

**ICES Code of Practice on the
Introductions and Transfers
of Marine Organisms 2005**

**Code de Conduite du CIEM pour les
Introductions et Transferts
d'Organismes Marins 2005**



International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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Preamble

Global interest in marine aquaculture (mariculture) began to increase dramatically in the 1950s and 1960s. A natural complement to this interest was the search for fish, shellfish (molluscan, crustacean, and echinoderms), and plant species whose biology was well known and which already had achieved or could achieve success in extensive cultivation or which could be of interest in research. Once identified, these species were thus potential candidates for movement to new locations in the world for the purpose of establishing new fisheries and new mariculture resources. Such animals and plants that are not native to these new locations are defined as species transported intentionally or accidentally by a human-mediator vector into aquatic habitats outside their native range, including secondary introductions by human-mediated or natural vectors. Other terms used for such introductions are alien, exotic, invasive, foreign, non-native, immigrant, neobiota, naturalized, or non-indigenous.

While the Code of Practice was originally developed for marine aquaculture activities, by far the largest number of introductions in recent years have been for re-stocking or enhancement purposes, but the same principles should apply.

While great successes have been achieved by these activities, leading to the creation of new and important fishery and mariculture resources, three challenges have surfaced over the past several decades relating to the global translocation of species to new regions.

The first challenge lies in the ecological and environmental impacts of introduced and transferred species, especially those that may escape the confines of cultivation and become established in the receiving environment. These new populations can have an impact on native species.

The second challenge stems from the potential genetic impact of introduced and transferred species, relative to the mixing of farmed and wild stocks as well as to the release of genetically modified organisms.

The third challenge is posed by the inadvertent coincident movement of harmful organisms associated with the target (host) species. The mass transfer of large numbers of animals and plants without inspection, quarantine, or other management procedures has inevitably led to the simultaneous introduction of pathogenic or parasitic agents causing harm to the development and growth of the new fishery resources and to native fisheries.

In recent years, for example, the release of exotic organisms via ships' ballast water has become a pressing issue with profound implications for fisheries resources, mariculture, and other activities. These issues are dealt with separately by the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV), and are not considered within this code.

The International Council for the Exploration of the Sea, through its Working Group on Introductions and Transfers of Marine Organisms and in cooperation with other ICES Working Groups and with the European Inland Fisheries Advisory Commission (EIFAC) of the Food and Agriculture Organization of the United Nations (FAO), has addressed these three levels of concern since 1973.

On 10 October 1973, the Council adopted the first version of what was to become an internationally recognized "Code of Practice" on the movement and translocation of non-native species for fisheries enhancement and mariculture purposes. The Code was set forth "to reduce

the risks of adverse effects arising from introduction by non-indigenous marine species”. Subsequent modifications, proposed by the ICES Working Group on Pathology and Diseases of Marine Organisms in 1978 and by the then newly reconvened ICES Working Group on the Introduction of Non-Indigenous Marine Organisms in 1979, led to the publication of a “Revised Code”, adopted by ICES in October 1979. The “1979 Code” became the standard for international policy and the version of the Code most widely used, cited, and translated for the next ten years. Minor revisions and additions over the decade resulted in the adoption in October 1990 of a “1990 Revised Code”, followed by the “1994 Code” adopted by ICES in September 1994 (ICES, 1995). The “1994 Code” took into account several updates and included genetic issues for the first time.

*The **2005 Code**, presented here, includes all concerns expressed in the 1994 Code of Practice (ICES, 1995) and follows the precautionary approach adopted from the FAO principles (FAO, 1995), with the goal of reducing the spread of exotic species. It accommodates the risks associated with current commercial practices including trade in ornamental species and bait organisms, research, and the import of live species for immediate human consumption (these are not species that are intended to be released to the environment, so a notification to ICES is neither appropriate nor practical). It also includes species that are utilized to eradicate previously introduced harmful and native species, as well as genetically modified organisms (GMOs) and polyploids (specifically triploids and tetraploids). It outlines a consistent, transparent process for the evaluation of a proposed new introduction, including detailed biological background information and an evaluation of risks.*

ICES views the Code of Practice as a guide to recommendations and procedures. As with all Codes, the current Code has evolved with experience and with changing technological developments. This latest version of the Code reflects the past thirty years of experience with the evolution of new fisheries and genetic technologies. While initially designed for the ICES Member Countries concerned with the North Atlantic and adjacent seas, all countries across the globe are encouraged to implement this Code of Practice. Public awareness of the concerns associated with introductions and transfers of marine organisms is essential to assist in the prevention of problems associated with such introductions. Countries are therefore encouraged to ensure the widest distribution of this code.

A brief outline of the ICES Code of Practice 2005

The ICES Code of Practice sets forth recommended procedures and practices to diminish the risks of detrimental effects from the intentional introduction and transfer of marine (including brackish water) organisms. The Code is aimed at a broad audience since it applies to both public (commercial and governmental) and private (including scientific) interests. In short, any persons engaged in activities that could lead to the intentional or accidental release of exotic species should be aware of the procedures covered by the Code of Practice.

The Code is divided into ten sections of recommendations relating to: (I) a strategy for implementation, (II) the steps to take prior to introducing a new species, (III) the steps to take after deciding to proceed with an introduction, (IV) policies for ongoing introductions or transfers which have been an established part of commercial practice, (V–VII) the steps to take prior to releasing genetically modified organisms, and (VIII–X) the steps to take prior to releasing polyploidy organisms. A section on “Definitions” is included with the Code.

The contents of Sections II–VII have been referred to above and in ICES reports (ICES, 1984, 1988, and 1994). Section I provides a strategy for implementation. In recent years, for example, the release of exotic organisms via ships’ ballast water has become a pressing issue, with profound implications for fisheries resources, mariculture, and other activities. Sections V–VII dealing with genetically modified organisms (GMOs) have been revised by the Working Group on the Application of Genetics in Fisheries and Mariculture (ICES, 2002). Sections VIII–X, dealing with polyploidy organisms, have been revised by the Working Group on the Application of Genetics in Fisheries and Mariculture in 2004, updating the 2003 version of the Code.

The Code is presented in a manner that permits broad and flexible application to a wide range of circumstances and requirements in many different countries, while at the same time adhering to a set of basic scientific principles and guidelines.

ICES Member Countries contemplating new introductions are requested to present in good time to the Council a detailed prospectus on the rationale and plans for any new introduction of a marine (brackish) species; the contents of the prospectus are detailed in Section II of the Code and Appendix A (see summary below and www.ices.dk). The Council may then request its Working Group on Introductions and Transfers of Marine Organisms (WGITMO) to consider the prospectus and comment on it. The Working Group, in turn, may request more information before commenting on a proposal. Guidelines to be followed are described, with details in appendices on the ICES Website.

If any introduction or transfer proceeds following approval, ICES requests Member Countries to keep the Council informed about it, both through providing details of the broodstock established and the fate of the progeny, and through submitting progress reports after a species is released into the wild. The specifics of this stage are detailed in Section III of the Code.

ICES has published two extended guides to the Code, one in 1984 as Cooperative Research Report No. 130, entitled “Guidelines for Implementing the ICES Code of Practice Concerning Introductions and Transfers of Marine Species”, and another in 1988 as Cooperative Research Report No. 159, entitled “Codes of Practice and Manual of Procedures for Consideration of Introductions and Transfers of Marine and Freshwater Organisms”. These reports are available in many libraries and from the ICES Secretariat. ICES views the Code of Practice as a guide to recommendations and procedures. As with all Codes, the current Code has evolved with experience and with changing technological developments. This latest (2005) version of the Code reflects the past 30 years of experience with the evolution of new fisheries and genetic technologies.

We are pleased to present the ICES Code of Practice in this fashion for wide consideration, and we welcome advice and comments from both Member Countries and our colleagues throughout the world. Recommendations and suggestions should be directed to the General Secretary of ICES in Copenhagen, Denmark.

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All introductions and transfers of marine organisms carry risks associated with target and non-target species (including disease agents). Once established, introduced species can spread from foci of introductions and have undesirable ecological, genetic, economic, and human health impacts.

Introductions of marine organisms occur in the course of many human activities, including but not limited to aquaculture, stocking, live trade (e.g., species used for aquaria, ornamentals, bait, and food), research, biocontrol, and the use of genetically modified organisms. Even species introduced intentionally into closed systems can be released accidentally. Thus, introductions can result whenever live organisms are moved, regardless of the original intent. As a result, a risk of introduction and subsequent impacts exists with any movement and should be considered explicitly.

This Code of Practice provides a framework to evaluate new intentional introductions, and also recommends procedures for species that are part of current commercial practices to reduce the risk of unwanted introductions, and adverse effects that can arise from species movement.

I) Strategy for implementation

- a) To protect indigenous as well as previous intentionally introduced species and to meet international obligations (e.g., Convention on Biological Diversity), agencies of Member Countries should fully implement the Code of Practice and apply all regulatory measures possible to prevent unauthorized introductions.
- b) To reduce illegal and unauthorized introductions, Member Countries are also encouraged to increase public awareness about the risks associated with importing live products.
- c) Countries that are not members of ICES are encouraged to adopt such management measures.

II) Recommended procedure for all species prior to reaching a decision regarding new introductions

- a) Member Countries contemplating any new introduction are expected to submit to the Council well in advance a detailed prospectus (see Appendix A) on the proposed new introduction(s) for evaluation and comment.
- b) The prospectus should include the purpose and objectives of the introduction, the stage(s) in the life cycle proposed for introduction, the native range, the donor location, and the target area(s) of release. The prospectus should also include a review of the biology and ecology of the species as these pertain to the introduction (such as the physical, chemical, and biological requirements for reproduction and growth, and natural and human-mediated dispersal mechanisms) and information on the receiving environment.
- c) The prospectus should also provide a detailed analysis of the potential impacts on the aquatic ecosystem of the proposed introduction. This should include, wherever possible, assessments from previous introductions. This analysis should include a thorough review of:
 - 1) the ecological, genetic, and disease impacts and relationships of the proposed introduction in its natural range and donor location;
 - 2) the expected ecological, genetic, and disease impacts and relationships of the introduction in the proposed release site and projected range, as well as vectors for further distribution;
 - 3) an economic assessment, where appropriate.

- d) The prospectus should conclude with an overall assessment of the issues, problems, and benefits associated with the proposed introduction. An evaluation of risks (see Appendix B) should be included.
- e) Upon review of the prospectus, the ICES Council will provide comments and recommendations on the proposed introduction.

III) If the decision is taken to proceed with the introduction

- a) Using internationally recognized protocols, such as the Office International des Epizooties (OIE), or any other appropriate protocols available at the time, review the health records of the donor location and surrounding area of the organisms to be introduced.
- b) The introduced organisms should be used to establish a broodstock for the production of progeny. The organisms should be transferred into a quarantine facility (see Appendix C). This facility should be in the recipient country or other location agreed to by the recipient country.
- c) The imported consignment(s) is not to be released to the wild, and should be separated from subsequent progeny.
- d) Only progeny of the introduced species may be transplanted into the natural environment, provided that:
 - 1) a risk assessment indicates that the likelihood of negative genetic and environmental impacts is minimal;
 - 2) no disease agents, parasites, or other non-target species become evident in the progeny to be transplanted; and
 - 3) no unacceptable economic impact is to be expected.
- e) During the pilot phase, the progeny, or other suitable life stages, should be placed on a limited scale into open waters to assess ecological interactions with native species, and especially to test risk assessment assumptions. Contingency plans, including the removal of the introduced species from the environment, should be ready for immediate implementation.
- f) A monitoring programme addressing specific issues (see Appendix D) of the introduced species in its new environment should be undertaken, and annual progress reports should be submitted to ICES for review at meetings of the Working Group on Introductions and Transfers of Marine Organisms until the review process is considered complete.

IV) Recommended procedure for introduced or transferred species which are part of current commercial practice

- a) All products should originate from sources in areas that meet current codes, such as the OIE International Aquatic Animal Health Code or equivalent EU directives.
- b) Live products destined for consumption, processing, and aquarium or display should not be placed into the natural environment.
- c) For organisms to be released into the natural environment, there should be documented periodic inspections (including microscopic examination) of material prior to exportation to confirm freedom from exotic accompanying (non-target) species including disease agents. If an inspection reveals any undesirable development, it must be immediately reported and importation must be immediately discontinued. Findings and remedial actions should be reported to the International Council for the Exploration of the Sea.
- d) If required, there should be inspection, disinfection, quarantine or destruction of the introduced organisms and transfer material (e.g., transport water, packing material, and containers) based on OIE or EU directives.
- e) Consider and/or monitor the genetic impact that introductions or transfers have on indigenous and previously introduced species or distinct genetic stocks, to reduce or prevent detrimental changes to genetic diversity.

Note: It is recognized that different countries will have special requirements for the inspection and control of the consignment in the donor and recipient countries.

V) General considerations regarding the release of genetically modified organisms (GMOs)

- a) Recognizing that little information still exists on the genetic, ecological, and other effects of the release of genetically modified organisms into the natural environment (where such releases may result in the mixing of altered and wild populations of the same species, and in changes to the environment), the Council urges Member Countries to establish strong legal measures¹ to regulate such releases, including the mandatory licensing of physical or juridical persons engaged in genetically modifying, or in importing, using, or releasing any genetically modified organism.

VI) Recommended procedure for all GMOs prior to reaching a decision regarding new releases

- a) Member Countries contemplating any release of genetically modified organisms into open marine and brackish environments are requested at an early stage to notify the Council about such releases. This notification should include a risk assessment of the effects of this release on the environment and on natural populations.
- b) GMO risk assessment should particularly involve consideration of:
- 1) The genetic and phenotypic characteristics of the modified organism, i.e., both the traits introduced or modified and other secondary phenotypic changes induced by the genetic modification, such as the construction and/or vector employed. The significance of the introduced or modified trait in relation to the biology of the parental organism should be evaluated;
 - 2) Characteristics of the ecosystems that the GMO might access;
 - 3) Possible interactions of the GMO with species of the ecosystems that might be accessed, in order to determine whether the release of the GMO poses genetic and/or ecological hazards.
- c) If possible, experiments in simulated natural environments are recommended. Such experiments should be conducted using secure systems to prevent escapes of GMOs from the experimental facilities at any life stage. The following points should be particularly assessed and reported:
- 1) Phenotypic traits associated with the GMO in a simulated natural environment;
 - 2) The behaviour of transgenic aquatic organisms in a simulated natural environment;
 - 3) The competitive advantages/disadvantages of transgenic aquatic organisms;
 - 4) The degree to which transgenic aquatic organisms are capable of mating with a native population, including their reproductive performance in competition with wild conspecifics;
 - 5) The success of that mating as defined by numbers of offspring;
 - 6) The relative fitness of juveniles of pure transgenic crosses, hybrids between native and transgenic crosses, and the pure native crosses.

¹ Such as the European Economic Community "Council Directive of 12 March 2001 on the Deliberate Release into the Environment of Genetically Modified Organisms (2001/18/CE)", Official Journal of European Communities, No. L, 106: 1-39 (2001).

VII) If the decision is taken to proceed with the release, the following action is recommended:

- a) It is recommended that initial releases of transgenic (GMO) organisms be reproductively sterile in order to avoid transfer of the gene construct to wild organisms. However:
 - 1) Mass production of sterile progeny requires the maintenance of fertile transgenic parental stocks. The risk assessment of these stocks should also be addressed;
 - 2) It should be noted that many current sterilization techniques are not 100% efficient and that many aquatic species have very high fecundity;
 - 3) Mass releases of sterile organisms could still negatively impact the ecosystem and affect wild populations through competition.
- b) Monitoring should be undertaken to ensure that GMOs, due to their nature, do not negatively affect wild populations and ecosystems after their release.

VIII) General considerations regarding the release of polyploid organisms

- a) The technology now exists to allow the production of triploid and tetraploid fish and shellfish (polyploid) in commercial quantities. However, little information exists on the genetic, ecological, and other effects of the release of polyploid organisms into the natural environment (where such releases may result in the mixing of altered and wild populations of the same species, hybridization between species, and in changes to the environment). Triploid organisms offer a means of inducing sterility, and can be produced in the laboratory with chemical treatments, heat or pressure shock. Tetraploid organisms when crossed with diploids of the same species are a means of producing triploids through sexual recombination. Triploids and tetraploids pose similar but different threats to the environment from those of GMOs. The procedures recommended for GMOs apply to tetraploids which are fertile and therefore have potential for genetic as well as ecological interactions with wild stocks and ecosystems. By nature of their sterility, triploid organisms require modified procedures.

IX) Recommended procedure for triploids prior to reaching a decision regarding new releases

- a) Member Countries contemplating any release of triploid organisms into open marine and brackish environments are requested at an early stage to notify the Council about such releases. This notification should include a risk assessment of the effects of this release on the environment and on natural populations.
- b) Triploid risk assessment should particularly involve consideration of:
 - 1) An evaluation of the sterility of the organisms and population (some induction techniques are not 100% effective). This is of particular concern with introducing triploid non-native species;
 - 2) The phenotypic characteristics of the triploid organism;
 - 3) Characteristics of the ecosystems that the triploid might access;
 - 4) Possible interactions of the triploid with species of the ecosystems that might be accessed, in order to determine whether the release of the triploid poses ecological hazards.
- c) If possible, experiments in simulated natural environments are recommended. Such experiments should be conducted using secure systems to prevent escapes of triploids from the experimental facilities at any life stage. The following points should be particularly assessed and reported:

- 1) Phenotypic traits associated with the triploid in a simulated natural environment;
- 2) The behaviour of triploid aquatic organisms in a simulated natural environment;
- 3) The competitive advantages/disadvantages of triploid aquatic organisms.

X) If the decision is taken to proceed with the release, the following action is recommended:

- a) The mass releases of sterile organisms could still negatively impact the ecosystem and affect wild populations through competition.
- b) Monitoring should be undertaken to ensure that triploids, due to their nature, do not negatively affect wild populations and ecosystems after their release.

Definitions

For the application of this Code, the following definitions shall be used.

Aquarium (= ornamental) species

All species imported or transferred into confinement for ornamental indoor or outdoor use.

Bait organisms

Live specimens used (e.g., on a hook or in a trap) to allure target species.

Biocontrol species

The intentional release of an organism that is intended to consume, infect, or debilitate a selected species to decrease its population size. Note: The possible limited specificity of biocontrol species is of concern as native species might be negatively affected.

Broodstock

Specimens of a species in any life stage from which a first or subsequent generation/growth may be produced for possible introduction to the environment.

Current commercial practice

Established and ongoing cultivation, rearing, or placement of an introduced or transferred species in the environment for economic or recreational purposes, which has been ongoing for a number of years.

Disease agent

Any organism, including parasites and prions which causes or contributes to the development of a disease.

Donor location (= source localities)

Specific localities in a country or zone from which the import or transfer originates.

Genetic diversity

All of the genetic variation in an individual population, or species.

Genetically modified organism (GMO)

An organism in which the genetic material has been altered anthropogenically by means of recombinant DNA technologies. This definition includes transgenic organisms, i.e., an organism bearing within its genome one or more copies of novel genetic constructs produced by recombinant DNA technology, but excludes chromosome manipulated organisms (i.e., polyploids), where the number of chromosomes has been changed through cell manipulation techniques.

Indigenous (= native) species

A species or lower taxon living within its natural range (past or present) including the area which it can reach and occupy using its natural dispersal systems (modified after CBD, GISP).

Introduced species (= non-indigenous species, = exotic species)

Any species transported intentionally or accidentally by a human-mediated vector into aquatic habitats outside its native range. Note: Secondary introductions can be transported by human-mediated or natural vectors.

Marine species

Any aquatic species that does not spend its entire life cycle in fresh water.

Native range

Natural limits of geographical distribution of a species (modified after Zaitsev and Ozturk, 2001).

New introduction

The human-mediated movement of a species outside its present distribution.

Non-target species

Any species inadvertently accompanying in, on, or with the species intended for introduction or transfer.

Polyploidy

An organism or cell having more than two haploid sets of chromosomes.

Progeny

Next generation(s) of an organism. Also included are new stages/fragments of seaweeds, protists, and clonal organisms.

Quarantine

The facility and/or process by which live organisms and any of their accompanying organisms can be held or reared in isolation from the surrounding environment.

Release

Voluntary or accidental dissemination of an organism, or its gametes, outside its controlled area of confinement.

Tetraploid

An organism or cell having four haploid sets of chromosomes.

Transferred species (= transplanted species)

Any species intentionally or accidentally transported and released within areas of established populations, and continuing genetic flow where it occurs.

Triploid

An organism or cell having three haploid sets of chromosomes.

Vector

Any living or non-living carrier that transports living organisms intentionally or unintentionally.

Zone

Part of a coastal area or an estuary of one or more countries with the precise geographical delimitation that consists of a homogeneous hydrological system (modified after OIE).

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Overview of appendices to the Code of Practice

The following provides an overview of the four Appendices referred to in the 2003 version of the ICES Code of Practice on the Introductions and Transfers of Marine Organisms. To ensure that the appendices are current and that the most recent information is included, appendices (with an example of a case study) will only be available on the Internet.

Appendix A. Prospectus

This Appendix provides detailed information on suggested guidelines for the prospectus including, but not limited to:

- potential of transfer of disease agents, parasites, and non-target species;
- review of previous introductions of the candidate species.

This information is used to conduct the biological risk assessment (see Appendix B). To be scientifically valid, the information provided needs to be based on a thorough literature review.

The prospectus also needs to include a contingency plan in case immediate eradication of the introduced species needs to be carried out.

The proponent should design an appropriate monitoring programme that will document impacts in the receiving environment.

Appendix B. Risk Assessment

This Appendix provides a detailed, consistent approach for evaluating the risk of genetic, ecological, and disease impacts in the proposed receiving environment, as well as the potential for introducing non-target species. This review should be based in part on the information provided in the Prospectus (see Appendix A).

There will be an assessment of each potential hazard as to the probability of the establishment and consequences of the establishment in the receiving environment. Mitigation factors and management issues will also be reviewed.

The precautionary principle will be taken into account in the final outcome of the risk assessment.

Appendix C. Quarantine

The intention of the quarantine process is to:

- prevent the escapes of target and non-target species into the environment;
- ensure freedom from disease agents in broodstock and progeny prior to release from the quarantine system;
- protect broodstock.

The size of the facility, and the extent of the quarantine measures, will depend on the characteristics of the species being introduced. Quarantine measures may also be required for some species transfers.

The Appendix provides detailed information on suggested requirements for quarantine facilities including, but not limited to:

- transport of broodstock;
- quarantine facilities;
- stock management in isolation;
- record keeping;
- disinfection.

Appendix D. Monitoring

The purpose of the monitoring programme is to assess the impact of the introduced organisms on the environment, ecosystem function, and biodiversity (including genetic biodiversity). The monitoring should be adjusted according to the type of organism and its potential dispersal range. The vectors responsible for further dispersal need to be identified.

Appropriate monitoring should be carried out in phases:

- initial baseline monitoring study before the introduction;
- continuing monitoring subsequent to pilot study release; and
- continuing monitoring following increases in scale of project.

The results of the monitoring may be reported to and assessed by WGITMO before the next phase is undertaken. Questions outlined in the Appendix should be addressed as far as possible.