.

- Copp, G. H., Britton, J. R., Jeney, G., Joly, J. P., Gherardi, F., Gollasch, S., Gozlan, R. E., Jones, G., MacLeod, A., Midtlyng, P. J., Miossec, L., Nunn, A. D., Occhipinti-Ambrogi, A., Oidtmann, B., Olenin, S., Peeler, E., Russell, I. C., Savini, D., Tricarico, E. & Thrush, M. (2008). Risk assessment protocols and decision making tools for use of alien species in aquaculture and stock enhancement. Report to EC, 85 pp.
- Cowx, I. G., Angelopoulos, N. & Nunn, A. D. (2009). Quarantining procedures. Report to EC, 40 pp.
- Cowx, I. G., Angelopoulos, N., Nunn, A. D., Britton, J. R. & Copp, G. H. (2009). Guidelines for environmentally-sound practices for introductions and translocations in aquaculture. Report to EC, 64 pp.
- Cowx, I. G., Miossec, L., Lapègue, S. & Nunn, A. D. (2008). Analysis of changes in genetic integrity of indigenous populations resulting from alien species introduction and genetically-modified organisms. Report to EC, 27 pp.
- Cowx, I. G., Nunn, A. D. & Angelopoulos, N. (2008). Role of alien species in European aquaculture, with linkages to fisheries. Report to EC, 30 pp.
- Gollasch, S., Cowx, I. G. & Nunn, A. D. (2008). Analysis of the impacts of alien species on aquatic ecosystems. Report to EC, 148 pp.
- Gollasch, S., Nunn, A. D. & Cowx, I. G. (2009). Synthesis scientific report on impacts with bibliography. Report to EC, 29 pp.
- Gollasch, S., Miossec, L., Peeler, E. & Cowx, I. G. (2008). Spread of novel pathogens and diseases caused by the introduction of alien species. Report to EC, 69 pp.
- Gozlan, R. E., Nunn, A. D., Britton, J. R. & Cowx, I. G. (2008). Review of the impacts of introductions on the aquatic environment and ecosystem services. Report to EC, 23 pp.
- Jones, J. & Kasamba, E. (2008). Social and economic impacts of alien species introductions: decision tools for aquaculture. Report to EC, 27 pp.
- Occhipinti-Ambrogi, A., Savini, D., Cowx, I. G., Copp, G. H. & Nunn, A. D. (2008). Analysis of drivers of the use of introduced species and dispersal mechanisms from aquaculture related activities. Report to EC, 26 pp.
- Olenin, S., Didžiulis, V., Ovčarenko, I., Olenina, I., Nunn, A. D. & Cowx, I. G. (2008). Review of introductions of aquatic species in Europe. Report to EC, 41 pp.