

REPORT OF THE 1978 MEETING OF THE ICES
WORKING GROUP ON THE PATHOLOGY OF
MARINE ORGANISMS

The ICES Working Group on the Pathology of Marine Organisms met at Nantes, France, from February 28 to March 3, 1978, with Dr. C. Maurin as Chairman. Twenty-one experts, representing nine ICES member countries, participated (a list of participants is appended to this report). Since this year, for the first time, the title and purview of the Working Group has been broadened to include the pathology of fish as well as crustaceans and molluscs, the agenda was divided in the following sections:

- A. Review of knowledge and current research in member nations on principal epizootics, diseases and abnormalities of marine organisms;
- B. Review of relationships between diseases or abnormalities and pollution;
- C. Preparation of a general index of principal diseases, parasites and abnormalities affecting commercially important species;
- D. Preparation of a disease monitoring plan;
- E. Development of measures to protect against the spread of diseases; and
- F. Recommendations.

During the discussions, participants contributed experience and information on agenda items in accord with the nature and extent of activity in their countries on the specific topic. Discussion was free

and informal, hence this report does not attempt to identify the specific contribution of each participant.

A. REVIEW OF KNOWLEDGE AND CURRENT RESEARCH ON PRINCIPAL EPIZOOTICS, DISEASES AND ABNORMALITIES

Discussion on this agenda item began with the viruses and proceeded to bacteria, protozoa, fungi, helminths, and copepods. Seven viruses from molluscs were discussed, with greatest interest expressed in the so-called "Tellina viruses" which are two-stranded two-segmental RNA viruses, serologically similar to the IPN virus and belonging to the Reoviridae. These viruses have been isolated from a number of different commercial shellfish taken from various parts of the UK, Europe and North America, and preliminary infection experiments have indicated a pathological capability of some of the isolates for Ostrea edulis. This molluscan virus will grow in fish tissue cultures. Because of its close similarity to IPN virus, the Tellina virus deserves continued attention.

Further work is being carried out on the gill disease and 1970 mortality in Crassostrea angulata. The pathology exhibits similarities to lymphocystis in marine fish and appears to be related to the presence of an Iridovirus. Further attempts have been made to obtain fresh material rather than re-fixed material of these diseases and one gill disease lesion in Crassostrea angulata was found at Arcachon in 1977. The number^{of} available animals with fresh lesions has been very limited in 1977 and only some new pictures of the virus have been obtained. The problem of attempting this type of work whilst molluscan tissue cultures are not available was discussed. The Working Group agreed

that further molluscan tissue culture work towards the production of stable cell lines is one of the most important fields of molluscan pathology at the moment. It was agreed that attempts at tissue culture should be an international effort, involving several laboratories and concentrating on specific tissues of specific molluscs.

Crustacean^a viruses, now numbering sixteen, were reviewed. Only a few of these have been even partially characterized, and there is again a pressing need for crustacean cell lines before real understanding of the viruses can be expected. Most of the crustacean viruses described thus far (13 of 16) have been found in crabs, the rest occur in shrimps.

Further work has been carried out on the blue crab virus (see Working Group 1977) which has been noted in Maryland, and also in Egypt and Texas. The virus appears in the haemocytes and in the epithelial cells of the X organ, budding through the nuclear membranes. In size it is a rod, 100 x 30 nm with a helical nuclear capsid resembling plant rhabdoviruses. No pathology associated with infection, Mixed viral infections frequently occur, particularly in the blue crab.

More detailed characterization is now available for the viruses S and P described from Macropipus depurator in the Working Group's 1977 report. Both are single chain RNA viruses and the density in caesium chloride and chemical structure of virus S has been determined and similar work is in progress on virus P.

Fish viruses. Research is in progress into Piscine Erythrocytic Necrosis (PEN) in W. Atlantic. No evidence of mortalities yet exist, but current studies indicate possible viral origin of this disease which is known from three different clupeioids.

A lymphocystis type of disease has recently been recognised in turbot being cultured in a warm water effluent system.

There was extensive discussion on a rhabdovirus which has been detected in Japan in eels which originated from the Nantes region of France. More recently, the same virus has been found in young eels from the Nantes region and also from Brittany. Currently, samples are being examined from Nantes, Ile de Re and from the River Adur in the south-west of France. All samples are of animals fished from the estuary as elvers and there is no evidence of mortality in the stocks of Anguilla anguilla. In Japan this virus is apparently linked with mortalities on large farms of Anguilla japonica. It is hoped to test larvae and elvers of A. anguilla captured at sea during a forthcoming international cruise to see if infection occurs at sea or is only in freshwater.

The occurrence of IPN virus Sp strain in Norwegian freshwater salmonids was reported. There is no evidence yet of this virus in the marine salmonid culture sites.

Chlamydial, Rickettsial and Mycoplasmal diseases have only recently been reported from molluscs. New information was presented on chlamydia associated with a wasting disease in Tellina and a rickettsial infection of Donax. This group of prokaryotes was described earlier from oysters and clams in the U.S. These organisms have now been recognised in commercial molluscs from most ICES countries including Macoma from 2,000 ft on the Continental Shelf.

The virulence aspects in the host and the public health implications are unknown at the present time and warrant further study.

Bacterial diseases, Crustacea. Artificial infections with Gaffkaemia (Aerococcus viridus) have been induced in the crab, Cancer pagurus, which is a potential reservoir since it appears able to shed the bacterium for some time without any obvious deleterious effect. Experimental studies with hybrid crosses between American and European lobsters has shown that the hybrid has retained the greater resistance of the European lobster. Experiments with Vancomycin treatment, as developed in the U.S.A. continue.

Bacterial diseases of fish. Work is currently in progress on an anaerobic bacterium (Bubacterium sp.) which has an affinity for the central nervous system, producing whirling symptoms and mortality in mullet in Biscayne Bay. Menhaden in the Atlantic are also affected.

An outbreak of furunculosis in Salmo salar smolts transferred in Spring 1977 to seawater occurred six weeks after the transfer. This infection was then transferred to over-wintered salmon held in sea pens where a 25% mortality occurred.

Vibriosis in saithe, and its relationship to vibriosis of salmonids in salt water culture was reviewed.

Epizootics of Vibrio in saithe populations were recorded in 1972 and 1974. The mortalities were noticed amongst small one-year-old fish which gathered around and entered salmon pens because of the available food. The epizootic began in June, reached a maximum in September/October, dying down thereafter. The bacterium differs from that seen in salmonids and the saithe recover more rapidly. During the period of the saithe epizootic the salmonids in the same cage remained unaffected. The 1974 epizootic did not occur north of Bodo (Norway), possibly a

different strain of saithe which is more resistant may be involved to the north of this point. There is certainly no temperature difference. Considerable discussion on the possible use of vaccines to control bacterial diseases in marine farmed fish then followed.

Bacteria have been recorded in the millary processes in spleen and kidney of cod. These bacteria are consistently present but are not isolable; possibly they are *Corynebacteria*.

Protozoan diseases, Molluscs. Among the protozoan diseases, the most significant news was that in 1977, for the first time since 1968 there was no extension of the disease caused by Marteilia refringens in oysters on the French coast. Three important areas of Ostrea edulis production remain free:- (i) Cancale; (ii) Binic; (iii) Bay of Quiberon (Le Po). In addition, the rivers Rance, Etel and Penerf remain free. There has been no extension in the Mediterranean although fresh diseased stocks were introduced last year. Workers have consistently obtained the indication that in recent years new infections have occurred almost entirely in August. Animals introduced into diseased areas before August do not become infected until August, and those introduced after August do not become infected until the following year. This has opened the possibility of using diseased beds outside the peak infection period as fattening areas for otherwise healthy stock. Crassostrea gigas at Carantec and also in the Etel have been found with parasites which are probably Marteilia refringens. Only 3% of animals examined were infected and those with only a few parasites. Exposure experiments have so far proved negative with Crassostrea gigas. Examination of material of Crassostrea cuculata has shown the possibility

of a Marteilia-like parasite. Mytilus edulis has also been recorded from the Italian Adriatic with a Marteilia refringens-like parasite.

Protozoan diseases of fish. Gulgea stephani has been detected on plaice on a Scottish fish farm where it was introduced from southern UK waters. Infection is dependent on high (> 15° or 16°C) water temperature, which accounts for the absence of the parasite in local wild plaice and its general dissemination through stocks in the farm which uses warmed water from a nuclear power station. High mortalities were found in experimental infections in the first two months after challenge. The parasite is endemic in the southern North Sea and western Baltic, but its effects on wild populations is not known.

Mycotic diseases, Crustacea. An external fungus infection in lobsters, resulting in darkening and erosion of the exoskeleton, was reported. The disease spread slowly, and became a serious problem only after 8-9 months. External abrasion seems necessary for infection. The fungus is tentatively identified as Ramularia sp.

Mycotic diseases, fish. Very disturbing information was presented about high prevalences (60%) of the systemic pathogen Ichthyophonus hoferi in a number of commercial fish species from the North Sea, particularly around Orkney and Shetland. Plaice and haddock are recorded as infected with deaths four to eight weeks after infection and a possible 20% mortality annually in plaice. The fungus has also been found in farmed fish fed with unsterilised trash marine fish. It was commented that the North-west Atlantic had been overdue for an outbreak of Ichthyophonus for the past 10 years. Over-fishing of the herring population may have retarded such an outbreak. This disease is known

to occur in epizootics, and should receive serious attention from pathologists. A recommendation was made that ICES member nations take note of this situation and that appropriate experts should document the occurrence and abundance of this disease.

Other diseases. A wide variety of helminth diseases was considered, but the most serious problem identified was that of increasing prevalences of larval nematodes (Anisakinae) of fish. Increases have been observed in several countries, and are probably related to increases in populations of seals and other aquatic mammals (the definitive hosts of the worms). A recommendation was made that ICES member nations take note of this situation, and that appropriate experts should document the occurrence and abundance of these larval worms (see section F, Recommendation No.2).

Among the crustacean parasites of fishes, the salmon louse, Lepeophthirus salmonis, is a continuing problem in salt water culture, and an increasing one in Norway, principally because of the severe ulceration that may result from parasitization. The organophosphate Neguvon can be effective if given with food in controlled doses.

Infestations of Ichthyobodo (= Costia) were reported from young Atlantic smolts recently transferred to seawater and causing severe gill damage. Similar problems have occurred in Scotland and Norway.

The intestinal copepod Mytilocola orientalis has apparently been introduced to French waters with imports of Crassostrea gigas seed. Heavy parasitization causes poor condition in oysters, and the parasite has been naturally transmitted to oysters, C. gigas and O. edulis, and to mussels, Mytilus edulis and M. galloprovincialis. Concern was

voiced that this parasite could spread in mussels on fouling on ships.

Other abnormalities, particularly a shell chambering abnormality in Crassostrea gigas and a type of haemocytic neoplasia, were discussed, as were several tumours of fish.

B. RELATIONSHIPS BETWEEN DISEASES AND POLLUTION

Neoplastic diseases of molluscs were reviewed, and a proposed classification presented. It was emphasised that despite the epizootic occurrences of certain neoplasms in certain polluted waters, no neoplastic disease of molluscs has been associated with specific carcinogens, nor has experimental induction of neoplasms been achieved. There is a suggestion in several studies, however, of environmentally induced neoplasia. Major consistent sites of neoplastic diseases are: (a) Yaquina Bay, Oregon (U.S.A.) (Mytilus edulis and Ostrea lurida, reaching 12% in winter); (b) Chesapeake Bay (U.S.A.) in Macoma balthica which is also subject to winter mortality; (c) New England (U.S.A.) in Mya arenaria with both haematopoietic and gonadal neoplasms being recorded; (d) N.W. Spain with haematopoietic neoplasms from Ostrea edulis; (e) Plymouth and N. Wales in U.K. in Mytilus edulis; (f) in Ostrea edulis in Brittany neoplasms have been recorded in 46 of 7,000 oysters (Ostrea edulis) examined. The peak time of occurrence of this condition is between July and October and it is suggested that there may be some relationship with other factors which stress the animal. This neoplasm may be of germ cell origin.

High frequencies of skin lesions in cod were reported from Danish waters. Sampling of sites within 5 kilometres of pollution sources

such as sugar plants, town sewage and cellulose plants in comparison with control sites showed a relationship with pollution. High levels of Vibrio anguillarum (10^6 /ml) were recorded in the period October-February in the sugar plant area. Up to 30% of cod in some stocks were affected by skin lesions. Up to 90% of cases with ulcers showed presence of Vibrio anguillarum in the ulcers and in the more severe cases the kidneys also showed the presence of Vibrio anguillarum. Aeromonas species and other bacteria were present only in the earlier stages of the lesions.

The ulcerative lesion has also been transmitted by ultra-filtrate. Intra-peritoneal inoculation was used, with an incubation period of 1-2 weeks. The clinical signs from the experimental fish being the same as those from natural conditions.

A variety of abnormalities, including fin erosion, haemorrhages beneath scales, and liver granulomas, have been found in cod and flatfish from the vicinity of Calais. An epizootic of dwarfism (up to 10% of individuals) was reported from a Danish trout farm.

Problems in establishing pollutant-disease relationships were reviewed. Among the most restrictive were: absence of baseline information about the organisms prior to pollution; the existence of multiple pollutants in many badly degraded waters; and the circumstantial nature of much of the evidence linking pollution and disease. The presence of specific pollutants cannot be recognised by the occurrence of specific pathologies, but a general description of pathological

responses can be useful.

Categories of pathological responses which should be considered are:

- (1) inflammation (acute and chronic);
- (2) degeneration (including edema, necrosis, and metaplasia);
- (3) repair and regeneration (proliferation, hyperplasia, and scar formation);
- (4) neoplasia (including consideration of cell origin, stage, and type - whether benign or malignant);
- (5) genetic derangement (including chromosomal changes, skeletal abnormalities).

In accord with a recommendation from the 1977 Statutory Meeting concerning the preparation and dissemination of a field guide for the recognition of common diseases and abnormalities of marine fish, a draft document was distributed to members of the Working Group for comments. The printed document will be sent to the ICFS Secretariat by April 1, 1978, for distribution to member nations, and a more detailed document will be prepared by the Working Group at the next annual meeting, possibly for publication as a Cooperative Research Report.

C. GENERAL INDEX OF PRINCIPAL DISEASES

As instructed by the Council, the Working Group then proceeded to discuss arrangements to produce a general index list of marine diseases. The general consensus was reached that it would be advisable to produce this in two forms. Firstly, a list in tabulated form giving the principle features of known and recognised diseases. Three editors

for the major phyla, that is, Mollusca, Crustacea and the two fish phyla, were agreed and Working Group members from each country agreed to send individual country lists of known diseases to these editors by April 30, 1978. Editors may call upon any other expert to help in editing material for particular categories of diseases (ex. viruses, tumours, helminths, etc.). Edited copies will then be sent to English-French editors (Alderman and Tixerant). These lists will then be forwarded to the Chairman of the Working Group as Editor-in-Chief of the list by May 31, 1978, for final forwarding to ICES. For each disease the following information will be required:

- (1) host species;
- (2) disease name;
- (3) aetiology;
- (4) associated environmental conditions;
- (5) geographical distribution;
- (6) significance;
- (7) Gross clinical signs;
- (8) histopathology;
- (9) control;
- (10) references and interested laboratories;
- (11) comments.

This layout for the Index was then experimented with with a number of known diseases with successful results.

Working Group members from various countries then agreed to produce individually trial sheets for a more extensive and descriptive catalogue of marine diseases. The format agreed was that used by Dr Sindermann

in a number of his publications and these trial sheets will be produced for the next Working Group meeting for discussion as to further steps in preparing the document. The following sheets should then be available:

Comps: Marteilia

Grizel: Gill disease mass mortalities 1970-1974

Bonami: Viruses of Crustacea
Virus of Penaeus japonicus

Leglise: Gaffkemia

Tixerant: Gill disease of sea bass
Diseases of Salmo gairdneri (kidney disease, furunculosis)

Duggan: Maladie due Pied (O. edulis)
Mytilocola intestinalis

van Banning: Milky disease of Crangon crangon
Myxobolus aeglefini in plaice

Meixner: Cauliflower disease of cels

Egidius: Salmon louse
Saithe vibriosis

Christensen: Vibriosis in cod

Alderman: Shell disease in O. edulis
Crustacean shell disease (fungal)
Mytilus neoplasms

Hill: Lymphocystis
Shellfish IPN virus

Munro: Anisakis
Ichthyophonus
Aeromonas in salmonids

Farley: Minchinia in oysters
Dermocystidium in oysters
Herpes virus in oysters
Sarcoma in O. lurida
Carcinoma in Macoma

Sindermann: Fin erosion

D. DISEASE MONITORING PLAN

Another recommendation to the Working Group from the 1977 Statutory Meeting was that a disease monitoring plan be prepared that would alert the various laboratories to the appearance of an epizootic in any ICES country, and would suggest control measures. In discussion, it appears that some member countries already have some form of disease monitoring plan (France in particular). It was suggested that an international monitoring plan might begin with one or a few important diseases and host species. Recommended were (1) ulcers, (2) Ichthyophonus, (3) nematodes, and (4) red disease of eels. Another suggestion was that Mytilus or oysters might be used as a basis for international monitoring, and that the Registry of Marine Pathology at the Oxford Laboratory (U.S.A.) be responsible for exchange of material.

The kind of information needed (species, prevalence, location of mortalities, associated environmental data) and the standardization of data collection were discussed. Important to the latter are standard protocols for pathogen identification, and standard methods for determining extent of mortalities.

The objectives of monitoring were reviewed. They are (1) recognition and notification of a new disease problem and (2) recognition of a change in intensity of an existing problem. Important considerations are possible public health implications, aesthetic problems, effects on resource species, and understanding of the nature and spread of epizootics.

It was concluded that the Working Group itself, at its annual meeting, would review (and hence act as monitor) the status of all

important disease problems, and would prepare an annual report to the parent committees.

The development of disease surveillance requires in addition to an index of diseases a system which permits collection of specific information by experts in each of the member nations. A recommendation has been prepared (Section F, Item 1 of this document) which the Working Group believes will produce this information. Designated individuals in each nation will collect, via a simple form, information on diseases of marine animals, and forward this information to ICES for distribution to member nations and co-operating individuals. The form is to be designed by the Working Group at the next meeting.

E. DEVELOPMENT OF MEASURES TO PROTECT AGAINST THE SPREAD OF DISEASES

There was considerable discussion over import regulations and Control of Deposit Orders, etc. French representatives described new quarantine facilities which they are developing at La Tremblade for molluscs. A recommendation to the Council was agreed, which is included in Section F, Item 3 of this report).

F. RECOMMENDATIONS

1. Monitoring Plan, Council's Recommendations 1977, 2.9.B.1:

The Working Group arrived at the following recommendation:
It is essential that an efficient and comprehensive system for gathering and summarising data on the major diseases of marine mollusca, crustacea and fish be established on a continuous basis.

It is recommended that this should take the form of notification

at intervals of three months from all ICES countries of the prevalence, significance and location of all the diseases on the General Index agreed by the Working Group, in each of the three host categories (mollusca, crustacea and fish) from all appropriate expert laboratories of each country. Members of the Working Group will be chosen to be responsible for receiving all returns for a particular host category, drawing up a summary sheet of the data and forwarding all the documents to the appropriate ICES Committee and also to all contributors.

The overall disease situation and trends during each year to be considered and discussed at the meetings of this Working Group.

Note: Design of the data forms to be decided by the full Working Group, if this recommendation is accepted by the Council.

2. Introductions Committee

The marine disease Working Group agreed that the revitalisation of the Council's Working Group on Marine Introductions is important. This Working Group therefore recommends that the Council press for the re-activation of the Introductions Working Group, which is currently inactive.

3. Code of Practice on Introductions

The Working Group, taking into account ICES Council Recommendation 1977, 2.9.B.2., recommends to the Council that the problem of introduction is not only the purview of ecologists, but also that of pathologists. Therefore, the Working Group recommends to the

Council the adoption of a modified Code of Practice to reduce the risks of adverse effects arising from the introduction of non-indigenous marine species. This Code is essentially that adopted by the Council on 10 October 1973 (original version is Appendix II) but modified to read as follows:-

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 to the importing country of each "candidate for omission" in its natural environment, to assess the justification for its introduction into a new environment, its relationship with other members of the ecosystem and the role played by parasites and diseases.
- (b) a careful assessment of the probable effects of the introduction into the new area including an examination of the effects of any previous introductions of this or similar species in other areas.
 - (i) Introduced species should be held in an approved quarantine situation which is separate from other aquatic organisms. The first-generation progeny of the introduced species may 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.

- (ii) Sterilization, in an approved manner, of all effluents from hatcheries or establishments used for quarantine purposes.
- (iii) A continuing study of the introduced species in its new environment, and the submission of progress reports to the International Council for the Exploration of the Sea.

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) Histopathological and ecological seasonal inspection of material prior to mass transplantation to confirm freedom from introducible pests and diseases should be carried out by the receiving country. If inspection reveals any undesirable developments, importation must immediately be discontinued. Findings and remedial actions should be reported to the International Council for the Exploration of the Sea.

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

4. Larval Nematodes

The Working Group recommends the following points to the Council's attention. An apparent increase in prevalence of larval nematodes (particularly of the genera Anisakis, Phocanema and Contracecum) has occurred in a number of important fish species in the North Atlantic. This increase may be related to changes in abundance of marine mammals which usually act as a definitive host of the worms. ICES should note this situation and request appropriate experts from member countries to document the occurrence and abundance of larval worms in fish populations exploited by their fishermen.

5. The Working Group also recommends to the Council's attention the following point. The common occurrence of the serious fungus pathogen Ichthyophonus hoferi has been reported in a number of fish species in the North Sea. Because this systemic parasite can kill host fish, and because it has a history of epizootics in certain species, the ICES should take note of this situation and request appropriate experts from member countries to investigate the occurrence and abundance of Ichthyophonus in fish populations exploited by their fishermen. Species known to be susceptible include cod, haddock, mackerel, saithe and herring. It is recommended that the systematics of this pathogen should also be studied.

6. Proposed International Symposium on Marine Pathology

Because of the great expansion of interest in and information about pathology of marine organisms, the Working Group recommends to the ICES Council that an International Symposium on Marine Pathology should be held. Possibly this might be held during the

week immediately preceeding the 1980 Statutory Meeting in Copenhagen.

7. The Working Group feels that its effectiveness would be greatly enhanced by the additional attendance of appropriate experts from those ICES member countries not yet represented on the Working Group. The Working Group therefore recommends that the Council encourage all member countries of ICES to nominate and send at least one representative to each Working Group meeting.

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APPENDIX II

For comparison with modified version recommended by Working Group
(Section F, Item 3)

CODE OF PRACTICE TO REDUCE THE RISKS OF ADVERSE EFFECTS ARISINGFROM INTRODUCTION OF NON-INDIGENOUS MARINE SPECIES

(Adopted by the Council 10 October 1973)

- 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 International Council for the Exploration of the Sea.

II. Recommended procedure for introduction 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 development, these should be reported to the International Council for the Exploration of the Sea 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.