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REPORT OF THE ICES WORKING GROUP ON PATHOLOGY AND DISEASES OF MARINE ORGANISMS

edited by

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REPORT OF THE ICES WORKING GROUP ON PATHOLOGY AND DISEASES OF MARINE ORGANISMS

The working group on pathology and diseases of marine organisms met in Hirtshals, Denmark, from April 16th through 19th, 1985 with Dr E. Egidius as chairman, to:

(i) discuss implications of information supplied to the chairman before 1 January 1985 on the current disease status in member countries and on new disease problems of wild and cultivated fish, and to develop a better format for disease reporting,

(ii) discuss investigations on diseases of juvenile and larval stages of cultivated fish as a first step towards greater understanding of the importance of disease in early stages of wild fish,

(iii) encourage work and exchange of information in the field of tumour pathology with the following aims:

a) to classify observations according to the definitions proposed by the working group in 1982,
b) to inform and test hypotheses on relationships with putative aetiological factors,

(iv) consider written submissions, and arrange for collaborative and cooperative studies on host-parasite interactions, especially the more fundamental aspects of host defenses and the pathological properties of pathogens,

(v) review the status of research on pathological states induced in fish and shellfish by animal parasites,

(vi) discuss at the joint session various aspects of possible pollution-related diseases.

I INTRODUCTION

Dr. V. Hansen, director of the Nordsøcenter branch of Danmarks Fiskeri og Havundersøkelser welcomed delegates of the Pathology and Disease working group and of the Biological Effects Study Group. He outlined the funding and organisation of the North Sea Centre.

II W.G. BUSINESS, REPORTING ETC

Dr. Egidius resumed the chair of the WGPDMO on separation of the 2 groups and details of the mode of action of the working group were determined. It was agreed that pairs of rapporteurs would be responsible for half day sessions. Agenda changes to accommodate the joint meeting on Wednesday were discussed, the agenda of the working groups meeting (Annex 1) was agreed upon and eventual pollution related diseases and definitions were taken as the first items.

III TOPICS TO BE DISCUSSED PRIOR TO THE JOINT MEETING

1. Strategy for joint meeting

A discussion was held on the background reasons for the interest of the pollution monitoring group in fish diseases and the question asked in what way could fish diseases be useful in pollution studies i e to determine cause - effect relationships or as a general index of pollution. Several case studies were considered in an attempt to elucidate this question.

2. National reports on possible pollution related diseases

Felix Baudin Laurencin reported the experimental investigation of 3 types of pollution to determine if these caused pathological conditions or if a well defined syndrome of rainbow trout can be related to these pollutants:

(a) Dithiocarbamates-pathological effects are noted only at higher concentrations than stated in the literature.

(b) Atrazine (dye) - at Cl 50 concentrations proposed in the literature no mortalities were found.

(c) Diesel fuel. High levels gave low levels of mortality, but chronic pathological signs were more common such as vacuolation of pancreatic cells. Experiments lasted 8-15 days and it was suggested that the more volatile compounds would have evaporated off rapidly making it difficult to determine which compound of diesel was having a pathological effect.

Georges Balouet summarized, verbally and in a typed report, the main conclusions arising from studies following the Amoco Cadiz oil spillage. Massive accumulation of hydrocarbons in oysters was found, capability of eliminating components varied, with aliphatic hydrocarbons being rapidly eliminated while PAH and especially polyalkylated dibenzothiophens were retained longer. Continued contamination was related to sediment retention: various histological lesions were found, especially in the digestive tract and gonads; some were reversible, particularly those occurring 2 or more years after the spill. No correlation was found between pollution and oyster parasite infection, nor did new tumours occur. Taste of oysters was affected.

Jan Thulin reported results of studies on perch in the Bothnian Sea in the vicinity of a pulp mill. A high prevalence (70%) of fin abnormalities was directly associated with pulp mill effluent and similarly 25% of the pike showed deformations of the head. Experimental trials with effluent showed effects in perch in 14 days. Although causative agents were not identified the use of chlorine bleaching by the pulp mill was thought to be a possible significant cause.

Paul van Banning gave a verbal summary of a joint Dutch-Belgian study carried out over 2 years on eels taken from polluted and non-polluted areas. A full report is available in Dutch. It was found impossible to establish a direct correlation between levels of pollution and disease in individual fish - some fish with high disease levels had low contaminant levels and vice

versa. There was, however, a higher prevalence of disease in the polluted area. It was concluded that there was no direct effect from pollution but that pollution resulted in higher levels of bacteria (Akaligenes, Aeromonas, Pseudomonas, Vibrio) which combined with possible decreased resistance of eels may have caused higher disease levels.

Burkhart Waterman summarized results of disease studies on titanium dioxide production waste (IDPW) dumping grounds in the German Bight and presented an official written review. Disease conditions of Dab studied were Lymphocystis, epidermal hyperplasia/papilloma, and ulcerations. The highest prevalence was found in the eastern German Bight, but most areas exhibited elevated disease rates. Present data show that there is a congruency between areas of increased chromium levels and areas of increased prevalences of diseases. Higher levels of chromium in Dab mucus and epidermis were found in the vicinity of titanium dumping and general evidence that chromium can act as a co-carcinogen was noted. Iron particles were more common in epidermal cells of Dab from waste dumping grounds and the potential of iron as an indicator was suggested.

Variables possibly affecting disease which had to be taken into account included fishery influences (including net damage), Dab migration (including spawning) and high disease levels in other areas (e.g. Dogger Bank). In conclusion it could not be stated that IDPW dumping had a specific effect. Increased disease levels were a result of a combination of different factors and it is important to start to assign roles of each component. Fish disease surveys are not capable of establishing cause-effect relationships but particularly in combination with fishery and chemical studies can give hints of effects of different factors including pollution.

In discussion Mellergaard reported the finding by E.M. of virus particles in Dab papillomas and van Banning noted that in aquarium experiments Dab epidermal hyperplasia could appear, disappear, grow or decrease. Also they could appear at all times during the year and not just in spring.

3. The J.J. Johnstone collection

A description of the newly re-discovered Johnstone collection on pathological samples from marine fish was presented by D. Bucke and G. Balouet who have had the opportunity of going through the material. The existence and importance of the collection for the historical recordings of pathological conditions in fish was discussed. Professor J.J. Johnstone (1870-1932) collected and studied the material as biologist, physiologist and pathologist. The material which remains consists of 285 gross specimens and approximately 700 slides. It gives a good picture of several topics which are currently in focus again for pathological and environmental studies such as tumours and tumour-like lesions, teratologic lesions and parasitic infections. Johnstone was also the first to describe Ichthyophonus in mackerel and plaice and the papilloma/hyperplasia condition of Dab.

4. Fish diseases as monitoring technique

The value of recording of fish diseases as monitoring technique was discussed. It was stated that the value must be considered as an epidemiological study giving some possible relation between disease and pollution to a certain degree. With the used monitoring techniques no direct proof for pollution can be concluded. Proofs in this field can only be obtained through experimental investigations.

The WG agreed that the points of view discussed at the meeting of 1983 concerning pollution and monitoring of biological effects are still valid and require only small amendments.

5. Classification of tumours

The importance of tumours in fish and shellfish among polikilotherms neoplasms (65% of cases collected in International registries concern fish and shellfish) was emphasized and the definition proposed by the ICES WGPDMO in 1982 (Ijmuiden) was reminded. This definition has been confirmed by the Compara-

tive Tumor Pathology Group of the Society of Invertebrate Pathology in 1984 (Davis, California). The classification is mainly based on histological descriptions and distinguishes:

- hyperplasia, non neoplastic lesions (e.g. epithelial lesions on skin, fins, etc.),
- pseudotumours and/or xenic tumours (e.g. lymphocystis, foreign bodies, fish "nodules" or granulomata, pseudobranchial tumours, etc.),
- benign tumours, non neoplastic, possibly the best markers of environmental changes (e.g. papillomas, fibromas, etc.),
- true malignant tumours or cancers, occasional, enzootic or epizootic lesions. The most common are found in target organs (skin, liver and hematopoietic tissues) and can have a metastatic evolution. They basically correspond to a genoma cell change, provoked by viruses or chemicals. This possibility is not always evident in exposition to polluted environment, but well demonstrated in experimental conditions with a multistep cell transformation.

Especially, experiments using small fishes (juveniles of certain marine fish, or aquarium fish) are developing as an excellent approach of carcinogenicity testing and demonstration of ultimate carcinogens responsability."

6. Definitions of Terms

In order to prevent misuse of terms and misunderstanding between members of the WGPDMO and in particular with other working groups, it was felt necessary to reach agreement on definitions of the following: disease, pathology, environment, pollution, monitoring. After considerable discussions, agreement was reached as follows:

1) Disease: a deviation from the state of complete physical or social well-being of an organism, involving a well

defined set of symptoms and aetiology and leading to an impairment of its normal functions.

Maladie: déviation de l'état de complet bien être physique ou social d'un organisme, correspondant à un ensemble de symptômes et á une étiologie bien définis, et conduisant à une altération de ses fonctions normales.

2) Pathology: is the study of diseases by scientific methods. A pathological condition in an organism is a deviation from normal, of known or unknown origin.

Pathologie: Etude des maladies par des méthodes scientifiques. Un état pathologique est, dans un organisme, une déviation par rapport à la normale, d'étiologie connue ou inconnue.

3) Environment: all of the external factors or conditions supporting or influencing the existence or development of an organism or assemblages of organisms.

Environnement: Ensemble des facteurs externes permettant out influencant l'existence ou le développement d'organismes isolés ou interdépendants.

4) Pollution: is the introduction by human activities, directly or indirectly of substances or energy into the environment resulting in deleterious effects as harm to living organisms.

Pollution: Introduction par l'homme, directement ou indirectement, de substances ou d'énergie dans l'environnement, aboutissant à des effects négatifs nuisibles aux organismes vivants.

5) Monitoring: consists of regular investigations and recording of the findings.

Monitoring: Surveillance régulière d'une situation avec enregistrement des résultats.

IV JOINT MEETING

The joint meeting with the Study Group on Biological Effects Techniques was held in the morning of April 17th. The main purpose of this meeting was to discuss the possible use of fish pathology in monitoring pollution effects. The meeting agreed upon a joint report with recommendations which are included as Annex 4.

V PUBLICATIONS

1. Leaflets in preparation

Fiches or "Diagnostic leaflets" number 11 to 20 were published in January 1985, and processing for printing of numbers 21 to 30 have started. The editor of the fiches, dr. C.J. Sindermann who unfortunately could not attend the meeting, at present has manuscripts for further numbers 31 to 36.

These are:

31. "Bacterial shell disease of crustaceans" by B. Austin and D. Alderman.

32. "Fungal shell disease of crustaceans" by D. Alderman.

33. "Epiderma papilloma of dab" by B. Watermann and V. Dethlefsen.

34. "Connective tissue inflammation in dab associated with an unidentified cell type" by B. Watermann.

35. "Ulcus syndrome in cod" by N.O. Christensen.

36. "Spring ulcer disease in eels" by I. Dalsgaard.

Additional titles, as yet without manuscripts are:

37. "Furunculosis of Atlantic salmon" by A. Munro.

38. "Microcell disease of flat oysters" by C. A. Farley.

39. "Haplosporidium nelsoni disease of American oysters" by C.A. Farley.

40. "Haplosporidium costalis disease of American oysters" by C.A. Farley.

2. New titles

Tentative titles and authors for which have been suggested are:

"Gaffkaemia of lobster" by J. Stewart.

"Lernaeocera branchialis" by H. Møller.

"Coccidiosis" by C. Morrison.

"Salt-water costiasis" by J. McArdle and R. Wootten.

"Soft clam neoplasms" by C.A. Farley and S. Otto.

"Rhizocephalan parasite of Japanese scallops" by R. Elston.

"Intranuclear parasite of razor clams" by R. Elston.

The working group discussed the titles put forward, its members will push proposed authors and the group also proposed further titles and authors:

Hepatic nodules in dab	D. Bucke
Epidermal hyperplasia in whiting	D. Bucke
Eimeria infections in blue whiting	K. McKenzie (Aberdeen)
Cold-water vibriosis or "Hitra disease"	E. Egidius
IPN disease in salmonids	Brit Hjeltnes (Bergen)

Exophiala infections in salmonids	F. Langvad and K. Engjom (Bergen)
Diplectanum (monogenean) infection in "sea bass"	F. Baudin Laurencin
Granulomatous tyrosinemia in turbot	F. Baudin Laurencin
Hepatomas in trout	F. Baudin Laurencin and G. Balouet

The working group repeated last years agreement on deleting the editors institution and address from the front page of the fiches, and request the secretariat to make this change.

VI STATISTICAL APPROACHES IN DISEASE WORK

The working group had requested of its Danish members, information and advice on statistical approaches and methodology for collecting and analysing disease data. Thorkild Aarup of the North Sea Centre provided the following advice and discussion:

He began by giving the characteristics of the surveys and suggesting that practioners must answer particular questions and convince themselves and others of the independence of the data in reference to particular parameters.

1) Background or characteristics

- Disease investigations will be undertaken at sea.
- These will include standard surveys or special surveys.
- They will be conducted from different research vessels.
- Different areas will be explored.
- The data will be collected from one or more hauls.

2) Data usage or the case for the data

- May be used as an indicator of pollution,
- Might be used to determine how disease affects mortalities.
- Could be used for the classification and identification of fish stocks.

- Accumulation of information under the general heading of Basic Research.

3) Requirements - Independence of data from:

a) Area
b) Station
c) Haul
d) Gear
e) Research vessel
f) Survey type (Disease data survey or standard population type surveys)
g) Time (year, month, day, time of day)
h) Weather/sea conditions

VII NATIONAL DISEASE REPORTS

Formats for national disease reports were discussed and the format used in this report was agreed to as a trial. For geographical distribution of diseases found in disease surveys, the ICES chart network was recommended. W.G. members presented their national reports summaries of which are presented in Tables 1.1-10 and 2.9-9 (Annex 5). No reports were received from group members not present or countries which are not represented in the group. After the meeting the chairman received a report from Poland (Table 1.8).

Points of special interest from the reports:

Canada for the first time reported severe infections with salmon lice, Lepeophtheirus salmonis, in the culture of Atlantic salmon at the Atlantic coast, an infection that has been persisting in Norway and Scotland for years.

Denmark reported severe mortalities due to the lobster pathogen Aerococcus viridans (Gaffkemia) in lobsters imported from Ireland. Gaffkemia also was diagnosed in lobsters in a holding site in southern England.

In Denmark ERM (enteric red mouth) was a serious problem in 50 fresh water fish farms of rainbow trout. The bacterium was found also in 3 marine farms but no serious problems occurred in sea water.

In France both Marteillosis and Bonamiosis still are important in all natural flat oyster beds in Brittany. All experiments on possible new ongrowth methods for Ostrea edulis (deep water, intertidal zones etc) came out with Bonamia infections. The summer mortalities in culture of Crassostera gigas were studied further. The resulting data suggest that high temperature, sexual maturation and spawning bring the oyster in energy disbalance.

In French fish culture chronic mortalities most probably due to Vibrio parahemolyticus were reported in sea bass. High mortalities in turbot larvae, sea bass and dorades were also reported. IPN virus type Sp was found once in one out of 8 lots of turbot larvae. In both sea bass and sea bream larvae non inflation of the swim bladder are followed by vertebral deformities.

The infection diseases IPN and ERM were diagnosed in farmed salmonids in Finland for the first time. The IPN virus was isolated in routine screening on trout frams and was not associated with disease or mortality. The ERM bacterium was isolated from clinical cases in two farms from salmon and coregonids.

The German (FRG) disease cruises in the North Sea last year paid special attention to the X-cell disease of dab. A different regional distribution as compared to other external diseases was found. Affected fish seem castrated and have very low condition factors.

Ireland reported severe losses in caged farmed salmon most probably due to sunburn with ulcers of the skin and pectoral fins as main symptoms.

The Netherlands reported progress in the attempts to fight the oyster pathogen Bonamia ostrea. Commercial planting of some 400.000 O. edulis was used as challenge test to detect new foci of infection. Three foci were detected in old oysterbeds, while the new planted beds remained free of the pathogen in the test period from April to November. Whereas in England this oyster disease was present and intensified in Cornwall and in Essex, but there was no indication of spread to other important oyster growing regions.

In Norway the so called cold-water vibriosis or Hitra disease is persisting with, in many cases, high mortalities. Nutrition deficiencies are by some researchers suspected to evoke a disease with identical symptoms as the proved bacterial infection. The disease has been diagnosed in one farm in Shetland, Scotland.

The mass rearing of cod is specially affected by vibriosis during the first summer and vaccination experiments are designed for 1985.

Sweden reported diarrhetic shellfish poisoning in both natural growing and farmed Mytilus edulis lasting with constant toxicity from October to the end of March along the west coast. The suspected causative agent is the algae Dinophysis acuta.

From Scotland it was reported that IPN had been shown to cause pancreas pathology in post smolt salmon and to be capable of transmission between salmon in sea water. 17 further Scottish farms now are affected by a pancreas disease of unknown actiology.

VIII WORKSHOP, MICROSCOPE SLIDES

David Bucke showed several of the original slides from the Johnstone collection which include lymphocystis, fibroma, several types of sarcomas, epidermal papilloma and Ichthyophonus from different fish species. Johnstone's collection in the Mersey-side County Museums, Liverpool, represents an

extremely valuable reference material collected in the beginning of this century.

Felix Baudin Laurencin showed some slides on granulomatous tyrosinemia (an enzymatic disorder induced by vit. C deficiency) in kidney of turbot. He also reported hepatoma in 20% of 4 year old rainbow trout (brood stock).

Georges Balouet showed some slides of liver tumours which had been experimentally induced with nitrosamins in juvenile marine fish (Mugil capito). These tumours appeared after 40-50 days of exposure.

Johan McArdle showed several slides on ulcers of the skin and pectoral fins of cage farmed salmon. These lesions were thought to be due to sunburn. The histological picture of these sunburn ulcers is very similar to that of UDN.

Paul van Banning presented slides showing hyperplasia/papilloma in cod and on a fungus in plaice. Furthermore he showed some pictures on sole with parts of the skin lost. 10-15% of a sole population had shown this condition which was thought to be related to cold water temperature.

Gøran Bylund presented slides of lymphocystis in herring where the typical cellgrowth also was found in internal organs. Further he demonstrated the evolution of skin ulcers in flounder associated with coastal waters carrying high loads of organic wastes. He also showed slides of lymphoma in northern pike which occurs where the fish lives at its extreme limit of salt tolerance.

Burkhard Watermann showed the distribution of X-Cell lesions in gills of dab. Some similarities between X-cells in dab gills and X-cells in pseudobranch tumours in cod were demonstrated. X-cells lesions in dab are mainly seen in fish about 15 cm long and result in poor condition and castration of the fish. Electron micrographs revealed similarities in cell division

pattern with amebal division leading to the hypothesis of amebal involvment.

Georges Balouet showed an example of haemacytosarcoma in cockles. Emmy Egidius presented a necrotic condition of the sideline of cultured cod. The same condition has been described from free-living cod and has been linked to brain damage. Michel Comps described the ultra structure of a new species of Marteilla in Ruditapes.

Several examples of histological slides demonstrating different pathological phenomena, were discussed.

IX LARVAL PATHOLOGY OF CULTIVATED MARINE FISH

1) Alisdair McVicar presented his experience with the problems. In nature an egg and larval mortality rate of 99% is common, but only little knowledge exists on diseases in juvenile fish. Cultivation of turbot has showed hatching rates of 10-30% in stripped eggs, highly dependent on the spawning stock; no infectious agent seems to contribute to this mortality.

A survival rate of 10% after the first 20 days is common, this low rate mainly seems to be due to dietary problems. Different examples of diseases in juvenile trout were illustrated by slides. Use of diatoms with high silicat content caused irritation of the gills resulting in hyperproduction of mucus.

The origin and relation to disease condition of a special cell type on the surface of juvenile turbot was discussed. In nature, loss of juveniles of 10-15% per day is seen in the North Sea.

Herpes virus infections have contributed to 30% mortality in juvenile turbot during a period of 10 months. Loss of epidermal integrity caused the mortality. Furthermore it was pointed out that stress is an important factor in mortalities. Ulcerations in sole caused by a Flexibacter columnaris like bacteria

cause mortality 1-2 days after infection. Vibrio infections are common, but treatment is possible.

Parasitic infections with Trichodina and Gyrodactylus causing both epidermal and gill lesions is common in juvenile turbot. Also infections with Haemogregarina sp. in turbot and Glugea stephani in juvenile plaice contribute to mortality. The reason for the high mortality in juvenile fish is due to low tolerance to diseases because of poorly developed immun system. Osmotic problems will be severe because of the large surface compared to the weight. However, the cause of disease is seldom identified in the young stages: role of predators must also be emphasized.

2) F. Baudin-Laurencin presented French experience in diseases in juvenile cultivated fish, before metamorphosis. In turbot, the essential loss appears from the 5th to the 12th day post hatching. This mortality is not associated with macroscopic lesions but sometimes with extreme thinness. In sea bass two syndromes are described. The first, which emerges during two mortality peaks (25 and 50 days post hatching) is characterized in moribund larvae by a spiral swimming motion, distended swimbladder and gallbladder, faecal castes and exophtalmia. The second syndrome concerns the non inflation of the swimbladder and deformation of vertebral axis. Sea bream seems also to be affected by the last syndrome.

In one case, a larval distomatosis attack was reported to cause a large mortality in sea bream. The fish is twisted and presents a white spot which corresponds to a metacercarian cyst. In the other cases, we have just hypothesis. An I.P.N. like virus is sometimes found and was associated to the first syndrome of sea bass. A colonisation of the intestinal tract by vibrionacae in turbot larvae leaded to envisage the possibility of a bacterial aetiology. However, nutritional and environmental problems seem also to be serious factors contributing to these pathological problems.

In the following discussion all agreed in the fact that little knowledge exists on causes of mortality in juvenile fish. Many of the problems can be related to lack of basic knowledge on the biology of fish prepared for cultivation. But both diseases of infectious etiology and environmental factors may be kept in mind.

Information and research on diseases found in juvenile fish in natural stocks can contribute to an understanding of some of the disease problems in cultivated fish.

X FINAL DISCUSSION AND RECOMMENDATIONS

1. Discussion

The working Group then discussed further work and the terms of reference for its next meeting.

Attention of ICES member countries should be drawn to Council Resolution 1978/4:15 which reads

> because of the apparent increase of larval nematodes (particularly of the genera Anisakis, Phocanema and Contracaecum) and the occurrence of the serious fungal pathogen Ichthyophonus hoferi in a number of important fish species in the North Atlantic, member countries should report the occurrence and abundance of these organisms in the commercially exploited fish populations to the Working Group on Pathology and Diseases of Marine Organisms.

and that they should be encouraged to present data currently being collected on the occurrence and abundance of Anisakis, Phocanema, Contracaecum and Ichthyophonus in commercially exploited fish populations to the WGPDMO.

The review on the possible relationship of fish-parasites and pollution was postponed for the next year, Jan Thulin and Carl Sindermann will take responsability for this work. The inter-

action between the host and the parasite should also be reviewed, Gøran Bylund will take responsibility for this.

The proposal of Michel Comps that all papers published by W.G. members should be sent to all other members of the group was agreed.

For the next meeting W.G. members will collect all national laws on mariculture and disease control which are to be sent to David Bucke before January 1st, 1986.

As a basis for further discussion on the usefulness to study diseases in relation to pollution two literature reviews should be compiled: 1) on diseases and abnormalities in larval stages of fish and 2) on methods to determine the effects of bioessays on fish.

2. Recommendations

Whilst respecting national regulations, a manual of protocols and methodologies for the sampling, examination of fish, including shellfish, and detection of their pathogens be prepared and published to assist the working group of introductions and transfers in their work.

Although the state of knowledge has greatly improved, the Working Group acknowledge that there still is a gap of information on normal levels of disease in wild fish and conceqquently recommend that

a) ICES member countries maintain efforts to establish baseline levels for disease in wild fish species and

b) continue laboratory experiments to establish eventual case and effect relationship between pollution and disease.

The Working Group will meet again for 4 days in Dublin, Ireland from April 22nd through 18th, 1986 under the chairmanship of Emmy Egidius,

to:

Discuss implications of information on the current disease status in member countries and on new disease problems of wild and cultivated marine organisms

Discuss experimental studies on juvenile stages of marine fish in order to determine relationships between levels of aetological agents and pathologenicity in wild fish populations

Examine available information on drug-resistance from different countries both from marine aquaculture and experimental studies

Study a review on possible relation of parasites and pollution and host parasite interactions

Review and discuss methods to determine the resistance- and immunostatus of marine organisms considering that a variety of pollutants and physical environmental factors can lower the resistance

Continue work on definitions and start preparing a glossary on fish health terms.

ANNEX 1

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ANNEX 2

ICES WORKING GROUP ON PATHOLOGY AND DISEASES OF MARINE ORGANIMS

North Sea Center, Hirtshals, April 16th to 19th, 1985

AGENDA

Tuesday, April 16th

9.30 AUDITORIUM	Joint opening with Biological Effects Subgroup. Welcome by dr. Kr. Vagn Hansen
10.00 MEETING ROOM A	Introduction, Joint meeting, Rapporteurs
	National reports on possible pollution related diseases
11.00	Coffee break
11.20	Cont. national reports
	Johnstone Collection
12.30	Lunsj
13.30	Definitions
	Classification of tumours Strategy for joint meeting
15.30	Coffee break
15.45	Strategy cont., Agenda for joint meeting
	Publications

Wednesday, April 17th

9.00 MEETING ROOM B	Joint meeting with Biological Effects Subgroup Seperate agenda
17.00	Tour of North Sea Center

Thursday, April 18th

9.00 MEETING ROOM A	National reports, reporting formats
11.00	Coffee break
11.20	Cont. national reports

ANNEX 3

Participants at the ICES WG meeting
on Pathology and Diseases of Marine Organisms,
Hirtshals, 16-18 April 1985

NAME	ADDRESS
David Bucke	Ministry of Agriculture, Fisheries & Food, Fish Disease Laboratory, The Nothe, Weymonth, Dorset, DT 4 8 UB U.K.
Gøran Bylund	Inst. of Parasitology/Åbo Akademi, 20500 ÅBO, SF Finland.
Michel Comps	IFREMER, Laboratories R.A., 34200 Séte, France.
John McArdle	Dept. of Fisheries and Forestry, Fisheries Research Centre, Abbotstown, Castleknock, Dublin, Ireland.
Dick Vethaak	Netherlands Institute for Fishery Investigations, P.O.Box 68, 1970 AB Ijmuiden, The Netherlands.
Paul van Banning	" " "
Daniel Declerck	Rijksstation voor Zeevisserij, Ankerstraat 1, Oostende, Belgium.
Alisdair H. McVicar	Department of Agriculture and Fisheries for Scotland, Marine Laboratory, AB930B Aberdeen, Scotland.

12.30	Lunsj
13.30	Cont. national reports
14.30	Statistical approaches in disease work
15.30	Coffee break
15.45	Workshop

Friday April 19th

9.00 ROOM A	Larval pathology of cultivated marine fish
11.00	Coffee break
11.20	General discussion, further work
12.30	Lunsj
13.30	Recommendations Final report

Jan Thulin	The National Swedish Environment Protection Board, Marine Section, Box 584, S-74071 Øregrund, Sweden.
Stig Mellergaard	Danish Institute for Fisheries and Marine Research, Fish Disease Laboratory, c/o The Royal Veterinary and Agriculture University, Bülowsvej 13, DK-1870 Copenhagen V, Denmark.
Inger Dalsgaard	" " "
Felix Baudin Laurencin	Laboratoire National de Pathologie des Animaux Aquatiques, (LNPAA), Services Vèterinaires, IFREMER, BP 337, 29273 Brest Cedex, France.
Georges Balouet	Laboratoire de Pathologie, Faculté de Médecine, 29279 Brest, France.
Burkard Watermann	Zool. Inst. u. Museum, University of Hamburg, Martin-Luther-King Platz 3, D - 2000 Hamburg 13, Federal Republic of Germany.
J.E. Stewart	Fisheries Research Branch, Department of Fisheries and Oceans, P.O.Box 350, Halifax, Nova Scotia, Canada.
Emmy Egidius	Institute of Marine Research, Directorate of Fisheries, C. Sundtsgt. 37, N-5000 Bergen, Norway.

ANNEX 4

ICES Working Group on Pathology and Diseases of Marine Organisms.
ICES Study Group on Biological Effects Techniques.
JOINT MEETING, Hirtshals, Denmark, April 17th, 1985

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1. The meeting was joint chaired by the chairmen of the two groups (Dr E Egidius and Prof I Dundas respectively). The purpose of the meeting was to discuss matters identified by the Working Group on Marine Pollution Baseline and Monitoring Studied in the North Atlantic and the Working Group on the Pathology and Diseases of Marine Organisms.

   The position of each group was first outlined by Drs Parker and Egidius acting as spokesmen for the Study Group and Working Group respectively. (Appendices I and II).

2. Environmental scientists have for some time been interested in applying methods in pathology among other biological techniques in monitoring pollution.

   Fish pathology could have the advantage that, unlike many of the other techniques available, it may show effects directly in the commercially important species.

3. The Chairman of the PDMO referred to an ammended version of the ICES WGPDMO (1983, Lisboa, Portugal) recommendation and said that all the suggestions of the SGBET were not practical and that at present the PDMO group did not consider that there was an established link between diseases and pollution. Also the PDMO group was not optimistic about fish stock assessment groups making meaningful fish disease surveys. Fish pathologists are aware that, while environmental factors have a role in the aetiology of at least some diseases, most diseases have a multifactorial aetiology. Environmental compounds do not always have the same effects on different species, and even where chemicals may cause anomalies in one fish population, in another population, exposed to the same chemicals, anomalies may not be observed. Accordingly a cause/effect relationship between a disease and a pollutant, may be difficult to establish with epidemiological field

   Footnote: The term fish is used here interchangeably with the term, aquatic life forms, and includes all life forms, mammals, invertebrates, finned fish, marine plants etc.

studies. It may, however, be possible to use certain pathological symptoms as indicators of generalized deterioration of water quality.

The fish pathologists considered that the most likely general effects of pollution was the non-specific lowering of disease resistance resulting in the appearance of variable symptoms, rather than the specific induction by a pollutant of an identifiable syndrome (analagous to environmentally-induced diseases in man).

4. The types of studies required by the environmental scientists are of an epidemiological nature. Two approaches are possible:

   (a) Demographic studies of variation in disease prevalence, eg to establish baseline data on normal levels of prevalence and also to identify disease "hot-spots". This approach could be applied to non-migratory populations locally or on a larger scale to entire fish stocks throughout their migratory range. As with human epidemiological studies, significant sample size is important and such studies could best be associated with stock assessment cruises (ref. ICES C. Res. 1982/4:5).

   (b) Alternatively, focused observational studies on stressed populations in pollution on hot-spots (together with controls) may allow the detection of correlation between disease/symptoms prevalence and environmental factors. In these circumstances, attention should focus on the most sensitive species regardless of possible significance as economic resources.

The pathologists advised that in these surveys it was firstly important to try to establish the rate of infection rather than simply make observations on disease prevalence and secondly that for long term and for trend studies it was better to use non-lethal diseases. See footnote.

5. The fish pathologists identified three principal target organs or tissues which might display pollution responses, namely the skin, liver and heamatopoietic tissues.

Footnote: Diseases with low prevalence may be the result of high mortalities, conversally diseases with high prevalence may be the result of low mortality.

External lesions of the skin (such as ulcers) have the advantage of ease of observation by personnel with relatively brief training. On the other hand difficulties of clear diagnosis probably render such lesions as fin rot less useful for such work, and other pathological effects such as lymphocystis and epidermal papillomas are suitable only for examination by trained personnel. Similarly, haematopoietic tissues offer theoretically good target tissues, while specific haematological parameters have very high normal variability and sampling is relatively difficult. Liver lesions probably offer the best possibilities for correlation with body burdens of contaminants, while some skin lesions may be more closely related to ambient environmental contamination (water, sediments). Due to the ability of sedentary molluscs to accumulate large quantities of foreign material, environmental changes can be detected by histological examination.

6. Since the basic mechanism of neoplasia (controlled cell proliferation) induction may be similar in all animal species (certain human neoplasias are thought to be induced by specific environmental contaminants) the pathologists identified neoplasias as potential long term indicators of environmental change.

7. The above points are largely theoretical as existing information is limited. Little is known on a broad scale of the normal levels of incidence of disease though the pathologists are now considering how to map the data presented to their meetings. Both groups considered that there was an urgent need to include epidemiologists and statisticians in their discussions to assist in developing statistically correct sampling programmes which could yield interpretable results. Little is known, except in rare cases of epizootics, about the impact of diseases on fish populations.

8. Nevertheless both groups considered that, while many unrealistic expectations for the immediate usefulness of fish pathology techniques in pollution monitoring had been removed, there were possiblities for using pathology in the biological effects monitoring strategy.

9. Both groups recognised that in the past difficulties in making progress were at least partly due to the lack of understanding and to semantic difficulties (eg when does a deleterious biological effect become a

pathological symptom?) and that it was therefore important to maintain close liaison between fish pathologists and persons concerned with the general use of biological effects techniques in pollution montoring. WGPDMO and SGBET jointly suggested the setting up a study group with a small membership drawn from WGPDMO, and from biologists involved in effects work through WGMPNA, SGBET or any successor group and with the addition of a statistician and an epidemiologist. The following terms of references were suggested for such a group;

(a) critically review published and unpublished studies or case histories of pathology in relation to pollution in order to identify which approaches have been or could be used successfully in identification and quantification of change related to pollution or in establishing cause-effect relations.

(b) consider problems of sampling, statistical design and interpretation results of pathology studies in relation to pollution.

(c) to make preliminary proposals for ICES co-operative inter-disciplinary action.

(d) to prepare a next joint meeting in 1987 on the use of pathology in "effects monitoring programmes".

This study group should work mainly by correspondence and should meet in conjunction with the PDMO and the eventual successor group to SGBET to discuss and complete its report.

ANNEX IV Appendix I

THE USE OF FISH DISEASE STUDIES IN POLLUTION MONITORING

Summary of views of the ICES Working Group on Marine Pollution Baseline and Monitoring studies.
Presented by M Parker (Chairman WGMPNA to the joint meeting of the WGPDMO and SGBET, Hirtshals 17 April, 1985.

1. The possibility that waste discharges might be among the causative factors in fish disease has interested ICES.WGMPNA for some time. Unlike many of the other possible indices of biological change, diseases affect commercially important fishery resources at the level of the individual and possibly at the population level as well. Thus if a cause/effect relationship could be established this would be a measure of effects of real significance to pollutic management. Furthermore, given the geographical ranges of many fish species, it could be important at an international as well as local level.

2. The interest in fish diseases by environmental scientists rests on an analogy with human epidemiological studies of environmentally-induced disease and stress syndromes. This analogy has not been adequately tested. The basis for human epidemiological studies of this type is the establishment of baselines of natural conditions (for selected geographical, age, social etc groups) and the identification of sub-groups in which a syndrome or disease occurs at higher than normal frequency. Most fish disease studies so far have been carried out in selected 'hot spots' without any attempt to examine the 'natural' level of incidence.

3. However, the analogy does lead to testable hypotheses. If the principle hypothesis, that environmetal factors are among the factors concerned in the aetiology of some diseases of fish, holds good (which seems likely) then fish disease incidence studies offer a possible tool for monitoring pollution or water quality.

4. If the effect of contaminant inputs is a generalised exertion of stress on fish, rendering them more susceptible to certain classes of disease or resulting in the appearance of stress syndromes, then fish disease incidence could be a useful tool in wide scale baseline surveys of environmental quality. Further, if the role of disease in population dynamics could be better understood, this approach might provide a direct measure of impact on stocks. At present, both of these are big 'ifs'.

5. Alternatively, specific contaminants might give rise to specific responses (eg cancer induction or piscine equivalents of asbestosis). Such possiblities would need to be examined on the basis of lab studies and would probably relate not to mean environmental concentration of waste, but probabilistically to the occurrence of extreme concentrations. Again, if such associations could be established, it might be possible to predict impact on fish stocks.

6. This much having been said, MPNA recognised that the relationship between disease incidence and pollution is by no means simple, that natural epizootics occur regularly and widely and that there are difficulties in determining the effects of these epizootics on fish populations. Nonetheless, MPNA considered that it would be valuable to attempt to establish baseline conditions over species' geographical ranges as to the natural occurrence of certain diseases.

7. In particular MPNA was interested in the occurrence of diseases whose aetiology might be related to environmental conditions (whether natural eg temperature, turbidity) or anthropogenic (eg toxic substances, pathogens). They identified in particular fin rot and ulceration as being often associated with areas of significant anthropogenic inputs and raised questions as to whether some cancerous tumours might be related to carcinogenic inputs, by analogy with certain human conditions.

8. While accepting the multifactorial nature of fish disease aetiology and the complexity of this issue, MPNA nonetheless felt that the possible gains from the use of this approach, if it proved feasible, made it worthwhile to invest effort in further study. The group identified a number of avenues for future study:-

(a) the collection, in conjunction with routine fish stock assessment cruises, of baseline data on disease incidence in commercial stocks;

(b) research into the relationships between body burdens of specific contaminants and pathology of individual fish to assess whether cause/effect relationships could be established;

(c) research into disease aetiology and into the effects of disease on fish populations;

(d) further analysis of studies which had linked high disease incidence to significant anthropogenic inputs.

9. Following suggestion from MPNA, WGPDMO at their 1984 meeting suggested the following terms of reference for our joint discussions.

1. The role of environmental factors, among others, in fish disease aetiology including the possible relationships between contaminant body burdens and disease.

1.1 The types of disease most likely to be environmentally influenced.

1.2 The types of environmental factors most likely to be relevant.

1.3 Other environmental variables that would be useful to support epidemiological studies.

2. Methodology including statistics in evaluating the relationship between pollution and disease.

3. The types of disease most likely to be feasible for inclusion in a monitc ng programme.

4. Outcome of epidemiological studies to date particularly on disease 'hot spots' and study of disease maps.

5. Suggestions for further work.

agc included in WGPDMP several years

ANNEX IV Appendix II

ICES WG on Pathology and Diseases of Marine Organisms Annual Meeting 1985, Hirtshals, Denmark

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The Working Group considered the two closely related questions 1) does pollution cause diseases among aquatic life forms and 2) can fish pathology be used to monitor the biological effects of marine pollution. The Working Group believes that the questions cast in these terms lead to a dangerously misleading over-simplification of highly complex interactions.

It should be clearly understood that diseases, defined broadly or narrowly, are multifactorial in origin and/or development. Furthermore clinical signs are often not specific to one disease. Similarly pollution is also a collective term which by its use however tends to suggest a single entity equivalent to salinity, oxygen or ambient temperatures. In reality, pollution covers a complex range of agents or event which includes among others, such diverse elements as waste heat, a lengthy list of both organic and inorganic chemicals, microbial agents, turbidity, increased sediment burdens etc in highly varied combinations and concentrations which either singly or in combination may influence fish health.

There are examples well documented in experimental situations where external agents or man induced changes have been shown to impair or eliminate resistance, interfere sufficiently with metabolic processes or otherwise pre-dispose animals to disease. Undoubtedly this, on occasion also occurs in nature, but the sweeping assertion that pollution necessarily causes disease is too all encompassing to be acceptable or useful.

It must be pointed out that the mere presence of disease at high or low levels coincident with the presence of pollutants is not necessarily indicative or a cause and effect relationship because diseases are multifactorial in origin and/or development. A linkage would not be suspected unless there has been a sudden or dramatic change in background levels or characteristics of the diseases consistent with changes in pollution.

The simple comparison of two areas (without taking natural and anthropogenic factors into consideration) one showing a high frequency of disease with another showing a low level should not be taken to indicate that the high disease rate area is necessarily highly polluted or polluted at all; there are many causes for disease and many factors controlling the levels.

It must be remembered also that disease studies are dealing with the more subtle end of the life scale rather than with those areas of dramatic or major change which result in massive kills and the major reduction of numbers or the creation of biological deserts. Effects on these scales are observable or determinable by the population scientists; the massive reduction or elimination of important species will not remain undetected.

The Working Group also wishes to make the observation that pollution is not studied for its own sake, but rather because it has or may have an impact on the biological entities or a reduction in the aesthetic value of an area. These biological effects include a reduction or elimination of stocks of aquatic life forms of commercial or recreational value or an interference with various elements of the food web. An answer to those concerned with environmental quality is that until the underlying causes of disease are clearly understood we should use diseases as an indicator of pollution with the greatest degree of caution. We should select, on the basis of first principles, those features which serve best the studies of man induced changes as well as those studies concerned with the more fundamental aspects of diseases and their impacts on populations. We believe that the best that can be achieved through fish disease surveys in relation to pollution is an indication of a change in overall environmental quality.

Footnote: The term fish is used here interchangeably with the term, aquatic life forms, and includes all life forms mammals, invertebrates, finned fish, marine plants etc.

ANNEX V RECOMMENDATIONS

The ICES Study Group on Biological Effects Techniques recommends:-

1) In order to make progress in the use of pathobiological techniques in monitoring programmes, that a Study Group be set up with the following terms of reference:-

(a) critically review published and unpublished studies or case histories of pathology in relation to pollution in order to identify which approaches have been or could be used successfully in identification and quantification of change related to pollution or in establishing cause-effect relations.

(b) consider problems of sampling, statistical design and interpretation results of pathology studies in relation to pollution.

(c) to make preliminary proposals for ICES co-operative interdisciplinary action.

(d) to prepare a next joint meeting in 1987 on the use of pathology in "effects monitoring programmes".

The membership of the Study Group should be drawn from WG.PDMO and from among biologists who have participated in the work of WG.MPNA or the Study Group on Biological Effects Techniques, with the addition of an epidemiologist and a statistician. It should work mainly by correspondence and report in the first instance to WG.PDMO and to either WG.MPNA or the successor group to the Study Group. It should have the opportunity to meet in conjunction with these groups to finalise its report.

2) That close co-ordination of activities on biological effects monitoring be maintained between ICES and the GEEP operating under IOC's GIPME programme, and that in particular ICES consider what support it can give to GEEP's Workshop programme.

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: BELGIUM

EFFORT: One survey October 1984

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	Flounder (Pleuronectes flesus) Dab (Limanda limanda)	9.5 % prevalence 3.4 % "
Hyperplasia / papilloma	Dab	1.6 % "
Ulcers	Flounder Dab	2.0 % " 0.6 % "
Fin erosion	Flounder Dab Plaice (Pleuronectes platessa) Whiting (Gadus merlangus)	4.0 % 0.4 % 0.5 % " 2.7 %
Skeletal anomalies	Flounder Dab God (Gadus morhua)	0.7 % 0.1 % " 0.6 %
Glugea stephani	Dab	6.6 % "

Table 1.1

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: CANADA (Atlantic coast)

EFFORT: No monitoring program on lobster in 1984

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Gaffkemia	Lobster (Homarus americanus)	Prevalence as in previous years
Salmon louse (Lepeophtheirus sp.	Atlantic salmon (Salmo salar)	First outbreak, one site
Pleistophora hippoglossoides	American plaice (Hippoglossoides platessoides)	Prevalence up to 50% in certain areas. Reduction in commercial quality
Aporocotyle simplex	American plaice - eggs in blood stream	Unknown

Table 1.2

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: DENMARK

EFFORT: Cruise May 1984
11457 dab and 6224 plaice investigated

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	Dab (Limanda limanda) Plaice (Pleuronectes platessa) low frequencies	9.2 % East. North Sea 0.7 % Skagerak 2.6 % Kattegat
Hyperplasia / papilloma	Dab	Low frequencies: German Bight 5.3 % East. North Sea 4.1.% Skagerak/Kattegat 0.1 %
Ulcers	Dab	Less than 1 % prevalence
Pigment anomalies	Dab - less than 1.5 % prevalence Plaice	German Bight 27.6 % Other sites 4 %
Stephanostomum	Dab	German Bight 5.8 % East. North Sea 18.8 % Skagerak 13.7 % Kattegat 26.7 %
Myxobolus	Dab Plaice (in brackets)	German Bight 3.4 % East. N. Sea 8.7 % (0.1 Skagerak 24.2 % (47.7) Kattegat 38.3 % (58.9)
Myxobacteria	Cod (Gadus morhua)	3 % prevalence
Furunculosis	Sand-eel (Ammodytes lancea, Hyperolus lanceolatus)	Atypical Aeromonas salmonicida isolated
Gaffkemia	Homarus gammarus imported from Ireland	

Table 1. 3

WILD POPULATIONS

COUNTRY: Fedral Republic of Germany

EFFORT: 3 cruises during 1984

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	Dab (Limanda limanda)	Dominating disease
Epidermal hyperplasia / papilloma	Dab	Elevated rates
Ulcers	Dab	Elevated rates
X-cell gill hyperplasia	Dab - less than 15 cm, low condition factor, no gonad development	Maximal prevalence 4 %
Pseudobranchial tumours	Whiting (Gadus merlangus) Cod (Gadus morhua)	Intensive survey, no cas 3 cases

Table 1.4

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: Ireland

EFFORT:

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Vibriosis	Eel (Anguilla anguilla)	Atypical V. anguillarum one estuary
Gaffkemia	Lobster (Homarus gammarus)	One outbreak during export
Bonamia	Flat oyster (Ostrea edulis)	Survey of oystergrowing area, no evidence

Table 1.5

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: NETHERLANDS

EFFORT: Diseases recorded during 5 routine stock assessment surveys

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	Dab (Limanda limanda) Plaice (Pleuronectes platessa)	Overall prevalence 4.5 Highest level 11.5 % Overall prevalence 1.4 % Highest levels 2.9 and 3.
Hypeplasia / pailloma	Dab	Overall prevalence 1.8 Highets levels 4.9 and 3.
Mycobacteriosis	Cod (Gadus morhua)	Overall prevalence 0.6 Highest level 3-1 %
Ulcers	Dab Plaice Cod	Overall level 1.5 % Overall less than 1.0. Overall less than 1.0
Glugea stephani	Dab Plaice	6.1 to 13 % prevalence Up to 2.4 % prevalence
Myxobolus	Dab Plaice	Average prevalence 15.7 Average prevalence 33.4
Skeletal anomalies	All species surveyed	Low prevalence

Table 1.6

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: Norway

EFFORT: Litle effort on diseases in wild populations

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Vibriosis	Saithe (Pollachius virens) locally along west coast	Seemingly high ortalitie in 1 and 2 year old fish
Pseudobranchial tumours	Cod (Gadus morhua) reappeared in 1983 yearclass in Oslofjord	Unknown
Cryptocotyle	Cod	High infection rates locally
Cod worm (Several species)	Several species av Gadidae	Serious problem in several localities

Table 1.7

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: Poland

EFFORT: Observations on
6045 cod
11500 herring
3353 sprat
1040 flounder 108 plaice

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Ulcers	Cod (Gadus morhua)	Considerable drop in incidence from 1983 Annual mean 1984: 0.84
Ulcers	Sprat (Clupea sprattus) Flounder (Pleuronectes flesus)	1.3 % incidence 1.2 % "
Skeletal deformities	Cod Herring (Clupea harengus)	0.58 % prevalence 0.04 % "
Fin rot	Cod	No cases observed
Skin and muscle losses	Herring (young specimens)	0.05 %
Lymphocystis	Flounder	1.9 % prevalence
Anisakis larvae Table 1. 8	Herring - infection rate increases with fish length	Over 30 cm: 100% inf. Mean: 54.3 %

ICES DISEASE REPORT 1984

WILD POPULATIONS

COUNTRY: Sweden

EFFORT: Special disease surveys

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	All species surveyed	As recorded previous year
Skin ulcerations	All species surveyed	As rec. previous years
Skeletal deformities	All species surveyed	As rec. previous years
Pseudobranchial tumours	Cod (Gadus morhua)	Up to 5.2 % prevalence in one locality, 2 % in 6 other localities
Cryptocotyle	Cod	Coastal population 75 to 100 % Skagerak 4 %
Learnaeocera	Cod	Coastal 24 % Skagerak 56 %
Myxobolus Table 1.9	Cod	Coastal 10 to 48 % Skagerak 2 %

COUNTRY: U.K., Scotland

EFFORT: 1656 dab and 1370 haddock examined

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Lymphocystis	Dab	Total prevalence 8 %
Epithelial papilloma	Dab	1.7 to 2 % prevalence
Skin ulcerations	Dab	1.6 to 4 % prevalence
Gill X-cell lessions	Dab	1.2 to 7 % prevalence
Ichthyophonus	Atlantic salmon (Salmo salar) Haddock (Gadus aeglefinus)	Spoilage problems Widespread, 20 - 50 % prevalence, incr. from 19E
Vertebral deformation	Haddock	Up to 7 %
Pseudobranch lessions	Haddock	Up to 6 %

Table 1.10

COUNTRY: CANADA (Atlantic coast)

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Furunculosis	Atlantic salmon (Salmo salar) sea culture	2 commercial sites
BKD	Atlantic salmon	1 large com. site, avaiable eggs threatened, control program carried out
ERM	Atlantic salmon throughout Atlantic area	No overt disease Carrier state detected
Vibriosis	Atlantic salmon Rainbow trout (Salmo gairdneri)	Losses effectively controlled through wide-spread use of vaccines
Salmon lice Lepeophtheirus sp.	Atlantic salmon	Severe infestations in one site

Table 2.1

COUNTRY: DENMARK

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
VHS	Rainbow trout (Salmo gairdneri) sea culture	One outbreak
Vibriosis	Rainbow trout in sea cages	Important problem
Furunculosis	Rainbow trout in sea cages	Important problem
ERM	Rainbow trout	3 marine sites affected
PKD	Rainbow trout	3 farms affected

Table 2.2

COUNTRY: FRANCE

Fish

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Vibriosis	Salmonidae Turbot (Scophthalmus maximus)	Little importance with vaccination Some cases
Vibrio parahemolyticus	Bass (Dicentrachus labrax)	Cronic mortalities
BKD	Coho salmon (Oncorhynchus kisutch)	Arround 15 % mortality each month
Yersinosis	Bass Daurade (Sparus auratus) Turbot	Experimental pathogenisity demonstrated in all 3 species
Hepatoma	Rainbow trout (Salmo gairdneri)	10 to 15 5 prevalence in brood fish
Hypertyrosinemic granuloma	Turbot Daurade	Prevention and treatment with vitamin C

Fish larvae

Larval mortality	Turbot (Scophthalmus maximus)	Very high mortalities IPN virus type SP found in one lot
Larval mortality	Bass (Dicentrachcus labrax)	Flattening of swim-bladder in 80%
Larval mortality	Daurade (Sparus auratus)	Swimbladder disorder very frequent

Molluscs

Bonamiosis	Flat oyster (Ostrea edulis)	Persisting Atlantic coast
Marteillosis	Flat oyster	Persisting Atlantic coast
Summer mortality	Crassostera gigas	Up to 30% affected in Arcachon Bay in 1983, Few mortalities in 1984
Marteilla	Mytilus edulis Cardium sp.	Up to 61 % prevalence " 52 % prevalence

Table 2.3

COUNTRY: IRELAND

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Furunculosis	Atlantic salmon (Salmo salar) smolt in sea cages	Significant losses
Salmon lice	Salmonids in sea cages	Several sites
Costia Ichthyobodo sp.	Salmonids in sea cages	Few cases
Trichodina sp.	Salmonids in sea cages	Few cases
Sunburn	Atlantic salmon in sea cages	Severe losses

Table 2.4

COUNTRY: NETHERLANDS

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Bonamiosis	Flat oyster (Ostrea edulis)	3 new foci of infection detected

Table 2 .5

COUNTRY: NORWAY

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Coldwater vibriosis (Hitra disease)	Atlantic salmon (Salmo salar) Rainbow trout (Salmo gairdneri)	Salmon most suscept., many sites affected, often high losses
Vibriosis	Atlantic salmon Rainbow trout Cod (Gadus morhua)	Persisting, somewhat lower frequency than in1983 Important problem 1st year
Salmon lice (Lepeophtheirus salmonis)	Salmonids	Persisting problem
IPN	Atlantic salmon Rainbow trout	Carriers frequent, no disease outbreaks
Furunculosis	Atlantic salmon Rainbow trout	Atypic variant isolated from 3 sites
BKD	Atlantic salmon Sea trout (Salmo trutta)	3 farms
Myxosoma cerebralis	Rainbow trout	3 farms (fresh water)
PKD	Atlantic salmon	5 sites
Costiasis	Atlantic salmon in sea cages	Appears frequently
Exophialia sp	Atlantic salmon	Persisting in at least one site, important losses
Table 2.6		

COUNTRY: SWEDEN

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Vibriosis	Salmonids	Dominant disease
Dinophysis acuta (DSP poisoning	Mytilus edulis	Constant level of toxicity during whole winter
Renicola roscowita	Mytilus edulis	High frequencies in natural populations, selden in farmed mussels
Mytilicola intestinalis	Mytilus edulis	Not found

Table 2.7

COUNTRY: U.K., SCOTLAND

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
IPN	Atlantic salmon (Salmo salar)	Pancreas pathology in post smolt salmon, transmission in sea water
Furunculosis	Atlantic salmon	Serious problem
BKD	Atlantic salmon	No new seawater outbreaks in 1984
Hitra disease	Atlantic salmon	One farm, Shetland
Pancreas disease	Atlantic salmon	Increasing problem, 17 cites affected
Salmon lice (Lepeophtheirus salmonis)	Atlantic salmon	Increasing problem

Table 2.8

COUNTRY: U.K., ENGLAND

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Vibriosis	Eel (Anguilla anguilla)	Outbreak in one farm
Gaffkemia	Lobster (Homarus gammarus)	Outbreak in one holding site
Bonamiosis	Flat oyster (Ostrea edulis)	Two cites, Cornwall and Essex
Table 2.9		

ICES DISEASE REPORT 1984

WILD POPULATIONS

EFFORT: 7524 Cod
3312 Flounder
3063 Northern pike
from commercial catches

COUNTRY: FINLAND

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
Ulcers	Cod (Gadus morhua) Flounder (Pleuronectus flesus) Northern pike (Esox lucius)	2.2 % 6.1 % 0.2 %
Lymphocystis	Flounder	2.2 %
Skeletal deformities	Cod Flounder	1.3 % 0.5 %
Pseudobranchial tumours	Cod	1.4 %
Neoplasia	Flounder Northern pike	0.2 % 3.4 %
Fin rot	Flounder	1.4 %

Table 1. 11

ICES DISEASE REPORT 1984

MARICULTURE

COUNTRY: FINLAND

DISEASE / PARASITE	SPECIES	SIGNIFICANCE
IPN	Rainbow trout (Salmo gairneri)	1 sea farm, no mortalities
ERM	Atlantic salmon (Salmo salar) Whitefish (Coregonus lavaretus)	2 fresh water farms, clinical outbreak and mortalities
Vibriosis	Salmonids	Controlled through vaccination
FURUNCULOSIS (achromogenic)	Rainbow trout	More and more frequent, source of concern
FISH LICE (ARGULUS, CALIGUS)	Salmonids	Problem in sea cages

Table 2.10