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International Council for the  
Exploration of the Sea

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Marine Environmental Quality  
Committee  
Ref. Mariculture Committee

REPORT OF THE WORKING GROUP

"PATHOLOGY AND DISEASES IN MARINE ORGANISMS"

Oxford, Maryland (U.S.A.)

22-25 April 1981

Prof. C. MAURIN (Chairman)

I.S.T.P.M.

Rue de l'Île d'Yeu

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REPORT OF THE ICES WORKING GROUP ON  
PATHOLOGY OF MARINE ORGANISMS,  
OXFORD, MARYLAND, USA, APRIL 22-25, 1981

INTRODUCTION

The meeting opened with comments by the Chairman, Professor C. Maurin of France, who noted that this was the first Working Group meeting held in the United States, that it indicated the efforts of Canada and the United States, and that the meeting provided greater opportunities for cooperation among countries on both sides of the Atlantic.

Participants numbered 21, from 10 ICES member nations (attendees are listed in Appendix I, and the Agenda is Appendix II).

A letter was read from Dr. Stewart, Editor for papers from the 1980 Special Meeting on Diseases of Commercial Species of Fish and Shellfish, requesting action and outlining instructions for manuscript preparation. Session chairpersons will ask authors if they want their papers included, and will edit papers and select reviewers. A standard letter to be sent to all participants by session leaders was drafted and sent to Dr. Stewart for approval.

Concerning recommendations approved by the Council at its 1980 Statutory Meeting, the following actions were taken:

- (1) Index of Diseases. This will be published as a Cooperative Research Report, with Dr. Maurin as Editor in Chief, and Dr. Munro, Dr. Bonami, and Mr. Farley as Editors. All material will be sent to Dr. Maurin before October 1, 1981.

- (2) Diagnostic Fiches. The Council agreed in principle to publication of the Fiches, but requested the Working Group to prepare a prospectus describing the series.
- (3) Reviews of Diseases. Decision by the Council was postponed, pending action on the Index and Fiches.

Other recommendations of the Working Group were not approved formally by the Council, but are in the reports of the parent committees, which were approved.

#### NATIONAL REPORTS

The status of diseases in each of the member countries was reviewed by participants:

Belgium. A survey has been conducted of brown spot disease in shrimp, and a document prepared for the 1981 Statutory Meeting. Additionally, a survey is being conducted of disease conditions in fish, including papillomas, fin erosion, ulcers (in flounders) and skeletal malformations (in whiting).

Denmark. The pathogen Bonamia has been found in flat oysters (Ostrea edulis) imported from France. Many of the transferred oysters have been retrieved, but it must be concluded that the pathogen will be present in Danish waters.

Continuing cod surveys in the "Little Belt" found large variations in prevalence of the ulcer syndrome, with some relationship to presence of organic sediments. Younger fish are most often affected, and an iridovirus seems to play a principal role (although bacteria are also important). The disease can be reproduced by injection of the virus. Ulcers have been found in low percentages in flounders and dabs.

Concerning ulcer disease of eels, a comparative study of two fjords is being conducted, in which fish are transferred from one to another, in an attempt to determine pollution impacts.

Canada. There has been no major change in the disease picture reported since the last meeting. An updated report on the status of a nemertean predator of lobster eggs is needed.

France. Marteilia disease of flat oysters is present in four sectors, and still causes mortalities. In at least one sector (Rade de Brest) the oysters seem resistant and wild populations are rebuilding. A microsporidan (Nosema) hyperparasite of Marteilia has been found.

Bonamia is now widespread in flat oysters in northern France, including all of Brittany. It is also present at La Tremblade and Arcachon. All age groups are affected; mortalities begin at age 2 and reach 50-60% in ages 3 and 4.

Minchinia americana, a third disease of flat oysters, is present but scarce.

Mytilicola orientalis has an average infection in Crassostrea gigas of 30% (1-5 per oyster) and is present in all channel and west coast areas. A study is being made of a possible relationship between microbial diseases and the occurrence and effects of Mytilicola (M. intestinalis in O. edulis and M. orientalis in C. gigas).

An IPN type virus has been found in sea bass, sole, and turbot in an experimental fish farm at Brest; this virus may be related to intestinal lesions in sea bass. A variety of other findings have been reported, including IPN and a rhabdovirus in elvers, vibriosis (two new strains) in salmon, corynebacteriosis in rainbow trout with cutaneous lesions, and visceral granulomas (with mortalities) in three-month-old turbot.

Federal Republic of Germany. A survey of abnormalities in fish from the German Bight is continuing, including ulcer disease, papilloma (in dab), lymphocystis, and skeletal anomalies (in cod). The roles of stress and of nutritional states are being examined.

Ireland. Lymphocystis is found regularly in young fish surveys, and prevalences will be reexamined in 1981.

Oysters on the west coast of Ireland exhibit gill erosion. Some areas have high prevalences, severe cases, but no mortalities. There is no evidence of pathology, and the gills regenerate. The condition is seen mostly in O. edulis, but occasionally in C. gigas.

Netherlands. Bonamia was found in July 1980 in flat oysters imported from France, and then in native flat oysters. Infections reached 56%, and mortalities occurred. Total losses reached 149 tons of oysters.

Norway. An outbreak of gaffkemia occurred in a holding pond where an outbreak occurred two years ago after import of Canadian lobsters. No infections or mortalities were found in wild stocks of lobsters.

Also, an outbreak of vibriosis occurred in saithe, but was not as severe as one which occurred in 1974. Vibriosis is a continuing problem in salmon farming.

Portugal. Diseases in wild fish stocks and in mariculture are being monitored -- including a gill disease of eels and marine finfish caused by myxobacteria, and helminth parasites of sardines and horse mackerel. Shrimp (Palaemon serratus) culture studies have disclosed the presence of a larval annelid worm in the haemocoel. Prevalences in wild stocks reached 10%, but seemed to have no effect on egg production or viability.

United Kingdom. Several salmon diseases are being examined, including IPN virus in brood fish (which could result in high egg infection and high juvenile infection in later years); furunculosis (which is controlled in seawater by avoiding letting fish go to sea when infected, and by vaccination); bacterial kidney disease (found in one salmon farm); and a disease of the pancreas in salmon (the disease causes necrosis of acinar cells, mortalities up to 20-30%, affects fish in first year after transfer to sea water; may cause spinal deformity; and is not caused by IPN virus).

Five outbreaks of vibriosis have occurred in farmed Atlantic salmon, with up to 50-60% mortality. Isolates are typical V. anguillarum but serotypes are different from United States strains. Fish kills not caused by vibriosis have occurred in two salmon farms; these were thought due to heavy plankton blooms. Gymnodinium aureolum was identified as the cause in one instance -- possibly because of asphyxiation caused by the abundant mucoid secretions of the alga.

The Weymouth Laboratory is working on a trivalent vibriosis vaccine, which is now ready for field testing. The Laboratory also has new antibiotics ready for testing.

Gaffkemia has been found in holding units for Canadian lobsters, and the disease has been transmitted to damaged European lobsters by siphoning water from tank to tank.

United States. Minchinia nelsoni, a severe oyster pathogen, is still at high endemic levels in C. virginica from Delaware Bay. A new epizootic was predicted for 1980, based on high spring prevalences, but no mass mortalities occurred.

Further studies are being made of a virus associated with neoplastic disease in clams from the Northeast coast. The virus has not yet been photographed or visualized in neoplastic cells, but the disease can be transmitted and reverse transcriptase has been reported.

A patent has been obtained privately for lobster gaffkemia vaccine, and a new survey disclosed average prevalences of gaffkemia of 26% in wild populations of lobsters on the Maine coast.

Further studies are being made of IPN virus in menhaden and other clupeoid fishes. Isolation of virus from cell lines has met with difficulty. The available menhaden cell line has become resistant, and the virus cannot be isolated from the available chinook salmon embryo cell line.

#### METHODOLOGY

A special study group on methodology was named in 1980 (Nounou, Chairman; Balouet; deClerck; and Farley). The purpose of the study group is to establish standard methodology for general and specific disease examination.

Accumulation of information on methods is progressing; the following documents have been prepared:

- Balouet -- methodology for skin lesions and visceral nodules;
- Balouet -- methodology for molluscs, especially protozoan diseases;
- deClerck -- methodology for brown spot and other microbial diseases of shrimp;
- Martoja -- methods for identification and characterization of metals in tissues;
- Hill -- general methodology for fish examination;
- Hill -- bacteriology of marine fish.



During the discussion it was suggested that Working Group members examine and comment on available documents by July 1, 1981, and that a full discussion of standardization of methodology be part of the 1982 meeting. It was pointed out that two aspects must be emphasized: how to diagnose known diseases, and how to identify unknown diseases. It was also pointed out that what is needed is a synthesis of available information from such publications as the American Fisheries Society and Dr. P. Johnson's recent book on histology of the blue crab.

#### POLLUTION AND DISEASE

Several member countries reported on new or continuing studies of the relationships of pollution and disease.

France is continuing to monitor effects of the Amoco Cadiz oil spill of 1978. Hydrocarbon levels in tissues increase in summer and decrease in winter, but in general the levels remain high. Gonadal lesions are still found in oysters, and effects on fish year classes have been noted in Morlaix and Lanion Bays, with the 1978 year class absent, the 1979 year class small, and the 1980 year class normal.

French investigators are also examining skin lesions in relation to visceral nodules, using material from surveys and experimental exposures. Initial findings are that initial lesions are not of microbial etiology, that there are no papular stages comparable to cod ulcers in Denmark, and that correlation of skin lesions and visceral nodules is seen only in shad.

French investigators are also examining effects of contaminants on marine mammals, and have reported ulcerations which may be caused by pollutants.

France has been carrying out observations on pollution effects for the past six years, as part of a program called National Network for Observations on Pollution (RNO). The entire coast is monitored, and reports are made annually to the ICES MEQ Committee.

The Federal Republic of Germany is continuing studies in the lower Elbe estuary and in the German Bight. Findings from the Elbe estuary are: mercury levels in eels are too high (> 1 mg/kg) to allow a fishery; many liver and spleen tumors are found in sea perch; and intestinal necrosis in fish seems correlated with entry into the estuary. The frequency of papillomas and other diseases in dab of the German Bight is the subject of a continuing study by two research groups. Recent findings are that the distribution of papillomas, lymphocystis and ulcers in dab of the Bight are not precisely congruent, but there is a large overlap; that papillomas are not X cell types, but are actually later phases of an initial hyperplasia; and that papilloma-bearing fish have generally higher tissue PCB levels.

The United States is continuing a study of skeletal anomalies in sand eels (Ammodytes). Three thousand fish have been examined, and there seems to be a rough correlation of frequency of abnormalities and plumes from polluted estuaries. Some samples have up to 28% of individuals with skeletal abnormalities.

The Netherlands and Belgium are beginning in 1981 a cooperative study of eels in relation to polluted waters.

A communication from the Chairman, MEQ Committee, was read, requesting contributions of papers for the 1981 statutory meeting on the general subject of pollution-associated diseases -- which is one of the themes selected by the Committee.

## NEW DISEASES

Bonamia ostreae, a new protistan pathogen of flat oysters, has received much attention from French investigators. It was first recognized in 1979 in gills and stomach epithelium, as an intracellular parasite in hemocytes. Two stages have been recognized: a small form with dense cytoplasm surrounded by clear areas, and a large form with two membranes and uniform dense cytoplasm with cristae. Other forms have been seen; one elongate form has an electron-dense apical body and microtubules similar to Minchinia.

The "microcell" stage which is the most common form is similar to microcells described from O. edulis in California by Katkansky and Farley, and to microcells from C. gigas in British Columbia (Denman Island). There is still some disagreement, however, as to whether all these are similar or identical.

Bonamia is a serious threat in the Netherlands. All oysters in infected zones (parcs) have been removed, so there will be no oyster culture at all in those zones. A new regulation has been put into effect, that if disease is discovered, all oysters must be removed immediately. Sixty percent of imported oysters have been killed, and the disease has spread to flat oysters native to the Netherlands. Findings in infected oysters are that gill erosion is probably not fatal, but extensive necrosis is seen 1-2 months after infection is found; mortality starts then -- especially if oysters are transferred -- but 60% mortality can occur even if oysters are undisturbed (some die even if fat); most blood cells are infected -- so the disease may interfere with resistance; early stages of the disease may be detected by the intensity of cellular reaction, especially in the gills.

## QUANTITATIVE STUDIES OF DISEASE EFFECTS

Largely as a result of discussions during the 1980 Working Group meeting and during the 1980 Special Meeting on Diseases of Marine Fish and Shellfish, particular attention has been directed to quantitative effects of disease on populations. Several reports relevant to this subject were presented.

Surveys of Lernaeocera branchialis parasitization of whiting, conducted by FRG, disclosed that 60% of age groups 0 and 1 were infected. The fish were emaciated, and mortality was probably high. Other studies of lymphocystis and epidermal papillomas suggest that these disease conditions are probably not lethal.

Continuing studies by Scotland of Ichthyophonous infections in plaice have disclosed a number of new facts. The disease has an epicenter northwest of Scotland and is recognized grossly in plaice by external emaciation and internal enlargement of organs, particularly the spleen. Antibody responses have been demonstrated, but not in all fish. Data from field and experimental observations suggest a mortality rate of about 15% each 2-3 months, but during the period 1974 to 1980 there have been no detectable downward trends in population size of plaice in the epizootic area, as determined by catch statistics. This may be due to continued recruitment of uninfected fish from areas to the east.

The United States is continuing its examination of effects of the same pathogen, Ichthyophonous hoferi, on herring stocks of the western North Atlantic. Population fluctuations attributable to the disease were demonstrated earlier, but subsequent fluctuations seem more related to other natural factors such as interactions with mackerel, and to fishing.

Attention of the Working Group was directed to the need to look more intensively at egg and larval mortality that may be caused by disease. Instances cited were mycobacterial infections of pre-recruit mackerel, losses of larvae in hatcheries of up to 90% due to IPN virus, and mortality caused by parasitic diseases of larvae (copepods and helminths in particular).

#### INTERNATIONAL COOPERATION

A number of cooperative research efforts concerned with pathology were announced:

A joint survey of pseudobranchial tumors and ulcers in North Sea fish was conducted by FRG and Norway in 1980, and another is scheduled for late May, 1981.

The United States and France are carrying out a cooperative study of integumental lesions possibly related to pollution. Histological material has been exchanged.

France is planning a two-week cruise in November, 1981, to survey abnormalities in fish in the southern part of the English Channel

An international listing of institutions offering courses in aquatic pathology has been prepared by Dr. H. Möller, FRG, and a copy is appended to this report (Appendix III).

## REGISTRIES OF MARINE PATHOLOGY

Some progress is being made in the establishment of national marine pathology registries, consisting of histological material, publications and bibliographies. The feeling of the working group is that efforts should begin with national registries, but should be tied in with an international network. With this approach, catalogs of material could be in each national registry and materials stored there, but accessibility to other nations could result from exchange of lists of holdings, much of which could be computerized. Recent developments in national registries are:

- ° A committee to design an international registry has been proposed.
- ° An updated accessions list will be distributed in summer 1981 by the Registry of Marine Pathology at Oxford, Maryland.
- ° The Fisheries Diagnostic Laboratory at Weymouth has prepared a list of histological material in its Registry of Aquatic Pathology.
- ° Oxford will provide to each member country an example of its format for accessioning and cataloging material.

As a result of discussions during the Working Group meeting, it was decided that each member nation will prepare for next year's meeting a list of microscopic slides available; that each country will prepare for next year's meeting a list of fatal or important diseases of commercial species (natural stocks or mariculture); and that each country will prepare a list of diseases of non-commercial species which should be investigated for special purposes (ex. pollution monitoring or assay, or use as models).

## DISEASE INDEX

Editorial responsibility for the Disease Index is as follows: Chief Editor, C. Maurin; Molluscs, A. Farley; Crustacea, M. Bonami; Fish, A. Munro. All material for publication in the Cooperative Research Report on Disease Index should be sent to the Working Group Chairman by September, 1981. The format of the Index will be standard (based on an earlier model selected by the Working Group), and language will be French or English.

## DIAGNOSTIC FICHES

A prospectus (justification) will be prepared by Dr. Maurin for submission to the Bureau in time for its May 22, 1981, meeting and then to Delegates in October, 1981. The prospectus will include the following points: justification, scientific interest, total number of fiches planned, number ready for publication, language, separates or single volume, projected distribution and numbers of copies, length and format (a copy of the prospectus is appended to this report as Appendix IV).

It was decided that the fiches would be issued as four-page separates with standard format; that 1500 copies would be requested; and that language could be either French or English. Approximately 30 fiches are ready for publication now; 11 more are in preparation, and a maximum of 100 is projected over a 5-year period. Detailed instructions to authors will be prepared after we learn of the reaction of the Bureau to the prospectus.

## RECOMMENDATIONS

As a result of discussions during its meeting, the Working Group on Pathology of Marine Organisms proposes the following recommendations to the parent committees:

### (1) Quantitative Effects of Disease

Because of possible severe effects of disease on commercial fish and shellfish, a series of review papers should be prepared jointly by pathologists, stock assessment biologists and ecologists, on quantitative assessments of disease impacts. These papers will be presented at a mini-symposium of ICES at the 1982 or 1983 Statutory Meeting, at a joint session of Pelagic Fish, Demersal Fish, Mariculture, and MEQ Committees. Diseases to be considered include but are not limited to Ichthyophonus, ulcers in cod, Menhaden disease and vibriosis in saithe, Minchinia, Marteilia, Bonamia.

### (2) Sand Eel Watch

Because of the widespread distribution and relative geographic stability of populations of eels (Ammodytes), and because initial studies of skeletal anomalies suggest possible effects of environmental variables including pollution, it is recommended that member countries consider initial examinations of populations of sand eels or other environmentally sensitive species off their coasts for anomalies and report to ICES on a timely basis.

### (3) Obstructions to New Mariculture

Diseases are considered major obstacles to the successful development of mariculture. It is recommended that member nations should identify and study diseases predicted or expected to be problems or deterrents for mariculture of new species -- turbot, penaeids, sea bass, etc. -- including genetic, nutritional, and environmentally-induced diseases.



(4) Because disease prevention is as significant as control, member countries should encourage the development of prophylactic measures against diseases important to mariculture.

(5) In view of their instructional value and their utility in archiving pathobiological data it is recommended by the Working Group that ICES member nations establish registries to acquire and accession microscopic slides depicting representative lesions and microparasites of marine fishes, crustaceans and molluscs.

(6) Because disease continues to be a significant factor in fisheries and mariculture in member nations, and because of the need to continue work on standard diagnostic methods, pathology registries, and disease summaries, the Working Group should meet in 1982. The time and place suggested is IJmuiden, Netherlands, April 20-24, 1982.



APPENDIX I

## APPENDIX I

LIST OF PARTICIPANTS

<u>Name</u>	<u>Address</u>	<u>Room</u>	<u>Field Trip</u>
C. Maurin	ISTPM, BP 1049, F44032, Nantes	104	+
A. Rosenfield	NOAA/NMFS, Oxford, MD	-	+
Baudin - <del>kaufmann</del>	LNPA, Brest	127	+
E. Egidius	FHI, Bergen	108	+
J. Menezes	INIP, Lisboa	111	+
H. Möller	IFM, Kiel	122	X
B. Hill	MAFF, Weymouth, U.K.	101	+
A. Munro	DAFS, Marine Lab., Aberdeen, U.K.	123	+
M. Comps	ISTPM, Sete	102	+
H. Grizel	ISTPM, La Trinite Sur Mer	103	+
N. O. Christensen	K.V.L., Copenhagen, Denmark	121	++
D. DeClerck	Rykntation zoor Zeevisery, Belgium	109	+
Paul van Banning	RIVO, Ijuiden, The Netherlands	105	+
B. Watermann	BFA, Hamburg	126	+
N. Poder	Laboratoire de Pathologie, Brest	115	+
G. Balouet	Laboratoire de Pathologie, Brest	114	+
A. Farley	NEFC, Oxford	-	+
C. Sindermann	Sandy Hook Lab., Highlands, NJ	130	+
W. Blogoslawski	NOAA, NMFS, Milford, CT		No
F. B. Bang	Johns Hopkins Univ., Baltimore		No
J. McArdle	Dept. Fisheries & Forestry, Dublin, Ireland	232	+

APPENDIX II

APPENDIX II

INTERNATIONAL COUNCIL FOR THE  
EXPLORATION OF THE SEA

CONSEIL INTERNATIONAL POUR  
L'EXPLORATION DE LA MER

WORKING GROUP MEETING ON PATHOLOGY AND DISEASES IN MARINE ORGANISMS  
REUNION DU GROUPE DE TRAVAIL SUR LA PATHOLOGIE ET LES MALADIES DES ORGANISMES MARINS

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Oxford laboratory - Oxford - Maryland - U.S.A.  
22-25 April, 1981  
22-25 avril, 1981

PROPOSED AGENDA  
PROJET D'ORDRE DU JOUR

WEDNESDAY, APRIL, 22th  
Mercredi 22 avril

Morning  
Matinée

- . Opening of the meeting  
Ouverture
- . Progress in council's resolutions  
Etat d'avancement des résolutions du Conseil
- . Current status of main diseases (review by country)  
Situation épidémiologique des principales maladies (revue par pa

Afternoon  
Après-midi

- . Current status of main diseases (the end)  
Situation épidémiologique des principales maladies (fin)

THURSDAY, April 23th  
Jeudi 23 avril

Morning  
Matinée

- . Methodology  
Méthodologie
- . Questions concerning the index, the "fiches", reviews, maps, etc.  
Questions concernant l'index, les fiches, revues, cartes, etc.

.../...

Afternoon  
Après-midi

- . Discussion about new information on diseases  
Discussion concernant les nouvelles informations sur les maladies
- . Diseases related to pollutions  
Maladies liées aux pollutions
  
- . Microscopy on *Bonamia* and pancreas disease  
Séance de microscopie sur le parasite *Bonamia* et la maladie du  
pancréas (IPM)

FRIDAY, APRIL 24th  
Vendredi 24 avril

Morning  
Matinée

- . Quantitative aspect of diseases impact on populations and  
recruitment, especially ichthyoplankton (*Marteilia*, *Bonamia* etc.)  
Aspect quantitatif de l'impact des maladies sur les populations  
et sur le recrutement, notamment sur l'ichthyoplancton (*Marteilia*,  
*Bonamia* etc.)

Afternoon  
Après-midi

- . Register  
Registre
- . International cooperation  
Coopération internationale
- . Discussion on recommendations  
Discussion des recommandations

SATURDAY, APRIL 25th  
Samedi 25 avril

- . Field tour  
Sortie sur le terrain

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

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10/10/10



APPENDIX III

name of lecturer and institution	title of lecture (1) or course (c)	histology	virology	bacteriology	parasitology	fresh water	marine water	fish	shellfish	hours in total	repetition every	language	number of students	fee for course	foreign students admitted?
		X	X	X	X	X	X	X	X	X	X	X	X	X	X
<p>AUSTRALIA</p> <p>Lester Department of Parasitology University of Queensland Brisbane Australia 4067</p>	Parasites of marine animals (c)				X		X X			40	year	engl.	20	free	by special permission
<p>AUSTRIA</p> <p>Grünberg Institut für Fischkunde Veterinärmedizinische Universität 1030 Wien III Linke Bahngasse 11</p>	<p>Fish pathology with exercises (1+c)</p> <p>a. Virology b. Bacteriology c. Parasitology</p> <p>Pathology of commercial littoral fishes of the Adriatic Sea (1)</p>	X	X X	X X	X	X	X			30 each	2 years	germ.	100- 150	free	yes
<p>DENMARK</p> <p>Christensen Kgl. Veterinær- og Landbo- højskole Ambulatorisk Klinik Bülowsvej 15 1870 København</p>	<p>Fish diseases (1)</p> <p>Aquatic pathobiology (a)</p>	X	X X	X X	X X	X X	X X X	X		150	year	dan.	5-10	free	yes
<p>FINLAND</p> <p>(1) Bylund (2) Wikgren  Institute of Parasitology Åbo Akademi Forhållsgatan 7 20500 Åbo 10</p>	<p>(1) Techniques in parasitology (1)</p> <p>(2) General parasitology (1)</p> <p>(1) Fish parasitology and fish diseases (1)</p>														

name of lecturer and institution	title of lecture (1) or course (c)	histology	virology	bacteriology	parasitology	fresh water	marine water	fish	shellfish	hours in total	repetition every	language	number of students	fee for course	foreign students admitted?
<b>FRANCE</b>  (1) Bonagi (2) Lopez (3) Yago  Université des Sciences Centre de Pathologie et Parasitologie 34060 Montpellier	(1, 3) Aquatic and marine pathology (1) (1, 3) Aquatic and marine pathology (c) (2, 3) Invertebrate pathology (1)	X	X	X	X	X	X	X	X	1-2 months	year	french	20	free	yes
<b>GERMANY</b>  Reichenbach-Klinke  Institut für Zoologie und Hydrobiologie Kaulbachstraße 37 8000 München 22  Körting  Fish Disease Research Unit School of Veterinary Medic. Bischofsholer Damm 15 3000 Hannover 1  Möller  Institut für Meereskunde Düsternbrookerweg 20 2300 Kiel 1  Schubert  Universität Hohenheim Abt. Biologie der Fische Schleich 7000 Stuttgart 70	Fisch and environment, Diagnosis and therapy of fish diseases (c)  Fish diseases (freshwater fishes) Part I+II (1) Diagnosis of fish diseases (c)  Diseases and parasites of fishes (c)  Fish pathology (1) Diseases of pet fishes (c)	X	X	X	X	X		X		30	year	germ.	30	DM200	yes
		X	X	X	X	X	X			24	year	germ.	6-10	DM50	yes
		X	X	X	X	X	X	X	X	20	year	germ.	12	free	by special permission
		X	X	X	X	X	X	X	X	40	2 years	germ.			

name of lecturer and institution	title of lecture (1) or course (c)	histology	virology	bacteriology	parasitology	fresh water	marine water	fish	shellfish	hours in total	repetition every	language	number of students	fee for course	foreign students admitted?
<p>GREAT BRITAIN</p> <p>Roberts et al.</p> <p>Institute of Aquaculture University of Stirling Stirling FK9 4LA</p>	<p>Aquatic pathobiology (c)</p>	X	X	X	X	X	X	X	X	800	2 years	engl.	45	15000 (foreign)	yes yes
<p>ISRAEL</p> <p>Paperna</p> <p>H. Steinitz Marine Laboratory of the Hebrew University of Jerusalem P.O.B. 469 Eilat</p>	<p>Fish diseases (c+l)</p> <p>Selected problems in parasitology (1)</p>	X	X	X	X	X	X	X	X	40	year	hebrew engl.	7- 12	7	yes
<p>SWEDEN</p> <p>Johannson</p> <p>Laxforskningsinstitutet 81070 Älvkarleby</p>	<p>(course)</p>	X	X	X	X	X	X	X	X	60	2 years	swed.	20	free	yes
<p>USA</p> <p>Rickards</p> <p>Cornell University Eastern Fish Laboratory Leetown, Kearneysville West Virginia</p>	<p>Aquavet (c)</p>	X	X	X	X	X	X	X	X	240	year	engl.	30	7	7

Dr. Heino Möller c/o  
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APPENDIX IV

PROSPECTUS FOR PUBLICATION OF "FICHES D'IDENTIFICATION  
DES MALADIES DES POISSONS ET COQUILLES

There are many and dispersed publications on diseases of marine fish and shellfish, but there is a need to provide a unified source of information for non-specialists. The proposed Fiches would attempt to provide summaries of all available information on important diseases in a standard format. The area of concern would be the North Atlantic and adjacent seas. No such source of information now exists.

Some of the reasons for the establishment of the series are:

- ° It will provide a practical guide useful to many people, for the rapid diagnosis of disease.
- ° It will provide information about disease effects on wild stocks of fish and shellfish, and about
- ° prevalences of such diseases.
- ° It will provide information leading to improvement of mariculture through disease control, prevention, and treatment. It will be important in inspection of animals to be introduced or transferred.
- ° It will provide access to key literature references concerning each disease.
- ° It will provide reference to key laboratories for information and diagnosis of particular diseases.
- ° It will provide a mechanism for the summarization and rapid publication of information about new diseases which may have great economic importance.

## GUIDELINES FOR FICHES

It is expected that approximately 100 fiches will be prepared in the next five years. About 30 are ready for publication now, and approximately 12 more are in preparation. Titles have been assigned for another 14. Still others will be developed as needed.

The fiches should be published as separates, similar to the ICES zooplankton fiches, and following a standard format of four pages, in either French or English, with suitable line drawings and photographs.

The fiches will be based on diseases or pathogens described in the published scientific literature. Detailed instructions for preparation of fiches have been prepared, and will be expanded (present instructions are included as Appendix 1 of this document).

We expect that the fiches will have substantial scientific interest, and project a printing run of 1500 copies, with 500 for immediate distribution to member countries.

Status of fiches being prepared for publication

A. Fiches in completed form ready for publication

Fish Diseases

- Papillomatosis of eels, by N. Peters and G. Peters
- Lymphocystis disease of fish, by B. J. Hill
- Corynebacteriose, by M. Vigneulle
- Ichthyophonus, a systemic fungal disease of fish, by A. H. McVicar
- Coccidiosis of the liver of blue whiting, by K. MacKenzie
- Digestive tract microsporidiosis of flatfish, by P. van Banning
- Cranial myxosporidiosis of fishes, by P. van Banning
- Phocanema larvae ("codworm") (Nematoda) in fish, by J. W. Smith  
and R. Wooten
- Anisakis larvae ("Herringworm") (Nematoda) in fish, by J. W. Smith  
and R. Wooten
- Phocascaris/Contracaecum larvae (Nematoda) in fish, by J. W. Smith  
and R. Wooten
- Larval paragnathiosis of mullets, by J. Menezes
- Viral erythrocytic necrosis, by M. Newman
- Vibriosis in saithe, by E. Egidius
- Pseudobranchial tumors of cod, by E. Egidius
- Salmon lice, Lepeophthirus salmonis, by E. Egidius



## Molluscan Diseases

Haematopoietic neoplasm in Mytilus edulis, by D. J. Alderman

and M. Green

Haemocytic neoplasm in Ostrea edulis, by G. Balouet

Virose de L'Huitre Portugaise, by M. Comps

Infection Rickettsienne de L'Huitre Plate, by M. Comps

Infection Rickettsienne de Donax trunculus, by M. Comps

Shell disease of oysters, by D. J. Alderman

Minchinia armoricana disease of the European flat oyster

(Ostrea edulis L.), by P. van Banning

Maladie de la glande digestive de L'Huitre plate, by M. Comps

Maladie du tissu intersticiel de L'Huitre plate, by M. Comps

Mytilicola orientalis Mori, by H. Brizel

Maladie des branchies, by M. Comps

Mytilicola intestinalis Steuer, by V. Dethlefsen

Viral gametocytic hypertrophy, by A. Farley

B. Fiches prepared but not in final edited form

Bacterial shell disease of Crustacea, by B. Austin and D. J. Alderman

Milk or cotton disease of the brown shrimp, by P. van Banning

Fungal shell disease of Crustacea, by D. J. Alderman

Others

C. Fiches proposed for preparation but not yet completed

Mycobacteriosis (van Banning)

Ulcer syndrome of cod (Christensen)

Microcell disease of oysters (Farley)

Perkinsus in oysters (Kern)

Gaffkemia in lobsters (Egidius and L'Eglise)

Furunculosis in Atlantic salmon (Munro)

Vibriosis of salmon (Egidius)

Minchinia nelsoni in oysters (Farley)

Macrocell disease of *Crassostrea gigas* (Farley)

Minchinia costalis in oysters (Farley)

X-cell lesion in dab (Watermann)

X-cell papilloma in dab (Watermann)

Spring ulcer disease of eels (Christensen)

Palpeque Bay disease of oysters (Farley)

## APPENDIX V

## APPENDIX V

### Draft guidelines for preparation of diagnostic fiches

1. Heading will include: Title (name of disease), author, complete address.
2. Section headings will be the same as for the Index, and in the same sequence.
3. Text should be 500-1000 words in length excluding diagnostic photographs, line drawings and key references.
4. "Key references" should give complete citations, and should number no more than ten. Only published literature should be cited.
5. Latin and common names of hosts should be used, with authority.
6. Technical jargon should be avoided.
7. High standards of photography and illustration are expected. Scale should be placed on illustrations where applicable.
8. Gross and microscopic photographs should be included where applicable. Virus papers must include electron micrographs. Emphasis should be on diagnostic features.
9. Photographs and line drawings should be limited to one page.
10. The total fiche should be contained on four pages.
11. The disease or pathogen must have been described in the published scientific literature.
12. Date of approval should be at bottom of first page.

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