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GUIDELINES FOR IMPLEMENTING THE ICES CODE OF PRACTICE
CONCERNING INTRODUCTIONS AND TRANSFERS
OF MARINE SPECIES

by

Working Group on Introductions and Transfers of
Marine Organisms

International Council for the Exploration of the Sea
Palægade 2-4, 1261 Copenhagen K
Denmark

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GUIDELINES FOR IMPLEMENTING THE ICES CODE OF PRACTICE
CONCERNING INTRODUCTIONS AND TRANSFERS
OF MARINE SPECIES

This document has been prepared and reviewed by the Working Group on the Introductions and Transfers of Marine Organisms. It attempts to clarify information relevant to the revised Code of Practice concerning introduced species as approved by the Council at its 1979 Statutory Meeting.

Included are the following sections:

- I. The revised Code of Practice as approved by the Council at its 1979 Statutory Meeting;
- II. A list of definitions for the application of the Code;
- III. An augmentation and explanation of each of the sections of the Code, as appropriate.

REVISED CODE OF PRACTICE TO REDUCE THE RISKS FOR ADVERSE EFFECTS
ARISING FROM INTRODUCTION OF MARINE SPECIES

At its Statutory Meeting in 1973 the International Council for the Exploration of the Sea adopted a "Code of Practice to Reduce the Risks of Adverse Effects Arising from Introduction of Non-indigenous Marine Species." At its Statutory Meeting in 1979 the Council adopted a revised code, as follows:

1. Recommended procedure for all species prior to reaching a decision regarding new introductions (A recommended procedure for introduced or transferred species which are part of current commercial practice is given in Section 4).
 - (a) Member countries contemplating any new introduction should be requested to present to the Council at an early stage information on the species, stage in the life cycle, area of origin, proposed place of introduction and objectives, with such information on its habitat, epifauna, associated organisms, potential competition to species in the new environment, etc., as is available. The Council should then consider the possible outcome of the introduction, and offer advice on the acceptability of the choice.
 - (b) Appropriate authorities of the importing country (including fishery management authorities) should examine each "candidate for admission" in its natural environment, to assess the justification for the introduction, its relationship with other members of the ecosystem and the role played by parasites and diseases.

- (c) The probable effects of an introduced species in the new area should be assessed carefully, including examination of the effects of any previous introductions of this or similar species in other areas.
 - (d) Results of (b) and (c) should be communicated to the Council for evaluation and comment.
2. If the decision is taken to proceed with the introduction, the following action is recommended:
- (a) A brood stock should be established in an approved quarantine situation. The first generation progeny of the introduced species can be transplanted to the natural environment if no diseases or parasites become evident, but not the original import. The quarantine period will be used to provide opportunity for observation for disease and parasites. In the case of fish, brood stock should be developed from stocks imported as eggs or juveniles, to allow sufficient time for observation in quarantine.
 - (b) All effluents from hatcheries or establishments used for quarantine purposes should be sterilized in an approved manner.
 - (c) A continuing study should be made of the introduced species in its new environment, and progress reports submitted to the International Council for the Exploration of the Sea.
3. Regulatory agencies of all member countries are encouraged to use the strongest possible measures to prevent unauthorized or unapproved introductions.

4. Recommended procedure for introduced or transferred species which are part of current commercial practice.

- (a) Periodic inspection (including microscopic examination) by the receiving country of material prior to mass transplantation to confirm freedom from introducible pests and diseases. If inspection reveals any undesirable development, importation must be immediately discontinued. Findings and remedial actions should be reported to the International Council for the Exploration of the Sea.
- (b) Inspection and control of each consignment on arrival.
- (c) Quarantining or disinfection whenever possible and where appropriate.
- (d) Establishment of brood stock certified free of specific pathogens.

It is appreciated that countries will have different attitudes toward the selection of the place of inspection and control of the consignment, either in the country of origin or in the country of receipt.

II. DEFINITIONS

For the application of this code, the following definitions should be used:

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

Introduced species (= non-indigenous species; includes both non-indigenous and exotic species): Any species intentionally or accidentally transported and released by man into an environment outside its present range.

Transferred species (= transplanted species): Any species intentionally or accidentally transported and released within its present range.

Quarantined species: Any species held in a confined or enclosed system that is designed to prevent any possibility of the release of the species, or any of its diseases or any other associated organism into the environment.

Country of origin (= exporting country): The country from which a specific consignment of a species (regardless of its native region) is received.

Country of receipt (= importing country): The country to which a specific consignment of a species is sent for introduction, transfer, or quarantine.

Brood stock: Specimens of a species, either as eggs, juveniles, or adults, from which a first or subsequent generation may be produced for possible introduction to the environment.

Disease: For the purpose of the code, "disease" is understood to mean all organisms, including parasites, that cause disease. (A list of prescribed disease agents, parasites and other harmful agents is made for each introduced or transferred species in order that adequate methods for inspection are available. The discovery of other agents, etc., during such inspection should always be recorded and reported).

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.

Established species refers to those with existing reproductive populations.

Maintained species refers to those which are reproducing in aquaculture for several generations without artificial spawning.

Note:

- (a) It is understood that an introduced species is what is also referred to herein as an introduction; a transferred species as a transfer; and a quarantined species as a species in quarantine.
- (b) Introduced and transferred species, as defined above, include those species subject to the ICES Code of Practice, parts 1 to 3, and part 4, respectively.
- (c) Introduced species are understood to include exotic species, while transferred species include exotic individuals or populations of a species. It is thus understood that the general term "exotic" can include both introduced and transferred species.

- (d) It is understood for the purposes of the Code that introduced and transferred species may have the same potential to carry and transmit disease or any other associated organism into a new locality where the disease or associated organism does not presently occur.

III. AN AUGMENTATION AND EXPLANATION OF EACH SECTION OF THE CODE OF PRACTICE

The title of the Code should, for clarity, read as follows:

"REVISED CODE OF PRACTICE TO REDUCE THE RISKS OF ADVERSE EFFECTS ARISING FROM INTRODUCTION AND TRANSFER OF MARINE SPECIES."

Item I. Recommended procedure for all species prior to reaching a decision regarding new introductions (this does not apply to introductions or transfers which are part of current commercial practice):

- (a) Member countries contemplating any introduction should be requested to present to the Council at an early stage information on the species, stage in the life cycle, area of origin, proposed place of introduction and objectives, with such information on its habitat, epifauna, associated organisms, etc., as is available. The Council should then consider the possible outcome of the introduction, and offer advice on the acceptability of the choice.

Item I(a) line 2. *"...an early stage"... refers to that point in the planning process where a definite proposal has been formulated and reviewed by appropriate administrative levels within the country. It is accepted that problems can arise regarding release of details of such a proposal before all local interests have been consulted and their views satisfied. However, although some details of the proposal may have to be withheld, all possible general information should be presented to the Council.*

Item I(a) line 5. *"...the Council"... will request advice from the Introductions Working Group in writing. Opinions may be solicited by mail if the matter is urgent, or may be developed during a regular or special meeting of the Working Group.*

Item I(a) -- *It should be clearly understood that the information (review) presented to the Council for their consideration will include an assessment of the potential impact of the introduction on neighboring states.*

Item I(a) -- *Consideration should be given to provision of rapid responses to proposals for introductions that involve well-described and justified short-term projects intended for non-commercial purposes (i.e., introductions intended for research or feasibility studies), and it is inherent that these will be guided by all normal ICES guidelines and that the risks of the project be acceptable.*

- (b) Appropriate authorities of the importing country (including fishery management authorities) should examine each "candidate for admission" in its natural environment, to assess the justification for the introduction, its relationship with other members of the ecosystem and the role played by parasites and diseases.

Item I(b) -- *"Appropriate authorities" include those qualified to conduct examinations of imports, as determined by regulatory officials of the importing country. These may be fishery management, environmental protection, or sanitary control officials.*

- (c) The probable effects of introduction into the new area should be assessed carefully, including examination of the effects of any previous introductions of this or similar species in other areas.

Item I(c) --*Importation for the establishment of wild or free stocks and for local aquacultural developments must be considered in an international ecological context. If fish are imported for commercial culture, escapes should be considered inevitable. While some large-scale, continued introductions have failed in their declared aim of establishing self-sustaining stocks, some reproducing populations have developed from surprisingly small numbers of fauna or flora. Establishment of wild populations is thus possible from escaped individuals. Populations can become established a considerable distance from the release/escape site - even in another country. In the event of escapes and establishment of self-sustaining stocks of new species in the local environment, the importing country should take vigorous steps to eliminate the free population. However, should positive benefits to the establishment of such a free population become manifest, it is recommended that the importing country use the eradication period to gather all possible information on the introduced species in the new environment for the purpose of allowing greater review of the positive and negative results which might be expected should future or purposeful introductions take place.*

Ocean ranching represents a special case in which a free population is established for aquacultural purposes. Ocean ranching introductions should, in general, be treated in the same manner as other free population introductions, since the impacts are likely to be similar. Such introductions should be permitted only when economically and (or) socially justifiable, well planned, and controlled.

Item I(c) -- *It has been suggested that introductions of new intra-specific genetic material to an indigenous population could have significant effects on its survival or other biological characteristics. No guidelines are proposed, but this factor should be given consideration.*

Item I(c) -- *It has been suggested that control of introductions of aquarium fishes should be included in this item.*

Item I(c) -- *It has been suggested that a gene bank should be supported.*

- (d) Results of (b) and (c) should be communicated in the Council for evaluation and comment.

Item II. If the decision is taken to proceed with the introduction, the following action is recommended:

- (a) A brood stock should be established in an approved quarantine situation. The first generation progeny of the introduced species can be transplanted to the natural environment if no diseases or parasites become evident, but not the original import. The quarantine period will be used to provide opportunity for observation for disease and parasites. In the case of fish, brood stock should be developed from stocks imported as eggs or juveniles, to allow sufficient time for observation in quarantine.

Item II(a) line 1. *"A brood stock ..." may be described as specimens of a species, either as eggs, juveniles, or adults, from which a first or subsequent generation may be produced for possible introduction to the environment.*

Item II(a) line 1. "... an approved quarantine situation ..." may be described as a confined or enclosed system that is designed to prevent the unplanned or unintentional introduction of the contained species and the possible introduction of any of its diseases, parasites, commensals, or epibiota, into the environment. Implicit here is effective effluent treatment, since effluent control is an integral aspect of quarantine. Partial recycling can be considered to reduce cost of waste treatment.

Item II(a) lines 2 and 3. "... The first generation progeny of the introduced species can be transplanted to the natural environment ..." may be interpreted as progeny resulting from spawning activity subsequent to the introduction of the brood stock to the importing country. This is intended to cover-off the possibility of the larvae of larviparous species, such as the European oyster O. edulis, being considered F₁, being introduced to the environment, and possibly acting as vectors for diseases, parasites, etc.

Item II(a) -- A technical listing of commercial research facilities or methodologies used in the quarantine system for a particular introduction should include: A full description of component parts, flow diagrams, flow rates, approved disinfectants, water quality criteria, disposal mechanisms for effluents, sampling frequency to ensure integrity of the system, specific tests conducted, and mechanisms of control (administrative and technical).

Item II(a) -- Some practical period of observation is recommended for brood stocks and progeny during which tests specified in the proposal or otherwise, may be conducted prior to release of the F₁ or progeny. This period should be related to such considerations as biology of associated

parasites or disease organisms, types of observations, tests conducted, numbers of animals at various stages sampled, and sampling frequency for each.

Item II(a) -- *Control of introductions and transfers of young eels constitutes an as yet unresolved problem, but a real problem in terms of world-wide shipment.*

- (b) All effluents from hatcheries or establishments used for quarantine purposes should be treated in an approved manner (which should include the killing of living organisms present in the effluents).

Item II(b) -- *"approved manner." Approval should be given by the agency responsible for approving the original import. There should be international discussion and agreement as to what procedures/systems/chemicals are acceptable.*

- (c) A continuing study should be made of the introduced species in its new environment, and progress reports submitted to the International Council for the Exploration of the Sea.

Item II(c) -- *If undesirable effects become apparent it may be possible to abort the introduction program, and destroy the stock, or at best limit its dispersal. Further, dissemination of information via the Council may prevent the same mistake being made elsewhere.*

The "continuing study" mentioned in this item should be conducted for at least 3 years by the fishery agency of the importing country, or by a laboratory approved by that agency. Reports from the agency should be submitted to ICES for the attention of ACFM.

Item II(c) -- *This continuing study and series of reports should include the following:*

1. *Observation of both early and late disease manifestations;*
2. *Species interactions;*
3. *Economic, social, and recreational impacts.*

These observations and reports should be provided at a minimum of once per year, particularly during the early years post-introduction. These studies and observations should pay particular attention to all life history stages and their habitats.

Item II(c) -- *Voucher specimens of the introduced species should be deposited at the time of introduction in a recognized or scientific institution. Voucher specimens are defined as documentary specimens representative of a species. Specimens should be derived from the actual population introduced at the time of introduction or release. Voucher specimens should be prepared and preserved (fixed) following standard methods, including those methods (as by embedding) that would permit histological studies in the future.*

"in a recognized museum or scientific institution" includes those institutions that house permanent biological collections scientifically curated and maintained by a curatorial staff or by persons acting in a curatorial capacity. Examples are national museums and university museums.

"Specimens should be derived ..." include a scientific subsample of the (donor) population being introduced into the new region. Because of the potential diversity of animal (invertebrate and fish) and plant species involved, no absolute minimal number of specimens can be indicated. However, the sample should be of sufficient size to represent the phenotypic

(morphological) diversity of the species, with specific attention to the two major future uses of the voucher specimens: (i) to provide a basis for future taxonomic (systematic) verification of the species introduced and (ii) to assess any future phenotypic (morphological) changes that may occur in the introduced species and in subsequent generations that result from the introduction. Genetic studies should be done at the time of introduction because of the infeasibility and difficulty of preserving material for long-term future genetic analysis.

"Voucher specimens should be prepared": A detailed document on the collection, designation, preparation, storage and use of voucher specimens has been prepared by the Council on Curatorial Methods, Association of Systematic Collections, Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045, USA. See also: R. J. Lincoln and J. G. Sheals (1979), *Invertebrate animals: collection and preservation*. British Museum (Natural History). 150 pages. Published by: Cambridge University Press, Cambridge CB2 1RP, England. For histological techniques, standard manuals of histology and laboratory microtechnique should be consulted.

Item II: A sample protocol (developed by A.L.S. Munro, UK) to obtain an F₁ disease-free generation of an introduced salmonid species.

1. Rationale: To import eggs of the species to be introduced quarantine the eggs and resulting fish for life and if free of prescribed disease agents and parasites produce an F₁ generation for introduction.

2. Origins of import

2. Always import fertilized eggs, not live fish.

2.2 The parent fish providing the eggs. Where possible these should come from sources, farms, rivers, etc., free of the prescribed disease agents and parasites. The parent fish should be individually tested at stripping for the specific disease agents and parasites and only those found free used to provide eggs and sperm. Authorized inspection personnel will be present at stripping to insure that the correct individuals are tested. Such personnel will label each batch of eggs from every tested parent fish to ensure that each remains identifiable.

3. Egg handling: The eggs should be incubated in waters and a hatchery free of the specified disease agents in the exporting country. The eggs should be disinfected immediately before leaving the exporting country. Eggs should also be disinfected on arrival in the importing country and all packaging materials destroyed by incineration.

4. Quarantine

4.1 The quarantine period should be for the life of the fish.

4.2 The eggs and the fish hatching from them should be kept in approved quarantine premises at all times.

4.3 The importers must ensure that fish cannot escape and that possible risk of interference with them is minimized.

4.4 The waste water from eggs and fish is treated so that the risk of escape of pathogens is negligible. Until several tests have shown the absence of specified pathogens, every

*attempt should be made to sterilize the waste waters.
At all subsequent times treatment with disinfecting
agents should be mandatory.*

*4.5 The eggs and fish should be available for inspection
at all times and in numbers sufficient so that sampling
to destruction is possible on a proportion of them.*

*4.6 If any of the specified agents is found, all fish be
destroyed forthwith and the premises freed of
infection.*

*4.7 During the period of quarantine other animals in the
vicinity of those quarantines should be kept strictly
separate but should not be moved from the premises
until the period of quarantine is over.*

4.8 The conditions of quarantine be binding on the importer.

*Item III. The term "regulatory agency" includes any legal entity
responsible for enforcing laws and regulations of the country or its various
subdivisions.*

*Item III. Resource management agencies should take primary responsi-
bility to insure that all other pertinent agencies are made aware of the
potential impacts and the need to prevent unauthorized or unlawful intro-
ductions.*

*Item IV. Recommended procedure for introductions or transfers which
are part of current commercial practice.*

*(a) Periodic inspection (including microscopic examination) by the
receiving country of material prior to mass transplantation to
confirm freedom from introducible pests and diseases. If
inspection reveals any undesirable development, importation
must be immediately discontinued.*

Findings and remedial actions should be reported to the International Council for the Exploration of the Sea.

Item IV(a) -- *"Periodic examinations" should usually refer to annual microbiological examinations of material from each exporting area, subject to final determination of feasible and desirable intervals between examinations. Possible cyclic occurrence of disease must be taken into account in sampling. Examination should be under the direction of the agency of the importing country which is responsible for aquatic animal health.*

Item IV(a) -- *If internationally approved control measures and regulations exist in the country of origin, a verification of freedom from specified diseases should be sufficient.*

(b) Inspection and control of each consignment on arrival.

Item IV(b) -- *Inspection on arrival should be as detailed as that for Item IV(a) and should result in assurance that the origin and size of the shipment is as indicated in the agreement or bill of lading. Visual inspection for gross indications of disease or other problems should also be made. Inspections should be under the direction of the appropriate agency.*

(d) Quarantining or disinfection where appropriate and whenever possible.

(d) Establishment of brood stock certified free of specified pathogens.

It is appreciated that countries will have different attitudes to the selection of the place of inspection and control of the consignment, either in the country of origin or in the country of receipt.

Item IV -- *For salmonids, the FAO/OIE Code of Practice for Preventing the spread of Communicable Disease should be used as an additional guideline.*

Item VI -- *Protocols, manuals and guide books should be developed for each of the sub-items [(a) through (d)] listed above. Among these documents would be a listing or identification of laboratories or facilities that have established "certified brood stocks."*

Item IV -- *Sample protocol (developed by F. Kern, USA) for inspection of oysters being transferred as part of current commercial practice:*

- 1. Sample size - 50 oysters of each year class, randomly selected.*
- 2. Sampling to be supervised on the scene by qualified biologists.*
- 3. History of samples and local ecology must accompany shipments.*

Note: *This augmentation and explanation of the ICES Code of Practice has mentioned but has not provided full discussion of persistent problem areas, including the following commercial shipments designed for consumption, but which actually enter waters of the receiving country; the public health aspects of introduced marine species; the effects of introduced species on biological diversity; the need for gene banks; criteria for designation of specific-pathogen-free stock; and the most feasible ways of developing adequate and effective quarantine facilities.*

- 4. Sample should be in shell and should reach examining laboratory within 24 hours.*
- 5. Individuals up to 4 mm plunged into adequate fixative (greater than 10-1) for shipment to lab.*

6. *Sample must be examined grossly for associates and their occurrence and abundance recorded (e.g., sponges, drills, other molluscs, bryozoans, algae, polychaetes, echinoderms).*
7. *Tissues of 25 animals to be cultured in fluid Thioglycolate media for the presence of Perkinsus marinus.*
8. *Cross-sections of tissues of 25 oysters to be examined microscopically for presence of known diseases and parasites.*
9. *Batch sampling for hatchery seed-spat must be examined before transplanting.*
10. *Right of appeal and resampling for requesting organizations.*

Item IV -- *Clarification as relevant to salmonids (developed by A.L.S. Munro, UK).*

The objective is to prevent the introduction of disease agents, parasites, and other unwanted organisms accompanying shipments of imports.

For transfers of farmed salmonids and carp the FAO Fisheries Report No. 192, Rome, 1977 entitled "Control of the spread of major communicable fish diseases" is recommended. The basis of this code is that the establishment of origin of the fish or eggs is certified free of specified pathogens. A guiding principle of the code is that specific pathogens and parasites are listed as unwanted and tests regularly performed to demonstrate their absence in representative samples. This principle of establishing a list of proscribed pathogens and parasites should be adopted for prospective imports of all species.

Where certified specific pathogen-free farms are not available, e.g., where the proposed imports are of wild animals or extensively cultured species such as oysters, the following is recommended:

1. *Never import from areas where the proscribed pathogens are endemic or have recently been reported.*
2. *If feasible import eggs only and if possible disinfect them on arrival.*
3. *Periodic inspection (including microscope examination and any other technique appropriate for determining the presence of proscribed pathogens, pests and weeds) by the receiving country prior to mass transplantation to confirm freedom from unwanted disease agents, pests and weeds. If inspection reveals any undesirable agents, importation must be immediately discontinued. Findings and remedial actions should be reported to the Secretariat, ICES.*
4. *On arrival, inspection of samples of the consignment. If possible, quarantine is recommended. Disinfection where possible, e.g., eggs or fish is also recommended.*

Because there are inherent dangers in regular mass transfers it is recommended that countries try to establish brood stock certified free of specific pathogens in their own country, thereby removing the need for regular shipments.

It is appreciated that countries will have different attitudes toward the selection of the place of inspection of the consignment, either in the country of origin or in the country of receipt.

Indication of spine colours

Reports of the Advisory Committee on Fishery Management	Red
Reports of the Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

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