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International Council for  
the Exploration of the Sea

C.M. 1973/E:5  
Fisheries Improvement Committee  
Ref. Shellfish and Benthos

Report of the ICES Working Group on the Introduction of  
Non-indigenous Marine Organisms (London, 26-28 June 1973)

by

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and

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The meeting was held following Council Resolution 1972/2:14, which is given in full, together with the general terms of reference of the Working Group and the agreed agenda, in Appendix 1. Those present were:

UK	Dr H. A. Cole (Chairman) Mr A. Franklin (Secretary) Mr R. Lloyd
Canada	Mr C. P. Ruggles
Federal Republic of Germany	Dr R. Meixner
France	Dr L. Marteil
Netherlands	Prof. Dr P. Korringa
Portugal	Miss M. J. de Figueiredo
Spain	Dr H. Quiroga Lorenzo
Sweden	Dr B. I. Dybern

Apologies for absence were received from:

France	Mr P. Rouzaud
Norway	Dr D. Møller
Republic of Ireland	Dr F. A. Gibson

In considering the terms of reference, the members of the Working Group were of the opinion that a more appropriate title for the future would be: "ICES Working Group on the Introduction and International Transfer of Organisms to the Marine Environment".

It was evident from material brought to the attention of the Working Group that problems in this field are becoming of ever-increasing importance, and accordingly the Working Group recommends that an Advisory Committee of ICES be set up to take responsibility for advising on all questions relating to the introduction and international transfer

of organisms to the marine environment, and for suggesting and modifying agreed procedures governing such introductions or transfers. The Committee should include in their consideration the movement of species between member countries, as well as new introductions from outside the ICES area.

The Working Group considered the amendments required to Co-operative Research Report No. 32 and also additional information on introductions available since 1971. All points raised were noted by the Secretary for inclusion in the report at a later date. One important amendment concerned the introduction of Crassostrea virginica to Malpeque Bay in eastern Canada. The relevant section occurs on page 11 of the Co-operative Research Report, line 32. This section should now read: "1914. After this introduction, the Gulf of St Lawrence stock was involved in serious epidemic mortalities (Drinnan 1967)".

The Working Group received a report from the UK representatives on the discovery of Sargassum muticum (Yendo) Fensholt, a brown seaweed from Japan (and elsewhere in the North Pacific), at two sites on the Isle of Wight and in Portsmouth Harbour. The weed was present only in the intertidal zone and had not been found sub-littorally. It grows rapidly to a length of over 2 metres and may interfere with small-boat navigation. It also displaces native seaweeds and could become a pest of oyster cultivation. After consideration by UK scientists, action had been taken to exterminate the weed and this would be continued as necessary.

The Working Group recommends that ICES should call the attention of the UK delegates to the desirability of vigorous action to prevent this weed from becoming established, including, if necessary, spraying shore areas with suitable herbicides.

The Working Group received a report from the French representative regarding the proposed introduction to the Atlantic coast of France of the giant kelp Macrocystis pyrifera for the purpose of improving the supply of raw material for the alginate industry. Experiments had been made at Roscoff by the Nantes laboratory of ISTPM which had indicated that the seaweed would grow satisfactorily in French waters; the plants had been removed before the reproductive phase had developed.

The Working Group was given a summary of the views of British phycologists on this question and a copy of a letter from Dr W. J. North of the California Institute of Technology to Dr H. T. Powell of the

Dunstaffnage Laboratory, Oban, Scotland, setting out the pros and cons of such an introduction.

The Working Group noted that a similar proposal had been made in 1950 by the UK Seaweed Research Institute for precisely the same purpose, but, after consideration at the highest scientific level, had been rejected.

The Working Group agreed that this proposed introduction, if implemented, could seriously affect other countries to which the giant kelp might spread, by impeding navigation, modifying the habitat (which would affect certain species, either beneficially or detrimentally), and interfering with fishing operations. It concluded, therefore, that the proposal should be discussed with representatives of these countries before any decision was taken.

The Working Group noted that a scientific paper describing the experimental work would be presented to the 1973 meeting of ICES.

The Working Group recommends that the proposal should be referred to ICES for advice and noted that, if the Advisory Committee which it recommends in this report were established, the consideration of this proposal would be one of its first tasks. In the meantime, the Chairman of the Working Group was requested to bring this matter to the attention of the President of the Council.

The Working Group then turned its attention to the further development of an International Code of Practice to govern introductions. It was recognized that positive advantages could be obtained from introducing new species, but that information supplied to the Working Group had also demonstrated the dangers of accidentally introducing harmful organisms. The Working Group felt strongly that the first prerequisite was national legislation to prohibit the importation of marine organisms except under licence. This was essential in order to impose complete national control of introductions, and needed to be supported by adequate control of movements within each country.

The Working Group recommends the following code of practice to reduce the risks of adverse effects arising from any licensed introduction:

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) An examination, by the appropriate authorities of the importing country, of each "candidate for admission" in its natural environment, to assess its relationship with other members of the ecosystem, including the role played by parasites and diseases.

- (b) A careful assessment of the probable effects of introduction into the new area, including an examination of the effects of any previous introductions of this or similar species in other areas.

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

- (i) Multiplication of the introduced species in quarantine conditions in a hatchery in the receiving country, followed by transplantation of juveniles to the natural environment if no diseases or parasites become evident. The period of rearing in quarantine will provide a further opportunity for observation of the introduced adults. Where practicable, rearing from introduced eggs and juveniles should present a smaller risk than breeding from introduced adults.
- (ii) Sterilization, in an approved manner, of all effluents from hatcheries or establishments used for quarantine purposes.
- (iii) In cases where artificial propagation techniques would be inappropriate or have not yet been developed for the species, the introduction of eggs or early larvae may be utilized without prior quarantining. In such cases, all appropriate precautions should be taken to minimize the risk of introducing associated undesirable organisms, for example by the use of disinfection procedures.
- (iv) A continuing study of the introduced species in its new environment, and the submission of progress reports to the Advisory Committee of ICES.

## II Recommended procedure for introductions or transfers which are part of current commercial practice:

- (a) Regular examination by qualified scientific personnel of consignments of species to be imported, before shipment, within the country of origin.
- (b) Inspection and control of each consignment on arrival.
- (c) Quarantining or disinfection where appropriate.
- (d) Inspection of material after transplantation to confirm freedom from introduced pests or diseases. If inspection reveals any undesirable developments, these should be reported to the Advisory Committee together with details of any remedial action taken.

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.

The Working Group examined technical questions related to the control of introductions and received a contribution from Dr P. R. Walne of the Conwy Laboratory, UK, entitled "Quarantine for Introduced Molluscs and Crustacea". It was decided to annex this contribution to the report of the Working Group meeting, for distribution to members of the Fisheries Improvement Committee (Appendix 2). The Working Group received a brief note from the Canadian representative on the usefulness of ozone as a sterilizing agent. The Group requested that an expanded communication be made if possible to the 1973 ICES meeting.

The Secretary was requested to ask Dr Walne for a similar note on the effectiveness of chlorine.

The Canadian representative suggested that sterilized effluents should drain into dry-wells where possible.

The Working Group agreed that certificates of freedom from pests and diseases provided with introduced species were of value in reducing risks, though they obviously could not guarantee complete safety.

The Working Group felt that these certificates should not give a "blanket" cover, but should specify the particular pests and diseases covered.

In considering the risks involved in the introduction and transfer of marine organisms, the Working Group recognized that there is a variety of predators, parasites and diseases which may affect fisheries, especially culture systems, and that a new organism may appear and become established in new localities. It is often impossible to eradicate these organisms, but, by appropriate modifications of fishing methods and culture practices, their adverse effects may be avoided or reduced. To take effective action it is necessary to have a full understanding of the biology of the organisms concerned and of their effects.

The Working Group therefore recommends that more attention be given to these predators, parasites and diseases in the research programmes of member countries.

It was decided that the Secretary should produce a draft report of the meeting which would be circulated to members of the Working Group in time to allow any recommended amendments to be included in the final report to be presented to the 1973 ICES meeting. In considering action for the future, the Working Group were of the opinion that links with ICNAF and NEAFC would be valuable; in addition, liaison should be maintained with FAO, and in particular with similar work being carried out by EIFAC.

APPENDIX 1

TERMS OF REFERENCE

Council Resolution 1971/2:7,

a Working Group shall be set up, with Dr H. A. Cole as Convener, to:

- (a) collate and disseminate information received regarding existing and proposed introduction of non-indigenous marine organisms, and
- (b) take responsibility for advising the Council on all questions relating to the introduction of new species and for suggesting and modifying agreed procedures covering them, with the aim of establishing an accepted International Code of Practice.

The Working Group should include in their consideration the movement of species between member countries as well as new introductions from outside the ICES area.

Council Resolution 1972/2:14,

the Working Group on the Introduction of Non-indigenous Marine Organisms will meet under the Chairmanship of Dr H. A. Cole for three days in London, in June 1973, to:

- (a) review and update information on the introduction of non-indigenous marine organisms,
- (b) develop further the provisional International Code of Practice which might govern such introductions,
- (c) examine technical questions related to the control of such introductions.

AGENDA

- (1) Introduction by the Chairman.
- (2) Terms of reference and membership - Council Resolutions 1971/2:7, 1972/2:14.
- (3) Revision and updating of information on introductions of non-indigenous marine organisms - Council Resolutions 1971/4:5, 1972/4:7.
- (4) Consideration of further action needed to develop an accepted International Code of Practice - Council Resolution 1971/2:7.
- (5) Examine technical questions related to the control of such introductions - presentation of memorandum from Dr P. R. Walne.

- (6) Preparation of the report of the meeting.
- (7) Advice to the Council.
- (8) Any other business.

APPENDIX 2

Quarantine for introduced molluscs and crustacea

by

P. R. Walne

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Shellfish hatcheries and research laboratories operated by government agencies and by commercial organizations wish to hold stocks which may be infected with pests, parasites or disease organisms. These stocks range from relatively small numbers of bivalve breeding stock (25-100 individuals) to large numbers ( $> 10^5$ ) of shrimp brought in as juveniles and reared in either intensive or extensive culture to market size. At present the major problems have arisen in bivalve culture but in the future it is possible that crustacean culture will give rise to similar difficulties.

The most difficult questions which arise when considering the conditions for quarantine or isolation of stock are:

- (1) defining the species which are to be confined,
- (2) the acceptable degree of risk.

There are further practical problems in deciding the methods to be used for isolation of the stock, sterilization of effluent water and solid wastes and the standard of management required. However, these questions are more clear-cut and more susceptible to objective answers than the two general questions previously outlined and which deserve a more detailed examination.

SPECIES OF PLANTS AND ANIMALS WHICH ARE TO BE CONFINED

The number of species which can be identified as undesirable are very few. For example, for bivalve stock brought into Conwy from northern Europe we know that we wish to exclude Crepidula, Urosalpinx and Mytilicola, since we believe that they might flourish in our local water and cause trouble. Precautions have therefore been taken which are designed to confine these species and by analogy we presume that these procedures will be satisfactory for related species which may be associated with bivalve stock obtained from temperate waters throughout the world. When unicellular organisms, viruses, bacteria and fungi are



considered the position is less satisfactory, although it is among these groups that the major causes of disease may be expected. There are some protozoan parasites of oysters reported from North America and the fungus causing shell disease of oysters in Europe, but we have no information on ease of transmission from one animal to another. Organisms of this type might be carried quite easily on clothes or hands.

The paucity of specified pests, coupled with suspicion that there are a number which are important although undescribed, leads to the imposition of comprehensive controls. It is difficult to convince commercial enterprises that these are not unnecessarily strict.

#### DEGREE OF RISK

Some risk will always occur when stock is brought from outside into an area. The unknown factors on which subjective judgements have to be made include:

- (1) The risk of a breeding population of a pest escaping. It is well known that most introductions fail to become established as breeding populations, but as there are instances where marine species have become established in British waters from what must have been quite small numbers, there appears to be no alternative to the aim of stopping the escape of all individuals.
- (2) The risk of introducing a species which is neither a pest nor of particular ecological importance in its own habitat but which can become dominant in a new environment. Such an introduction may well affect species remote from those being cultured. As there is no certain way of defining such organisms one is again left with the aim of stopping the escape of all individuals.

#### THE PRACTICE OF QUARANTINE

##### Bivalves

The movement of bivalve stock carries a risk of transferring pests and diseases associated with bivalves and also a movement of other organisms attached to the shell as epifauna and flora or hidden in nooks and crannies of the shell. The risks of introduction can be reduced by the following procedures:

- (1) Removal of adventitious organisms. We thoroughly scrape and scrub the shells of new stock. If possible this should be done before the stock goes into the water. If, however, it is too weak they should go into stagnant tanks which can be thoroughly chlorinated as soon as the stock has been cleaned and transferred to running

water. It is impractical to remove all the epifauna by this means. We have had small numbers of oysters (< 100) which were thoroughly cleansed at another laboratory, cleansed again when they arrived at Conwy and yet a few days later Crepidula spat were found crawling on the wall of the tank. We have been reluctant to use chemical methods because the stock is usually weakened to some extent during transit.

Care should be taken that all packing material, as well as the shell scrapings, are kept away from the sea. A pit dug above high-water mark is the simplest method.

- (2) The period of risk can be reduced in the case of bivalve stock by only bringing them into the hatchery when the gonads are ripe and removing them as soon as spawning is completed.
- (3) Treatment of effluent. At Conwy the tanks used for isolated stock stand in a concrete bay which drains into a pair of concrete tanks, which stand outside the building. When one tank is filled, the drain is diverted to the empty tank while the full tank is chlorinated for 24 hours. Stabilized calcium hypochlorite, in powder form, is used for chlorination. Used at a rate of 85 g per 1000 litres this gives an initial concentration of 20 ppm chlorine. This falls to about 10 ppm in a few hours but then remains constant until the tank is emptied. We believe this to be effective, but information for a wide range of species is not available. A useful additional precaution would be the introduction of a coarse filter (> 100  $\mu$ m) immediately before the chlorinating tanks. This would trap the larger and more resistant organisms.
- (4) Establishment of a good code of working practice. This is particularly important because there can be no certain check that the rules are being observed. If the methods of working in an establishment are slipshod then accidental escapes become more likely. For example, contaminated stock, rubbish or packing material may be thrown on the beach or clean stock kept in a contaminated tank "for a few days". It is best to have one room devoted to isolated stock.

#### Crustacea

The risk of introducing epifauna and other adventitious organisms with crustacea (prawns, lobsters) would seem to be less than with bivalves, but the potential problems of parasites and disease remain although positive information is even more sparse. There is interest

in the culture of tropical species in closed systems in temperate areas and this seems to offer little threat to the environment. The operators may have disease problems but it seems unlikely that organisms from the tropics will flourish in a temperate environment outside the hatchery.

Our present practice with crustacea obtained from outside the UK is to chlorinate all waste water for one month from tanks containing new introductions, while all waste food, dead animals and other rubbish are thrown into a pit on dry land. If the stock shows no abnormal mortality after one month then isolation is no longer maintained.