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

Ostend, 19 - 22 February 1991

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INTRODUCTION

The Working Group on Pathology and Diseases of Marine Organisms (WGPDMO) met at the Fisheries Research Station, Ostend, Belgium, with Dr B. Hill as Chairman (C.Res.1990/2:34). Local arrangements had been made by D. Declerck. The WG participants were welcomed on 19 February by Dr W. Vyncke, Head of Division, who gave a brief account of the work of the Station. The WG Chairman thanked Dr Vyncke for his welcome and Mr Declerck for his excellent preparatory work.

1 OPENING OF THE MEETING

The meeting was opened at 0930 on Tuesday, 19 February, with the Chairman expressing regret at the low attendance rate of members at this year's meeting: only 15 of the WGPDMO membership of 39 were able to participate. This was believed to be mostly due to lack of travel funds for many WG members. The list of participants is attached as Annex 1.

2 TERMS OF REFERENCE, ADOPTION OF AGENDA, SELECTION OF RAPPORTEURS

The Chairman reminded all those present of the Terms of Reference (TOR) for the meeting given to the WG by ICES Council via C.Res.1990/2:34, copies of which had been sent to all WG members. In addition to the 5 tasks, the WG had recommended, in its 1990 report, 3 further items (f, g and h) had been added to the TOR by ICES Council.

TERMS OF REFERENCE (C.1990/2:34)

a) Compile and analyze the national reports on diseases in wild fish and shellfish stocks, with special reference to the anticipated new information being made available from Baltic countries;

b) Compile and analyze national reports on recent disease trends and developments in mariculture, and provide advice on preventive and control measures;

c) Review current molluscan disease control measures in order to provide advice on updating the relevant ICES/EIFAC guidelines of the "Code of Practice" in close collaboration with the Working Group on Introductions and Transfers of Marine Organisms;

d) Review current and historical data on lethal diseases of wild marine fish and consider possible relevance to stock assessment;

e) Review the relevance of information on the migration habits of dab (*Limanda limanda*) and flounder (*Platichthys flesus*) to studies on disease prevalences in areas of the North Sea, Baltic Sea, and Irish Sea;

f) Describe the distribution of parasites and diseases that are harmful to Atlantic salmon in NASCO's North-East Atlantic Commission and West Greenland Commission areas, and report this information to the Working Group on North Atlantic Salmon in time for its meeting in March 1991;

g) Examine and report on the health status of sea trout stocks, especially with regard to Ireland and Scotland where a dramatic reduction in catches in some sea trout fisheries has occurred;

h) Statistically analyze the data on diseases of marine fish stocks which have been compiled by the Group according to the guidelines presented in Section 4.4 of Doc. C.M.1990/F:13.

A draft agenda was discussed and agreed and a programme of work constructed to take account of sub-groups working on specialist subjects in parallel, where necessary.

As at the last meeting, the reporting task was divided by agenda item equitably amongst all participants to ensure production of a draft report for approval prior to the end of the meeting.

3 REPORT ON THE 1990 ICES STATUTORY MEETING

The Chairman gave a brief report on the 78th Statutory Meeting held in Copenhagen, 3-12 October 1990, highlighting those items which had particular relevance to the WGPDMO.

Attention was drawn to the report of the Mariculture Committee and particularly those aspects concerning publications which had been proposed by WGPDMO (see under report **Section 6.1**).

The WGPDMO's proposal to review current molluscan disease control measures in order to provide advice on updating the relevant ICES/EIFAC guidelines in the "Code of Practice on Introductions and Transfers" was welcomed by Mariculture Committee, who agreed that relevant members of the WG should conduct this as an inter-sessional task undertaken by correspondence. The exercise was to be undertaken in close co-operation with the WG on Introductions and Transfers of Marine Organisms, to whom the final outcome should be reported in time for consideration at its meeting in July 1991.

Concerning liaison between WGPDMO and OIE, Mariculture Committee had decided that it would be premature to join efforts with OIE at the present time in view of the impending EC measures on the health conditions governing trade in aquaculture animals and products, which would have an effect on several ICES member countries.

The WG Chairman then drew attention to the Terms of Reference of the next meeting of the WG on Biological Effects of Contaminants (6-8 March, 1991), which contained 2 items of direct interest to WGPDMO. These were:

e) To provide advice on the development of a general scheme of study on the relationship between the quality of the environment and the health of fish;

g) Evaluate recent papers on fish diseases in relation to pollution with a view to identifying the significance of any correlations.

In discussion, several WGPDMO members expressed surprise at this apparent duplication of work, since these have been topics (particularly item (g)) which have been discussed in great depth by the WGPDMO over recent years, with evaluations and advice being given through its reports to ACMP. The item (g) is a matter which is still an active element of WGPDMO's current work, which also includes consideration of non-published data on fish disease prevalence rates to give a more complete picture. The Chairman agreed to inform the Chairman of ACMP about WGPDMO's concern over this development and proposed that the relevant items in this year's report should be sent to the Chairman of WGBEC in time for consideration at their meeting during 6-8 March.

4 DISEASES IN WILD POPULATIONS OF MARINE ORGANISMS

4.1 Analysis of National Reports (1990) on Diseases in Wild Fish Stocks

In all, 9 national reports on wild fish diseases were received from the 17 ICES member countries: synopses are given at Annex 3. Several countries have adopted and applied the recommendations of the ICES Standardised Methodology for Fish Disease Surveys (Cooperative Research Report No. 166, 1989) and reported data on the ICES Report Format. The WG regretted the lack of information from USA, Iceland, Portugal, Spain, Poland and the USSR. No systematic studies on diseases of marine fish stocks were carried out in 1990 by France, Norway, Ireland or Canada although the latter country intends to do so in the near future.

The discussions following the national reports were mainly concerned with the observed disease levels in dab populations. The **German** investigations in May 1990 on dab in the former TiO_2 dumping ground in the German Bight showed a lower prevalence of liver tumours/nodules and hyperplasia/papilloma from the levels of previous years. Whether this is an effect of the cessation of dumping remains unclear at present. German investigators also reported yellow tumours in the armed bullhead being associated with lentivirus-like particles. **Belgium, Denmark** and **Netherlands** also reported decreasing prevalences of papilloma as well as lymphocystis. Thus, the 1990 reports to the WG suggest an overall decrease in 1990 prevalence in the North Sea for some of the key pathologies used in disease monitoring. On the basis of a 2-year survey of the German part of the Wadden Sea, **Germany** reports that consistent geographical patterns of maximum prevalence have been observed for the same disease conditions in different fish species.

In the **UK**, monitoring of dab in Scotland indicated that the significance of variation in areas of pollution should be evaluated in the light of that occurring from natural causes and that the absolute level or trends observed within one area should be evaluated in relation to other local areas. It was stressed that the spatial variation (local) can be considerable. Elsewhere, the UK effort had concentrated on stations designated by the North Sea Task Force and disease prevalence rates were found to be very similar to those for the same stations and general areas for previous years. In the southern North Sea a marked green skin pigmentation of unknown cause was seen in almost 11% of dab captured at some stations.

Finland reported that *Pseudomonas anguilliseptica*, a recently established pathogen in farmed salmonids, has now been isolated from wild Baltic herring.

France reported on *Hematodinium* sp. causing high winter mortalities in crab (*Cancer pagurus, Liocareinus puber*) in the English Channel, Iroise Bay, Bay of Biscay and off Scotland.

The WG also discussed the different international programmes which include fish diseases as part of the biological effects monitoring.

i) North Sea Task Force (NSTF) and Joint Monitoring Group (JMG)

In discussing the involvement of the WGPDMO in the design and evaluation of the disease monitoring aspects of the NSTF Programme, the WG decided to delegate the coordination of these activities to J. Thulin and K. Anders. It is hoped that similar liaison will also be established with the JMG's *ad hoc* working group on monitoring.

ii) Baltic Marine Biologists

The continuing lack of information from several of the Baltic countries was deplored. The Chairman reported he had received a request from the Chairman of ACMP for WGPDMO to examine the need for a disease identification and intercomparison workshop for the Baltic labs along the lines of the one organized for the North Sea labs.

J. Thulin, Chairman of the Baltic Marine Biologists (BMB) WG 25 "Fish Diseases and Parasites in the Baltic" reported that all these preparations have already been made. Thus:

1) a sea-going workshop will be held on board the FRG R/V "Alkor" which will entail 16 trawling hauls along the coast from Kiel, FRG, to east of Tallinn, Estonian SSR, from October 1-11 this year;

2) 12 scientists, 1 or 2 fish disease specialists from each country bordering the Baltic, are listed for the cruise;

3) the Workshop will be chaired by J. Thulin and K. Anders will be co-convenor.

4) the key species to be examined will be cod, flounder and Baltic herring, and the aim will be not only to compare disease prevalences but rather to establish a standardized methodology for monitoring fish diseases in the area.

Finally, J. Thulin reported that the BMB WG has compiled a list of fish disease scientists in the Baltic area, as well as a list of their publications including mimeographed and other unpublished reports.

Conclusions

a) The apparent decreasing trends of some disease levels in certain areas of the North Sea reported by some countries are over short time periods and should be treated with caution at present in view of known large seasonal variability of prevalence rates.

b) It is still impossible to evaluate the disease situation in the Baltic Sea given the absence of national reports from most Baltic countries. However, the submission of data is expected to improve now there are firm links with the BMB WG 25 and a methods standardisation cruise will be carried out.

Recommendations

1. National delegates should be urged to impress upon their nominated members of the WGPDMO to send the annual report and data on disease in wild marine fish populations to the WG Chairman for the WG's analysis, even if they are unable to attend WG meetings.

2. The WGPDMO recommends that, particularly for consideration of pollution effects, trends in disease prevalence rates in local areas are presented in the wider context of prevalence rates in all relevant ICES areas and stresses the importance of taking into full account natural spatial and seasonal variations in disease prevalence rates when field data are being evaluated.

4.2 Review of Information on Migration Habits of Dab and Flounder Relevant to Disease Prevalence Studies

Relationships between disease prevalences and biological as well as environmental factors are highly complex. Despite several years of extensive field studies on diseases of dab and flounder in the North, Baltic and Irish Seas as well as in the estuaries of tributary rivers to the North Sea these relationships are still poorly understood. In recent years, as a first step towards a better basis for interpretation, the WGPDMO has contributed to improvements in the recording and knowledge of some of the factors known to influence disease prevalence, such as length-/age- and sex relationships as well as the minimum size of lesions recorded. However, difficulties remain in interpretation of the data on the spatial distribution of diseases partly due to a lack of information on migration habits of dab and flounder which are the target fish species in biological effects monitoring programmes.

Information on migration of dab and flounder so far available to WGPDMO has been very limited. Belgian and German results of tagging experiments have indicated that North Sea dab are capable of considerable migration away from tagging areas particularly from spawning grounds. However, the maintenance of marked gradients of diseases with known prolonged persistence over short distances in Scottish study areas have indicated that, at least over certain periods, some populations of dab have limited migration behaviour. Population studies on flounder from the lower Elbe River showed the importance of the river system as permanent residence area for O- and 1-group specimens. Mature adults undertake seasonal migrations into the southern North Sea for spawning during a relatively short period in spring and remain resident in the estuarine region throughout the rest of the year. There is evidence that some parts of the population do not leave the river and spawn in freshwater.

According to the overview paper submitted to the meeting by WG member D. Bucke, there is not much published information on migration habits of either the above species but there is a large amount of detailed information in the form of internal reports and theses in various research institutes. The WG agreed that this would be useful for evaluation of disease prevalence data and hopes efforts can be made to obtain the information.

For disease surveys two options are available:

a) to sample fish populations during mixing periods when an average prevalence of disease may be obtained for the population;

b) to sample only fish populations which are known to have been resident in an area for a prolonged sufficient period for local effects to manifest themselves.

The WGPDMO agreed that more information is needed on the following points:

1) Seasonal migration patterns of dab and flounder of the different year-classes in the North, Baltic and Irish Seas;

2) Residence periods (length of time) of fish in certain areas, especially in the so-called 'hot spot' contaminated areas;

3) Small-scale movements of fish within restricted geographical areas, e.g., in estuaries.

Conclusions

a) In order to facilitate interpretation of the data from fish disease prevalence surveys, studies should be designed with suitable times for sampling based on knowledge about typical migration patterns of flatfish populations.

b) Additional intersessional work to obtain, compile and analyse existing data on migration of dab and flounder is necessary;

c) Other ICES WGs and/or Committees should be encouraged to provide WGPDMO with information on points (1) to (3).

Recommendation

ACFM is recommended to ask the relevant ICES working groups to provide WGPDMO with data on points (1) to (3) above.

4.3 Statistical Analysis of Data on Disease Prevalence in Marine Fish Stocks

A sub-group of WG members (S. des Clers, K. Anders, J. Höglund, A. McVicar, J. Thulin) met separately to consider this item during the meeting and reported the following account back to the full Working Group.

Objectives

The WGPDMO has been instrumental in developing a standard methodology for fish disease surveys, (ICES Cooperative Research Report No. 166, 1989) and will now concentrate on the analysis of the data that has been collected using this methodology since 1988. The main objectives of the analysis are:

a) to produce an annual account of the geographical distribution of selected diseases in North Sea and Baltic Sea dab, flounder and cod;

b) to evaluate temporal changes in prevalence for each disease, and

c) to produce guidelines for the interpretation of observed prevalence rates for the use of other ICES working groups. These guidelines will define the statistical and biological significance of observed differences, in view of natural variations in the biology of hosts and pathogens that can be expected to occur.

ICES standard reporting forms and protocol

It is proposed that some guidelines of how the forms should be filled (including the severity of disease signs needed for a positive diagnosis) should be added to the back of the ICES Standard Reporting forms (see Figures 1-3). A presence-absence coding (+/-) of the disease prevalence in samples smaller than the recommended minimum numbers in each size-group (100 or 50 fish) is added on each form. The standard format has now been thoroughly tested, and WGPDMO emphasises its recommendation that "each ICES member country should select and report on at least two stations which are known for their differences in contamination levels". This should be undertaken "with international cooperation as required to ensure a sufficiently broad spread of locations".

Fig 1

ICES REPORTING FORMAT (Rev 1991)

Completed forms to be sent to the Chairman of ICES WGPDMO

COUNTRY:
STATION LAT:
STATION LONG:
ICES SQUARE NO:
HAUL NO:

OBSERVER:
INSPECTION TIME /FISH(MINO:
DAY(DAY/MONTH/YEAR):

FISH SPECIES: **DAB** *(LIMANDA LIMANDA)*

SIZE GROUP 15-19 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
EPIDERMAL PAPILLOMA					
SKIN ULCER					

SIZE GROUP 20-24 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
EPIDERMAL PAPILLOMA					
SKIN ULCER					
LIVER NODULE/TUMOUR					

SIZE GROUP >25+ CM (min 50 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
EPIDERMAL PAPILLOMA					
SKIN ULCER					
LIVER NODULE/TUMOUR					

* Prevalence coding : N if not looked for
0 (zero) if looked for and not present
For samples smaller than minimum numbers + for present
- for absent

Minimum sample sizes

Dab Size group (cm)	Disease examination External	Internal
15-19	100	
20-24	100	(50)
>25	50	50

Minimum disease signs for positive diagnosis

Common dab	Lymphocystis	More than one surface nodule
	Epidermal papilloma	Lesions larger than 2mm diameter
	Skin Ulcers (acute and healing)	Open lesion (all colours)
	Liver nodules / tumours	Larger than 2mm diameter (in fish > 20cm)

Latitude and longitude of hauling point only.

It is recommended that survey hauls are on the same track from one year to the next and on parallel tracks until the minimum numbers of fish are reached

Inspection time/fish please, NOT total.

References

ICES, 1989. Methodology of fish disease surveys. Cooperative Research Report No 166

Möller, H and Anders, K. (1986). Diseases and parasites of marine fishes. Kiel, Möller, 365pp.

Fig 2

ICES REPORTING FORMAT (Rev 1991)

Completed forms to be sent to the Chairman of ICES WGPDMO

COUNTRY:
STATION LAT:
STATION LONG:
ICES SQUARE NO:
HAUL NO:

OBSERVER:
INSPECTION TIME /FISH(MINO:
DAY(DAY/MONTH/YEAR):

FISH SPECIES: **FLOUNDER** *(PLATICHTHYS FLESUS)*

SIZE GROUP 20-24 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
SKIN ULCER					

SIZE GROUP 25-29 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
SKIN ULCER					
LIVER NODULE/TUMOUR					

SIZE GROUP >30+ CM (min 50 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOT. NO. EXAMINED		TOT. NO. AFFECTED		PREVAL (%)*
	MALE	FEMALE	MALE	FEMALE	
LYMPHOCYSTIS					
SKIN ULCER					
LIVER NODULE/TUMOUR					

* Prevalence coding : N if not looked for
0 (zero) if looked for and not present
For samples smaller than minimum numbers + for present
- for absent

Minimum sample sizes

Flounder Size group (cm)	Disease examination External	Internal
20-24	100	
25-29	100	(50)
>30	50	50

Minimum disease signs for positive diagnosis

Flounder	Lymphocystis Skin Ulcers (acute and healing) Liver nodules / tumours	More than one surface nodule Open lesion (all colours) Larger than 2mm diameter (in fish > 25cm)

Latitude and longitude of hauling point only.

It is recommended that survey hauls are on the same track from one year to the next and on parallel tracks until the minimum numbers of fish are reached

Inspection time/fish please, NOT total.

References

ICES, 1989. Methodology of fish disease surveys. Cooperative Research Report No 166

Möller, H and Anders, K. (1986). Diseases and parasites of marine fishes. Kiel, Möller, 365pp.

Fig 3

ICES REPORTING FORMAT (Rev 1991)

Completed forms to be sent to the Chairman of ICES WGPDMO

COUNTRY:
STATION LAT:
STATION LONG:
ICES SQUARE NO:
HAUL NO:

OBSERVER:
INSPECTION TIME /FISH(MIN0:
DAY(DAY/MONTH/YEAR):

FISH SPECIES: **COD** *(GADUS MORHUA)*

SIZE GROUP <29 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOTAL NO. EXAMINED			TOTAL NO. AFFECTED			PREVAL (%)*
	MALE	FEMALE	UNKNOWN	MALE	FEMALE	UNKNOWN	
SKIN ULCER							
PSEUDOBR. TUMOUR							
SKELETAL DEFORMITY							
CRYPTOCOTYLE							

SIZE GROUP 30-44 CM (min 100 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOTAL NO. EXAMINED			TOTAL NO. AFFECTED			PREVAL (%)*
	MALE	FEMALE	UNKNOWN	MALE	FEMALE	UNKNOWN	
SKIN ULCER							
PSEUDOBR. TUMOUR							
SKELETAL DEFORMITY							
CRYPTOCOTYLE							

SIZE GROUP >45+ CM (min 50 fish)

MEAN LENGTH OF SIZE GROUP+SD

	TOTAL NO. EXAMINED			TOTAL NO. AFFECTED			PREVAL (%)*
	MALE	FEMALE	UNKNOWN	MALE	FEMALE	UNKNOWN	
SKIN ULCER							
PSEUDOBR. TUMOUR							
SKELETAL DEFORMITY							
CRYPTOCOTYLE							

* Prevalence coding : N if not looked for
0 (zero) if looked for and not present
For samples smaller than minimum number + for present
- for absent

Minimum sample sizes

Cod Size group (cm)	Disease examination External	Internal
<29	100	
30-44	100	(50)
>45	50	50

Minimum disease signs for positive diagnosis

Cod	Skin Ulcers (acute and healing)	Open lesion (all colours)
	Skeletal deformities *	Grossly or by filleting
	Pseudobranchial swelling	Grossly observable
	Cryptocotyle	One or more cysts

* i.e. pughead, opercular shortening, spinal deformities. Filleting or head to total length are recommended.

Latitude and longitude of hauling point only.

It is recommended that survey hauls are on the same track from one year to the next and on parallel tracks until the minimum numbers of fish are reached

Inspection time/fish please, NOT total.

References

ICES, 1989. Methodology of fish disease surveys. Cooperative Research Report No 166

Möller, H and Anders, K. (1986). Diseases and parasites of marine fishes. Kiel, Möller, 365pp.

The reporting forms may be used in two different contexts:

i) to report to ICES annually through the WGPDMO on the prevalence of diseases diagnosed according to the standardised protocol.

ii) to report to WGPDMO any new emerging disease problems particularly in dab, flounder or cod.

The diagnosis of any new disease needs to be standardised before samples from different observers, locations or time of the year can be compared at the ICES level.

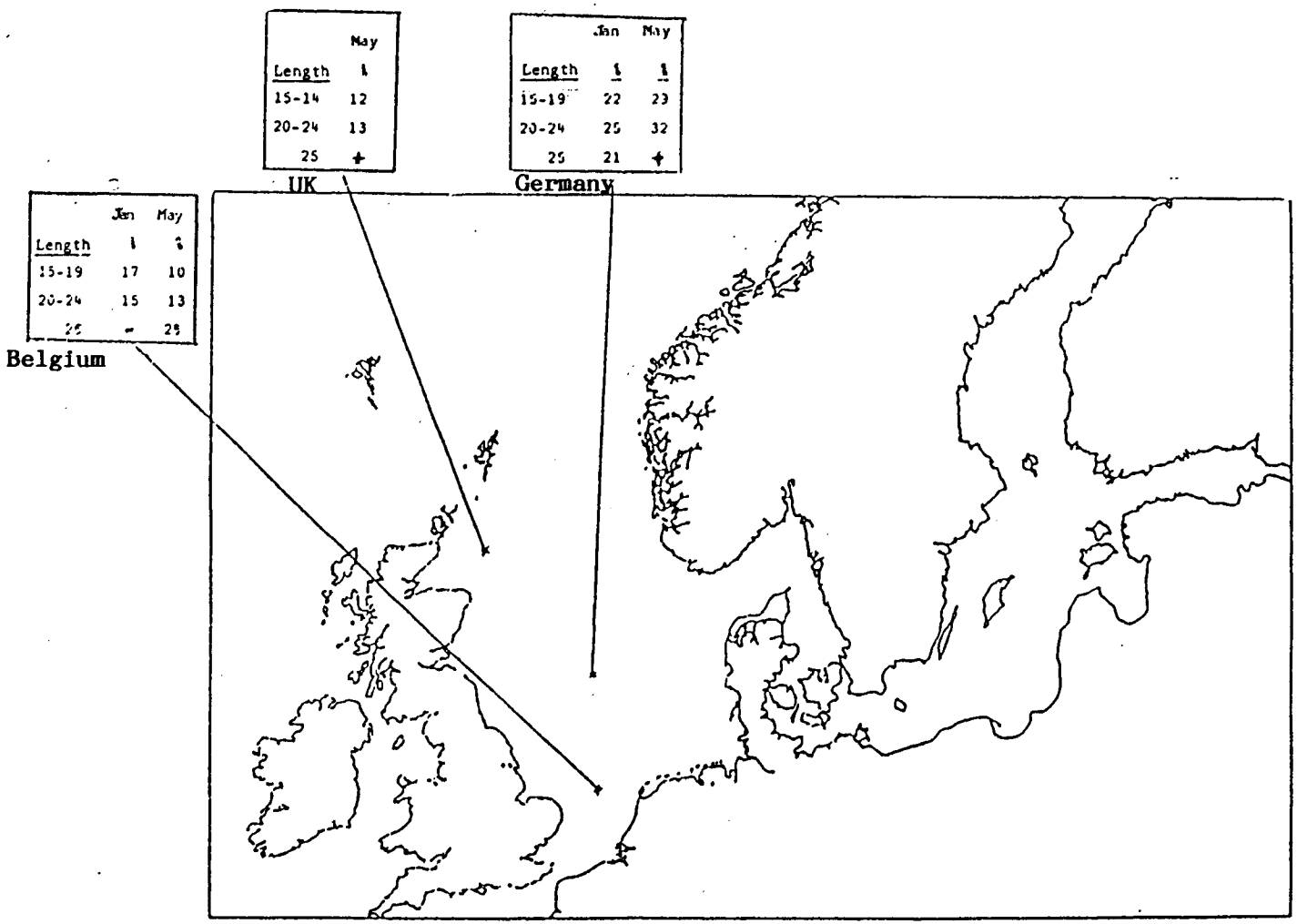
Only data on diseases listed in the ICES standard report forms should be reported to ICES, while data collected on other diseases should be held in national data banks.

It is hoped that close liaison with the North Sea Task Force and with WGBEC, will enhance complementary use of station location and survey dates and produce comparable observations on standardised disease data and historical observations collected by WGPDMO members.

Data analysis

Data on lymphocystis in North Sea dab was analysed by the sub-group to illustrate the WG's request to ICES for assistance with the statistical analyses of the historical data.

Some of the data could be presented in the form of annual tables or graphs of historical trends in prevalence rates, placed around a map of the North Sea and Baltic areas indicating the precise locations (longitude/latitude) of sampling stations (Figure 4). Summary maps will be produced by disease for each fish species, annually for tables of prevalence rates, and each year graphs of historical trends will be updated. In the first instance, sexes are not considered separately until information on fish growth rates and migrations is analysed.



1990 DAB (Limanda limanda), LYMPHOCYSTIS.

Figure 4. Example for the illustration of prevalence rates for 1990

In annual tables, prevalence rates are rounded to the nearest higher integer and given by a +/- code for a presence/absence in a sample smaller than the recommended minimum size. The months of sampling and country producing the data are indicated, percentages are given for the three standardized size-groups as in the following example.

May	Dec	Months of samples
-	+	1st length group, less than 100 fish
6	2	2nd " " more than 100 "
4	0	3rd " " " " 50 "
Belgium		Country doing the survey

Rules of interpretation for the statistical confidence in prevalence rates of each disease, in each fish species, and at different times of the year, will be devised by WGPDMO in 1992 when 4 years of data will be evaluated. These need to be based on a documented estimate of the actual disease prevalence in the population sampled, and WGPDMO recommends that individual prevalence rates are not interpreted out of context, and that differences are tested for their statistical significance. For example, substantial variations can be expected in the numbers of diseased fish found in a sample of 100. This is especially so for diseases with an actual prevalence lower than 10% in the population, as disease may then be detected in less than two sample groups out of three.

The biological significance of changes in disease prevalence will be assessed by WGPDMO from the analysis of seasonal and inter-annual variations observed in the past. The interpretation will be based only on the examination of those factors that are suspected to affect disease occurrence naturally. ICES should provide WGPDMO with maps or tables indicating the following information:

Abiotic

Four seasonal maps of averages if possible (annual overview otherwise).

Benthic oxygen deficiency
Benthic salinity
Benthic salinity fluctuation ranges
Benthic temperature
Benthic currents

and a general map of the substrate (granulometry).

Biotic

Annually (overview of several years otherwise) for dab, flounder and cod in North Sea and Baltic Sea:

Age/length population structure
Stock separation
Times of migrations and the locations of spawning grounds
Stock density (CPUE) and index of recruitment

WGPDMO encourages each member country to conduct disease surveys and to evaluate the temporal (if possible on a monthly basis) and spatial variations of selected diseases in their area. A Scottish study in the Moray Firth, presented to the WG, showed large variations between trawls within one nautical mile separation. Spatial variations in disease prevalence are expected to be higher in static, non-migratory fish stocks, and will provide information on local situations, whereas studies in areas at times of mixing between populations (e.g., on spawning grounds) will provide data averaging disease patterns over wider areas. In

any case, WGPDMO recommends that trawl surveys are done on the same track every year, and on close parallel tracks in each survey.

Conclusions

a) The sub-group could not at this meeting carry out a full statistical analysis of the data which have been collected according to ICES standard methodology since 1988. Some member countries have not yet sent data for 1990, and ICES support will be needed to analyse historical data once they have been collated by WGPDMO.

b) The standard reporting forms for fish diseases, with very few amendments are herewith (Figs.1-3) sent to ICES (ACMP) so that they may be sent to the NSTF and any other groups conducting disease surveys in the North Sea and Baltic areas.

c) The kind of analysis of disease survey data that needs being done by ICES is presented above. WGPDMO will provide ICES with four years of standardised disease data, which will then need to be summarised in the form of tables and graphs placed on maps indicating stations location. WGPDMO agreed with the suggestions of the Chairman of ACMP (G. Topping) that a future meeting of the Working Group should be held at ICES headquarters to facilitate collaboration with ICES statistical staff on this matter.

d) WGPDMO will devise interpretation guidelines to put observed variations in disease prevalence in the context of natural environmental variations and of changes in host population biology.

Recommendations

1. Each member country should conduct surveys for fish diseases according to the standardised protocol defined by ICES (1989), for at least two stations annually.

2. ICES member countries should submit the standardised data they have collected since 1988 to ICES via the Chairman of WGPDMO for compilation.

3. Each member country should evaluate natural factors influencing the seasonal and spatial variations in disease prevalences that can be expected for their survey stations.

4.4 Distribution of Parasites and Diseases Harmful to Atlantic Salmon in NASCO's N.E. Atlantic Commission and W. Greenland Areas

WGPDMO had been asked by ICES to perform this task and report the information to the Working Group on North Atlantic Salmon for its meeting in March 1991. The WG discussed this requirement and felt it was difficult to deal with in view of the lack of clarity concerning the purpose of the request.

The literature on parasites and diseases of Atlantic salmon is substantial and in view of the important number of organisms already described it would be a major task to concisely evaluate and comment on their distribution or their harmful effects as requested. The WGPDMO could, however, provide information or analyze data on specific diseases which are thought to be the most important, if so required.

The WGPDMO recognizes that there are several pathogens that could be harmful to wild or cultured Atlantic salmon under particular circumstances, but this can be a complex process due to the interrelationship of numerous environmental and biological factors.

Conclusions

a) The WGPDMO recognizes that there are some examples where the introduction or presence of a disease (e.g., furunculosis, Gyrodactylus, BKD) in a wild population has in the past proved to the detrimental to stocks, but a quantification of the impact cannot be easily evaluated. With this in mind an attempt could be made to review available data existing in the literature and evaluate this for WGNAS. This, however, can not be done for all disease organisms and some specifications are required. The presence of a known pathogenic organisms does not imply a severe effect on a wild population as the pathogenicity may vary from area to area and in time within one area, e.g. furunculosis in the U.K. (see Furunculosis Committee Report 1935).

b) WGPDMO recognizes that there is a general lack of sound information on the types and impact of diseases in natural populations of Atlantic salmon and that research is required in this area.

Recommendation

This matter should be referred back to NASCO with a request to be more specific as to the information required and to provide some indication of the purpose of it.

4.5 Health Status of Sea Trout Stocks Especially with Regard to Ireland and Scotland

The WG received reports prepared intersessionally by WGPDMO members in the three main countries affected by declining sea trout stocks.

1. **Ireland** (J. McArdle)

The catches of sea trout appear to have declined since at least 1987 and, perhaps, even earlier in many fisheries in the west of the country based on detailed figures from 23 fisheries presented to the group.

Besides the severe drop in the catch a number of other features were observed particularly the early return to freshwater of post-smolts and kelts, which were sometimes heavily infected with sealice. In some fisheries abnormally thin adult fish were also observed during the angling season. Fisheries in other parts of the country performed normally during the same period and in some areas even improved.

Research into the problem was sponsored by the Sea Trout Action Group (STAG) which was set up to tackle the problem. This commenced in 1990 and was coordinated by the Salmon Research Agency. On the premise that the problem appeared to originate in the marine environment, the aim of the research was to track the movements of smolts and kelts at sea and to monitor their subsequent survival and condition. Sea trout from several sites in the affected area were also examined for signs of disease and parasites. Histological and virological examination yielded no evidence of an infectious agent although some significant pathological changes were observed. However, varying numbers of sea lice were found on fish examined. Sea trout from 3 locations off the west coast were sampled for the presence of sea lice. The prevalence of the sea lice was in excess of 95% at all locations but the impact of the infection was not quantified. Parasitic intensity varied from area to area with the highest levels (in excess of 100 lice) being recorded from some fish in one of the sites where fish farming was carried on. The principal species encountered was *Lepeoptheirus salmonis*.

The research results were collated in December 1990 and based on these results the action group issued a report early in 1991 the main conclusion of which was that in all probability a major factor in the collapse of the sea trout in parts of the west of Ireland in 1989 and 1990 was a sea lice explosion deriving from coastal salmon farms in the region.

2. Scotland (A. McVicar)

Sea trout catches in Scotland between 1952 and 1989 showed good and bad periods with a general synchrony between areas of the country and fishing methods. A peak was reached in the mid-1960s, a trough in the mid-1970s followed some recovery in most areas in the early 1980s. Catches have again reached a trough with approximately 50% of rivers where statistics are available showing 75% or less of previous years figures. Affected rivers were widely dispersed on both the east and west coasts of Scotland. Some 30% of rivers have shown increased catches.

Of 300 sea trout obtained from the sea and lower reaches and estuaries of rivers in 1990 for scientific analyses few were thin. In one west coast river data from which was available it was concluded that sea trout were growing and surviving less well at sea compared with 1989, 1980 and 1926-1928 data. Sea and estuary caught fish had mainly full stomachs (sandeels, sprats/herring, crustaceans), but those in lower parts of rivers were mainly empty.

Considering fish caught in estuaries and sea the numbers of lice per fish varied considerably with no obvious pattern emerging. Highest numbers were 62 *L. salmonis* found on a 36 cm fish caught at Gruinard (west coast), followed by 64 (43 *L. salmonis*, 11 *Caligus* sp.) on a 65 cm fish from Montrose (East coast). A wide range of pathological conditions including kidney damage, blood vessel inflammation, lipoid liver degeneration, pancreas inflammation, myocardial degeneration, liver inflammation was observed with no consistency in their occurrence in relation to each other or river of capture (both west and east coasts).

3. England and Wales (D. Bucke)

Available data suggest that sea trout catches in Wales during 1990 were generally well below average with some rivers declining by up to 90%. Summary data for north-east England since 1960 indicated a series of peaks and troughs in catches similar to the situation in Ireland and Scotland with 1990 showing a marked decline. In this population there were no indications of disease or excessive infections of sea lice.

4. Other countries

No information on the status of sea trout catches was presented to the WG from other countries represented.

Conclusions

a) The factors contributing to the considerable year to year fluctuations evident in sea trout catches in Ireland, Scotland and England/Wales over prolonged periods are obviously complex and have not been fully elucidated.

b) The hypothesis that in all probability sea lice derived from fish farms are a major factor in the collapse of sea trout stocks in one region (west of Ireland) is in the opinion of WGPDMO not justified in the light of available scientific evidence since:

   i) the current data does not allow a cause and effect relationship to be established as it is known that lice, in addition to acting as primary pathogens, frequently accumulate in large numbers on fish which have become weak and debilitated for a variety of causes.

   ii) high sea lice levels on Atlantic salmon have been reported in areas well removed from salmon farming areas.

   iii) the decline of sea trout population is not restricted to salmon farming areas, apparently occurring with significant severity in some rivers in eastern Scotland, north-east England and Wales.

iv) other possible causal or contributory factors have not been sufficiently investigated to be discounted.

c) In the opinion of the WG, based on available pathological data, the decline in sea trout populations reported can not at present be attributed to a single recognised disease condition.

Recommendation

The WGPDMO recommends that additional disease studies be carried out in sea trout in freshwater and seawater, particularly on thin fish from seriously affected river systems. It is essential these studies be integrated with detailed fish population and environmental studies including factors such as afforestation, erosion and climatic influences.

4.6 Review of Current and Historical Data on Lethal Diseases of Wild Marine Fish with Possible Relevance to Stock Assessment

Overview papers were received from two WGPDMO members (D. Bucke, UK, and J. Couillard, Canada) which the WG read and discussed.

The WG believes there is increasing awareness that infectious disease-induced mortalities in wild marine fish stocks might influence recruitment by increased natural mortality and/or have an effect on reproductive capability. Natural mortality due to disease should not be neglected in stock assessment calculations. However, published information on the topic is scarce, reflecting the difficulty in obtaining good field data.

The only proven examples of infectious disease-induced mortalities are epizootics with the fungus *Ichthyophonus hoferi* among Atlantic herring in the Gulf of St. Lawrence and the Gulf of Maine since 1898 and among plaice populations in the northern North Sea.

In addition to direct mortality effects fish diseases may have impact on fish populations (numbers and biomass) through reduction of fecundity and decreased growth performance.

There are several examples of severe diseases and parasite infestations which could have a possible impact on fish stocks. These include:

- mycobacteriosis in mackerel,
- visceral granulomatosis and dermal necrosis in Atlantic cod,
- x-cell lesions in dab and starry flounder,
- "bleaching syndrome" in flounder and plaice,
- "yellow pest" in Atlantic cod,
- *Lernaeocera* infestation in gadoids.

These conditions could usefully be given more attention and this should be taken into account in future research plannings of stock assessment and disease monitoring studies.

Conclusion:

There is a requirement for disease monitoring programmes to be integrated with research on aetiology and epidemiology because most disease conditions in marine fish stocks are still incompletely characterized. Improved background knowledge is required before it will be feasible to consider the possible relevance of particular diseases on fish stocks.

Recommendation:

ICES member countries should consider conducting field studies to provide more knowledge on the pathogenesis and virulence of severe diseases in commercial species of marine fish with the aim of having a better understanding of their possible contribution to stock dynamics.

5 DISEASES IN MARICULTURE

5.1 National Reports on Recent Disease Trends and Developments in Mariculture

Written reports were received from 9 ICES member countries and synopses are given at Annex 4. The main trends and recent developments identified were as follows :

A. FISH

i) ATLANTIC SALMON

Furunculosis (typical) is still considered to be the most serious disease of marine farmed Atlantic salmon in **Ireland** and the West Coast of **Canada**. The disease has not been previously reported from **Iceland** and the **Faroe islands**, but there were no national reports presented or received for 1990. The disease is continuing to spread by transmission in sea water in **Scotland** and **Norway** and this route of spread was suspected for the first time in Eastern **Canada**. There is also further spread in the Baltic Sea area in **Sweden** and **Finland**. Furunculosis is now established in Norwegian wild salmon populations and the Baltic stock of Atlantic salmon is considered to be carriers.

Furunculosis (atypical), caused by atypical strains of *A. salmonicida*, remains a problem in **Canada** (previously reported in **Iceland** as well) and both typical and atypical strains of *A. salmonicida* have been isolated from the sea wrasse.

There is an increasing problem with antibiotic resistance in all areas with the greatest problem in **Scotland** with 20% of the isolates being multiresistant. **Canada**, for the first time has also reported on the presence of a multiple resistant strain of *A. salmonicida*.

Because of the developing problem of antibiotic resistance there is a need for alternative methods for control of the disease. Husbandry methods (fallowing, reduction in stock densities and removal of mortalities) are being evaluated and promoted. New improved antibiotics and vaccines are being developed and field trials are in progress. Preliminary results of field trials are promising.

Bacterial kidney disease (BKD) remains the most important problem in cultured Pacific salmon on the West coast of **Canada** and now a significant increase in BKD infection has been reported in cultured Atlantic salmon there. These results have serious implications for other Atlantic salmon growing areas. For the second time, BKD was isolated from farmed Baltic Atlantic salmon in **Finland** and simultaneously, there was a significant spread of the disease on the Swedish coast rainbow trout culture facilities. For the remaining member countries, the BKD situation showed a slight increase. BKD was reported in the **Faroe Islands** for the first time from an identification by Danish scientists. There are still no reported cases in **Ireland**.

The WGPDMO is not aware of any developments on improved or alternative treatments or on vaccination: BKD remains a difficult disease to control.

Vibriosis has become a major problem in rainbow trout cultured in **Finland** with mortalities of 5 to 10%. Otherwise, the situation with vibriosis remains the same in other member countries except in Ireland where it cause significant losses in farmed Atlantic salmon in 1990.

Cold water vibriosis. *Vibrio salmonicida* was detected for the second time in **North America (Eastern Canada)**. In **Norway** the disease remains generally under control due to vaccination.

Infectious pancreatic necrosis (IPN) appears to becoming more of a problem in Atlantic salmon farms. There was an increase in the number of clinical cases of the disease in post smolts Atlantic salmon in **Norway** and **Scotland** and clinical IPN was recorded for the first time in **France** in sea-farmed Atlantic salmon.

Infectious Salmon Anaemia (ISA) is an increasing problem in **Norway** and efforts to isolate an infectious agent have failed so far. Recent findings indicate the presence of neutralizing antibodies in the serum of surviving fish. The disease has not been reported in any other countries.

Pancreas disease (PD) continues to cause problems in cultured Atlantic salmon in **Scotland, Norway and France** and was considered the most important disease in **Ireland** in 1990. So far PD has not been diagnosed in Atlantic salmon farms in **Canada**. No infectious agent has been isolated or could be identified with this disease, but experimental transmission studies indicate a virus could be the cause. Strong acquired resistance has been confirmed experimentally.

Sealice (*L. salmonis*) infestation remains the most important parasitic disease affecting cultured Atlantic salmon in **Norway, Scotland and Ireland**. There are reports of increased resistance of *L. salmonis* to dichlorvos treatment.

"Fading smolt syndrome" is a growing problem in **Scotland** and **Norway**. The relationship to "summer disease" of Atlantic salmon previously reported in **France** should be investigated. The cause of the disease is unknown.

New diseases reported for the first time

- *Dermocystidium*-like infection of farmed Atlantic salmon **(Eastern Canada)**
- Gnathids larvae - observed in posts smolts **(Ireland)**
- *Microsporidian* sp. in muscle and internal organs **(Ireland)**
- *Dermocystidium*-like agent in salmon **(Ireland)**

ii) OTHER SALMONIDS

Furunculosis is increasing (double the number of cases) in rainbow trout cultured in the Baltic **(Finland** and **Sweden)**, with concurrent antibiotic resistance being observed.

Pancreas disease (PD) was found in brown trout reared in the sea in **France**: this represents the first case of PD involving a species other than Atlantic salmon.

Infectious pancreatic necrosis (IPN) carriers are increasing in rainbow trout farms in **Finland** and a first case of IPN in sea cultured brown trout was reported from **France**.

Viral haemorrhagic septicaemia (VHS) was the most serious problem in sea cage culture of rainbow trout in **Denmark** in 1990, with mortalities reaching 30%. The reasons for this development are unknown.

iii) OTHER MARINE FISH

Vibriosis in **Norway** and **France** has been the most serious bacterial disease of cultured marine farmed fish in 1990, causing losses of up to 50% in **cod** and **turbot** juveniles.

Furunculosis and atypical strains of *A. salmonicida* have been isolated from cultivated **turbot** in **France.**

New diseases reported for the first time

- **Viral haemorrhagic septicaemia (VHS)** is believed to have caused mortalities **in Germany** at a turbot farm situated on the Baltic coast. If confirmed, this will be the first field case of this disease to have occurred in a marine non-salmonid species and represents a serious new development with consequences not only for turbot farming itself, but also implications for control of the spread of VHS amongst marine rainbow trout farms.

- ***Serratia liquefaciens*** in turbot **(France)**

- ***Pasteurelle piscida*** in sea bass, mullet and sole **(France)**

- ***Picorna*-like virus** causing encephalitis (100% mortality) has been recorded in sea bass larvae **(France).**

Conclusions

a) In view of the rapidly increasing problems caused by furunculosis in Atlantic salmon farms, improved treatment and vaccination methods are urgently required, as is research on alternative methods for control.

b) Because of the reported differences in antibiogram profiles within the same population and even within the same fish, several isolates should be tested for the determination of antibiotic resistance profiles in diagnostic cases. There is also an urgent need for standardization of antibiotic resistance assay methodology.

c) The WGPDPMO approves the continuing efforts to develop more sensitive methods for detecting BKD carrier fish and strongly supports the rationale of controlling the disease by instituting a "clean broodstock" policy of disease elimination at source.

d) The extent of occurrence of atypical furunculosis and its significance requires further evaluation in ICES member countries.

e) In view of the continued increase of virus-associated diseases, additional viral research should be strongly supported .

f) Countries importing and/or exporting turbot juveniles should be made aware of the potential for VHS transmission.

g) The fallowing of sites is an effective technique to break the infection cycle of pancreas disease.

h) There is a pressing requirement for more research on new treatments and alternative methods for control of sea lice in Atlantic salmon farms.

Recommendations

1. The extent of occurrence of atypical furunculosis in all species of wild and farmed fish be evaluated in ICES member countries and reported to the WGPDMO.

2. The WGPDMO recommends support and emphasizes the need for continuing research into diagnostic and treatment methods for furunculosis in Atlantic salmon and suggests the convening of a special ICES Workshop on this topic.

B. SHELLFISH

i) MOLLUSCS

a) *Ostrea edulis*

Bonamia ostreae **(Bonamia disease)** in the Netherlands reached prevalences of 80-97% in Grevelingen. This extreme mortality was linked to environmental stress, a factor which appears to exacerbate this disease in other affected areas (**France, Ireland, U.K.**). It was noted that, despite exhaustive attempts to eradicate *Bonamia* by removing all oysters from the Grevelingen beds for several years, the disease persisted. In **France, Ireland** and the **U.K.**, there has been no significant change in the distribution or prevalence of *Bonamia*. In **Ireland,** however, it was reported that since the 1989 outbreak of *Bonamia* and removal of oysters from the affected area (Galway Bay), the disease has not been detected. A correlation was noted between intensity of oyster culture and *Bonamia*-related mortality (**Ireland**). As in previous years, sub-tidal oysters were less susceptible to infection than intertidal stocks. In the **U.K.**, where MAFF guidelines are adopted, it is possible to fatten clean stock on infected sites for one season without clinical losses. A result of *Bonamia* infection of *O. edulis* noted by **Ireland** and the **U.K.** was a trend towards *Crassostrea gigas* cultivation instead of *O. edulis* cultivation. This is believed to be due entirely to the risk of *O. edulis* losses to *Bonamia*. In **France** the distribution and prevalence of *Bonamia* has not changed significantly since 1989 and efforts are currently being made to increase *O. edulis* production through improved management techniques. Recent experiments, using oysters from highly- and chronically-infected areas or surviving oysters from experimentally-infected samples, have produced several F1 generations which show increased resistance to *Bonamia*. Oysters of F2 generations will be analyzed in 1991 using a genetic selection program. The occurrence of false negatives during the initial weeks of infection was proven using experimental inoculation of high concentrations of *Bonamia*. This reinforces the need for caution in transfer of such genetically-selected strains of *O. edulis* until more is confirmed.

In addition, high individual variability between oysters in susceptibility was demonstrated and provides a promising base for research on immunological responses and genetic selection for resistance.

Marteilia refringens in **France** caused continual problems with up to 90% prevalence in certain locations and high mortalities. An intermediate host is suspected, since in certain regions disease-free oysters have been introduced into previously oyster-free areas and *Marteilia* subsequently appears.

b) *Crassostrea gigas*

In **France** there were significant difficulties in production of *C. gigas* in several hatcheries due to mass mortalities. No pathogenic organism was found in association with these losses; hence, it is suggested that the cause may have been some environmental factor. Further studies will be conducted to ensure that a pathogenic agent is not involved.

Concern was raised with respect to continued introductions into Europe of *C. gigas* from the western USA and Canada (apparently without certification), and the probability that they may be carriers of pathogenic agents not currently being screened for, e.g. OVVD (oyster velum viral disease) or ***Mikrocytos mackini***

(Denman Island Disease). Concern was also expressed about the significance of **Iridovirus** decribed in *C. gigas* larvae and adults, due to its being considered for inclusion as a List II Disease under the CEC Council Directive "concerning the animal health conditions governing the placing on the market of aquaculture animals and products".

A written summary sent to the WG by E. Burreson, **USA**, on the experiments with *C. gigas*, was received with interest. These include preliminary studies using genetic manipulation (triploidy) of *C. virginica* for investigation of sensitivity to infection with ***Perkinsus marinus***. Unfortunately, as the information was in the form of a summary, sufficient detail was not provided on the percentage of triploidy achieved or on the infection doses used. It is hoped that a **USA** representative will attend the next meeting of the WG to clarify this work, since it is of direct interest to all countries now using *C. gigas* for aquaculture.

c) *Tapes philippinarum*

France reported that **"brown ring disease"** of *T. philippinarum* had been significantly reduced in nurseries by using antibiotic treatment (furazolidone) against the causative agent *Vibrio* sp. (P1). Specific monoclonal antibodies against the pathogen have been produced and clinical evaluation is in progress in order to develop an epidemiological study of this disease which is not yet well understood.

d) *Cardium edule*

Ireland reported one incident of abnormal mortality in a number of molluscan species from one area. The only species showing significant pathology were cockles (*C. edule*) which showed a heavy infection with ***Nematopsis*** sp.

e) *Mytilus edulis*

Chronic heavy mortalities were observed in the Gulf of St. Lawrence (**Canada**) from February to November. In addition, survivors harvested for processing demonstrated a limited tolerance to debyssing and a significantly reduced shelf-life (± 7 days to 1-2 days). No pathogenic agent has yet been detected. Certain seed stocks appear more susceptible than others and studies are underway to determine whether or not susceptibility is related to the presence of a second mussel species, *M. trossulus* (which is known to occur in neighbouring Nova Scotia waters).

Hemic neoplasia and ***Proctoeces***-like digenean castration are reported from Atlantic Canadian mussels for the first time. Neither infection was directly associated with mortality. 70% of mussels from a single location on Vancouver Island (Pacific **Canada**) were infected by a new haplosporidian. The effect and distribution of this parasite are being closely monitored.

f) *Mercenaria mercenaria*

Chytrid-like infections of hatchery broodstock appeared in spring 1990 and 1991 causing mass mortalities. The infection appears limited to one broodstock and is under investigation.

g) *Argopecten irradians*

Bay scallop culture is now resticted to Nova Scotia (**Canada**) waters pending results of studies to determine whether or not ***Perkinsus karlssoni*** can be transmitted to native bivalve species.

A post-transfer die-off of bay scallops was initially attributed to a ***Pseudoklossia***-like eucoccidian. Subsequent investigations, however, revealed equally heavy infections in surviving individuals.

h) *Pecten maximus*

France reported that gill infections of *Pecten maximus* with **rickettsia** continue to be observed, with high prevalence and infection levels, on several scallop-beds, but the significance of this infection is not yet well understood.

Conclusions

a) **Bonamia** has shown no significant increase over the last year and control appears to be being successfully achieved through refinement of management techniques.

b) A number of new diseases have appeared, the significances of which are not currently understood, but merit continued close observation, e.g. the **haplosporidian** in Canadian mussels and heavy mortalities of *C. gigas* in French hatcheries.

c) Uncontrolled transfers of *C. gigas* from North America to Europe is cause for concern given the known occurrence of ***Mikrocytos mackini*** (Denman Island Disease) in North America.

d) In the light of the continued emergence of new diseases and the persistence of established diseases, it is recognised that prevention and control are unlikely to be practically achieved through chemical treatment or stock eradication. Thus, it is necessary to develop research in the fields of rapid diagnostic techniques and molluscan genetics for selection of resistant strains. In addition to chromosomic manipulations, research in quantitative genetics is now possible. Indeed preliminary results acquired for *Bonamia ostreae* have shown important individual variability of disease sensitivity. Moreover, it appears that F1 oysters from "naturally" or experimentally-derived resistant oysters, appear to show increased resistance to the pathogen. Other fields of research which appear to have potential for enhancing disease resistance are genetic engineering and immunology.

ii) CRUSTACEANS

American lobster (*Homarus americanus*)

A single lobster-pound in **Canada** suffered very high mortality due to infection by the ciliate *Anophrys* sp. This is the first case of mortalities associated with this disease in Canadian waters.
Gaffkaemia was confirmed in native stocks of lobsters on a holding site on the north coast of Wales (**U.K.**). The case was tentatively linked to imports of North America lobsters and no evidence of infection was detected in wild stocks in the vicinity. The site was cleared and the facility disinfected. **Denmark** reported a similar case, but have tentatively traced the source to lobsters from the North Sea.

5.2 Review of Current Molluscan Disease Control Measures for Update of ICES/EIFAC Guidelines on Introductions

In its report to the Statutory Meeting of 1990, the Mariculture Committee welcomed the proposed assistance of the WGPDMO to improve the ICES/EIFAC Codes of Practice and Manual of Procedures and agreed that relevant members of the WG should review the current molluscan disease control guidelines as an intersessional task. This exercise was undertaken by correspondence and a paper entitled "Overview of current Molluscan Disease Control Measures" was prepared by S. McGladdery (Canada) and tabled for discussion by a sub-group (E. Mialhe, B. Hill, J. McArdle & S. McGladdery) during the WGPDMO meeting. The information contained in this overview had been provided by WG representatives from most member countries in response to a written request for details of current molluscan disease control measures employed by each country.

The sub-group felt that it was a useful document, but regretted the lack of a return from a major mollusc-producing country (Spain). It was agreed that information from Spain should be actively sought by **S. McGladdery** and be added to the complete review. Based on the information received to date, it is clear there is enormous variation between ICES member countries in the control measures available and that even where legislative controls are in force, it is not always apparent how strictly the regulations are applied. Considerable correspondance will be required in order to provide a clearer picture.

Following scrutiny of the relevant parts of the ICES Code of Practice on Introductions and Transfers of Marine and Freshwaters Organisms, especially the molluscan diseases listed and methods stipulated for their detection, it was noted that there were certain areas which could be improved, e.g. the addition of thioglycollate culture to routine diagnostic procedures in light of recent discoveries of three new species of *Perkinsus* in three different bivalve hosts.

It was also noted by the sub-group that molluscan disease diagnostic methodologies are currently being formulated for inclusion in the proposed EC Directive "concerning the animal health conditions governing the placing on the market of aquaculture animals and products". Preliminary details are known to some members of the sub-group and it was recognised that, if implemented as currently drafted, they contain methodologies and sampling procedures which are different to those currently contained in the Code of Practice. Since 9 ICES Member Countries are also members of the EC, they will automatically be bound by the new measures, with respect to molluscan disease monitoring. It was also noted that the proposed EC measures will have significant impact on those ICES Member Countries outwith the EC, which currently supply live molluscs for culture to EC Member States. "Third Countries" (countries outwith the EC) will be required to supply evidence that their proposed consignments of molluscs originate from areas which are free of the diseases currently listed under the Directive (*Bonamia ostreae*, *Marteilia* sp., *Haplosporidium* sp., and *Perkinsus* sp.) in addition to any other potentially pathogenic disease.

Conclusions

a) It was agreed that the sub-group members (**E. Miahle, B. Hill, J. McArdle and S. McGladdery**) should continue this work by correspondence to provide suggestions for amending the relevant mollusc sections of the Code. These suggestions will be compiled in consultation with appropriate specialist collegues and will be submitted by **B. Hill** to the WGITMO (Chairman Dr. J. Carlton). The suggested modifications will be submitted as soon as possible (along with the completed paper "Overview of Current Molluscan Disease Controls") to the WGITMO, for consideration at their next meeting in Finland in July 1991.

b) In order for disease controls to be applied in a consistent manner between ICES member countries in the future, it appears that there is a need to ensure that the ICES Code of Practice is compatible with the health checks stipulated in the EC Directive.

Recommendation

The WGITMO should consider revising the disease aspects of the ICES/EIFAC guidelines of the Code of Practice to make them compatible with the proposed sampling and test procedures that the forthcoming EC Directive concerning fish and shellfish health, since 9 ICES member countries are members of the European Community and will be affected by the new measures.

6 ANY OTHER BUSINESS

6.1 Publications

a) Glossary of Terms used in Pathology

The "Glossary of Terms used in Pathology" prepared by WGPDMO and edited by WG members D. Bucke and F. Baudin-Laurencin, had been sent to Prof. H. Rosenthal as Chairman of the Joint ICES/EIFAC study group to be incorporated into the enlarged EIFAC/ICES "Glossary on Biological and Technical Terms Relevant to Aquaculture". Although WGPDMO had argued that including definitions of individual fish diseases would be a large task and suggested this be avoided, the Mariculture Committee was of the opinion that definitions of important diseases in salmon farming should be included and that, since EIFAC interests had to be considered, diseases of cyprinids should also be included. It had also been agreed to expand the number of terms of relevance to fish disease surveys which WGPDMO had listed as one of the advantages of having the Pathology Glossary published as a separate document. Organisation of these additions was in the hands of Prof. Rosenthal, who would be contacting the editors of the Pathology Glossary.

b) Review of Problems of Medication in Mariculture

The WGPDMO's proposal (as reported last year) to produce for publication a review of problems of medication in mariculture, had been discussed by the Mariculture Committee who had welcomed this activity. However, they had drawn attention to the fact that the WG on Environmental Impacts of Mariculture was in the final stages of preparing a document on "Use of Chemicals in Mariculture" and decided that the two WGs should combine their effort into an enlarged multi-author single document. This was to be co-ordinated by the Chairman of WGEIM (Prof. Rosenthal), who would contact Dr Alderman and the other proposed WGPDMO contributors to clarify what was required and by whom.

c) Training Guide for Marine Fish Disease Surveys

In the absence of the three WG members responsible for producing this Guide, discussion was limited. It was nonetheless understood that the training guide is near it's final stage of preparation and that it will be submitted shortly to WGPDMO through the Chairman, who will forward it to the ACMP for consideration as a possible ICES publication.

d) Preparation of a video to complete the training guide

For the same reason reported above (absence of the three members responsible for this project) the Chairman will make enquiries with those members as to the progress made in putting together a detailed proposal on the preparation of a training video. The WGDPMO still supports this project.

e) Diagnostic fiches

The Editor of the diagnostic fiches (G. Olivier) reported that the latest series of fiches (41-50) are now being printed. Only 3 of the next 10 proposed and 2 new additions had been received. The Editor will write to the various authors who agreed to prepare the outstanding fiches.

The WG members agreed it would be useful if ICES could produce an official binder for the fiches already available. The WG also would like to know more about the cost of the fiches and the reason for the lack of publicity given by ICES to their availability. The question was asked whether ICES Secretariat or the WGPDMO itself should take the lead on this publicising the series. The Editor agreed to make enquiries through the Publications Committee.

The Editor asked that members give serious thought to the future development of the fiches and be prepared for discussion and comments at the next meeting.

6.2 Future Activity of WGPDMO

a) Working procedures

The continuing poor attendance rate of members of the WGPDMO at its meetings and the failure of members in some countries to submit national reports is causing problems for the efficient functioning of the Working Group. The Chairman pointed out that if some tasks were to be carried out inter-sessionally by members, it was incumbent upon them to prepare any necessary reports or papers and submit these for consideration at the WG meeting, even if they could not attend in person. This was imperative if the Terms of Reference for the meeting included a requirement to evaluate such papers with a view to conducting an analysis and/or providing advice to one or more ICES Committees. The Chairman proposed that he should write to the Chairman of the Consultative Committee pointing out the problems being experienced by WGPDMO through members failing to attend or submit written contributions, with the request that this be drawn to the attention of national delegates who should consider writing to their nominated members of WGPDMO reminding them of the obligations associated with their membership.

To help WG members to clearly understand what is expected of them, the Chairman of WGPDMO will, in future, send a reminder to all members having inter-sessional tasks and give firm deadlines for their completion, also emphasising the need for tasks to be completed even though attendance at the next meeting might not be certain. All inter-sessional tasks will be identified within the body of the WG report against the named member(s) and a summary of all tasks with deadlines will be circulated by the Chairman to the full membership as soon as possible after the ICES Statutory Meeting when the Council's resolutions have been made concerning Terms of Reference for Working Groups.

The Chairman pointed out that he had sent to all members a copy of the notes on the conduct of meetings of working groups reporting directly or indirectly to ACMP, and that these requested that WG reports should conclude with a concise analysis of progress in relation to the tasks assigned with some justification given in cases where there had been a lack of progress. This would be done for the first time in the present report.

Because of the length and complexity of the items in the Terms of Reference for this year's meeting, it was unanimously agreed that 4 days had been barely sufficient and that an extra day should really have been allowed. It was pointed out that the WG itself had initially recommended 4 days for the meeting, based on the Terms of Reference it had recommended in last year's report, and it was suggested that when ICES Council added more tasks to the Terms of Reference for a meeting this might require the WG to meet for one or more days longer than the period initially recommended and that this could have important implications for the laboratory which had volunteered to host the meeting. The Chairman agreed to draw this to the attention of the Chairman of the Consultative Committee and seek advice.

b) New Tasks

i) Disease interactions between farmed and wild fish populations

The WG discussed the fact that at this meeting it had been asked to consider 2 items (Terms of Reference (f) and (g)) concerned with the possible impact of disease on migratory salmonids. Although not specifically stated within the description of the tasks, several WG members were of the opinion that the reason behind this was the growing speculation and concern that increasing levels of parasites and diseases in Atlantic salmon farms could be spilling over into wild salmonid populations with detrimental effects on stock levels. The WG agreed that the whole question of diseases in farmed and wild populations was an emotive issue in some quarters, with conclusions being reached often with little if any sound evidence, and that an objective expert review of the data available would be of benefit to all concerned.

It was agreed that as an initial step, an intersessional task should be to seek from all ICES member countries any evidence they have regarding the spread of disease between farmed (particularly salmonids) and wild populations of fish and that this should be collated in the form of a review which the WGPDMO could

discuss and then present its conclusions to the appropriate ICES Committees and Working Groups. **J. McArdle** agreed to take on this task and will write to WGPDMO members in all countries to request the information be provided as soon as possible and no later than the end of this year.

ii) Revision of fish disease aspects of EIFAC/ICES Code of Practice on introductions and transfers

It was agreed that the review being carried out on the mollusc disease aspects of the Code of Practice was proving useful and could lead to an improved updated version of the Code subject to agreement by the WGITMO, who were currently engaged on the redrafting process. It was agreed that a similar exercise could be usefully done for the fish disease sections of the Code and that **G. Olivier** would conduct the intersessional task of gathering what information was available from those ICES member countries which are not Member States of the EC, and will compile this data for presentation to the next meeting of the WGPDMO by which time the details of the EC-stipulated health certification procedures should be available for taking into account at the same time.

c) **Future meetings**

The participants unanimously agreed that there was sufficient outstanding tasks requiring group discussion to justify a further meeting of the WGPDMO. In view of the suggestion by the Chairman of ACMP (G. Topping) that the statistical analysis of the fish disease prevalence data (as discussed under item 4.3) might best be completed next year through a meeting of the WGPDMO at ICES in Copenhagen, a Recommendation to this effect should be made. The ACMP Chairman had also pointed out that any data on fish diseases collected by JMG labs during 1990-91 period should be assessed by WGPDMO, as should similar data from the NSTF programme.

Recommendation

The Working Group on Pathology and Diseases of Marine Organisms (Chairman: Dr B.J. Hill, UK) should meet at ICES, Copenhagen, for 5 days in the early part of March 1992 to:

a) Statistically analyse the compiled data from the national reports submitted to the WGPDMO on disease prevalence rates observed in marine fish stocks.

b) Analyse and evaluate any disease data submitted to ICES for assessment by JMG, NSTF and BMB, taking into account any information provided to the WGPDMO on the residence time of dab and flounder in the areas under study.

c) Compile and analyse national reports on recent disease trends in mariculture and provide advice on preventive and control measures.

d) Review current fish disease control measures in order to complete the updating of the relevant ICES/EIFAC guidelines on the "Code of Practice on introductions and transfers" in close collaboration with the Working Group on Introductions and Transfers of Marine Organisms.

e) Analyse the compiled information from ICES countries on cases of disease interactions between farmed and wild populations, and evaluate for any evidence of detrimental impact of disease on wild fish in marine fish farms.

7 APPROVAL OF DRAFT REPORT

All major sections of WGPDMO report drafted by the appointed rapporteurs during the meeting were considered, amended and finally approved in time for an almost complete print of the report to be issued to the participants before departure. It was left for the Chairman to carry out an overall editing of the report before submission of the final draft to ICES.

8 CLOSING OF MEETING

In summing up, the Chairman thanked all participants present for their sustained hard work throughout the meeting. On behalf of the WGPDMO and ICES he expressed sincere gratitude to D Declerck and the secretarial staff at the Fisheries Research Station for their excellent support, which had ensured the meeting had completed its exceptionally heavy agenda on time, including the preparation and approval of the draft report. The generous provision of resources and hospitality by the Director, Dr P. Hovart, and the staff of the Fisheries Research Station had been greatly appreciated by all participants.

The meeting was closed at 20.45 on Friday, 22 February.

ANNEX 1

WORKING GROUP ON PATHOLOGY AND DISEASES OF MARINE ORGANISMS

Ostend, 19-22 February 1991

LIST OF PARTICIPANTS

Dr K. Anders	Institute für Meereskunde an der Universität Kiel Düsternbrooker Weg 20 D 2300 Kiel, 1, GERMANY
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Mr D. Declerck	Station de Pêche Maritime Ankerstraat 1 8400 Ostende BELGIUM
Dr B.J. Hill (Chairman)	Ministry of Agriculture, Fisheries & Food Fish Diseases Laboratory Weymouth UNITED KINGDOM
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Mr J. Höglund	Statens Naturvardsverk Box 7073 75003 Uppsala SWEDEN
Dr J. McArdle	Department of the Marine Fisheries Research Centre Abbotstown, Castleknock, Dublin 15 IRELAND
Dr S. McGladdery	Department of Fisheries & Oceans P.O. Box 5030 Moncton New Brunswick CANADA
Dr A. McVicar	Scottish Office Agriculture & Fisheries Department Marine Laboratory Victoria Road Aberdeen AB9 8DB UNITED KINGDOM
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ANNEX 2

WORKING GROUP ON PATHOLOGY AND DISEASES OF MARINE ORGANIMS

Ostend, 19-22 February 1991

AGENDA

1. **Opening of meeting**

2. **Terms of reference, adoption of agenda, selection of rapporteurs**

3. **ICES Statutory Meeting 1990: points of relevance to WGPDMO**

4. **Diseases in wild populations of marine organisms**

   4.1 Analysis of national reports (1990) on diseases in wild fish.

   4.2 Review of information on migration habits of dab and flounder relevant to disease prevalence studies.

   4.3 Statistical analysis of data on disease prevalence in marine fish stocks.

   4.4 Distribution of parasites and diseases harmful to Atlantic salmon in NASCO's north-east Atlantic Commission and West Greenland Commission areas.

   4.5 Health status of sea-trout stocks especially with regard to Ireland and Scotland.

   4.6 Review of current and historical data on lethal diseases of wild marine fish with possible relevance to stock assessment.

5. **Diseases in mariculture**

   5.1 National reports on recent disease trends
   (a) fish; (b) molluscs; (c) crustacea.

   5.2 Review of current molluscan disease control measures for update of ICES/EIFAC guidelines on introductions.

6. **Any other business**

   6.1 Publications:
   - glossary of aquaculture terms;
   - training guide and video for marine fish disease surveys;
   - problems of medication in mariculture;
   - diagnostic fiches.

   6.2 Future activity of WGPDMO.

7. **Approval of the draft WG report**

8. **Closing of meeting**

ANNEX 3

SYNOPSES OF NATIONAL REPORTS ON DISEASE PREVALENCE IN MARINE FISHSTOCKS (1990)

Belgium (D. Declerck)

Taking the 1985-88 survey period as reference for the Belgian coastal zone an increase for skeletal deformities in dab (0.2%), flounder (0.5%), plaice (0.5%) and sole (2.15%) was noted in 1990. These results confirm the numbers obtained in 1989. Liver tumours were observed in flounder (2.8%), dab (2.6%) and plaice (4.3%). The presence of skin ulcers in dab (0.5%) and flounder (1%) remains low. This is also the case for the rare incidence of epidermal papilloma as well as X-cell lesions in dab. On the other hand, the prevalence of the protozoan disease *Glugea stephani* in dab (10.1%), plaice (2.3%) and flounder (3.8%) was high. Especially in autumn, the infected dab was up to 14.5%.

Again the cod populations were almost absent during the biannual (May-October) surveys on the Belgian Continental Plat (B.c.p)(F 2/3 - 31). Only 60 samples, caught in the south-western North Sea could be examined. High disease levels were noted: spleen granulation (20%), liver tumours (3.3%) and ulcers (6.7%). *Ichthyophonus hoferi* was present in 10% of the cases. None of the granulated ones was positive for *Ichthyophonus hoferi*. The viral disease lymphocystis decreased slightly. Looking for bloodparasites in flounder and dab, *Haemogregarina platessa* was present in both species. The prevalence of disease in whiting was in the order of that in 1989.

During the beamtrawl survey (Aug 1990) in the south-western North Sea three different fishing zones were examined. To each of the three zones belong a specific dab and plaice population. Concerning the incidence of parasites, *Stephanostomum baccatum* was found in the three different dab populations, but not present in the B.c.p. The protozoan parasite, *Glugea stephani*, was detected in dab and plaice, but the incidence was much lower than in the B.c.p. There was no difference in prevalence of liver tumours in the three dab populations (2.6%). As in the case in the B.c.p., an increase of skeletal deformities and a decrease of lymphocystis was found for dab. Finally epidermal papilloma was present in the three different dab populations.

Denmark (I. Dalsgaard)

In the German Bight, the prevalence of lymphocystis and epidermal papillomas in 1990 decreased from the levels of 1989, while the situation along the Danish west coast was unchanged. In the Skagerrak, the prevalence of lymphocystis showed an increasing trend. In the southern Kattegat, where oxygen deficiency still is a problem a minor decrease in the disease rate was observed from 1989 to 1990.

Germany (T. Lang , K. Anders, H. Möller)

As in previous years the German activities focused on diseases and parasites of free-living fish species from the North Sea and Baltic Sea. The results obtained concerning the well-known diseases revealed no significantly new trends.

A study on the spatial distribution of lipomas of North Sea dab yielded maximum prevalences and intensities at stations off the Scottish coast.

In May 1990, the prevalence of liver spots/nodules/tumours of North Sea dab was found to have decreased considerably compared to data derived from previous studies. In contrast to North Sea flatfish, dab and flounder inhabiting the western Baltic Sea seem to be much less affected by liver anomalies. Histological

investigation, at least of the small nodules, is needed to distinguish between neoplastic and other lesions. Data on the occurrence and spatial distribution of different whiting parasites have been compiled.

A tagging experiment with dab from the German Bight gave evidence for the ability of dab to undertake considerable migrations. This factor should be considered when evaluating disease data from different regions.

In 1988 and 1989, the occurrence of external diseases in fish from the German part of the Wadden Sea was quantified. Thirty-two stations, located along seven transects including four estuaries, were sampled with shrimp trawlers monthly or at 3-month intervals. Of more than 100.000 12+cm long fish of the seven dominating species, 6% were diseased. In fish species which complete their life cycle in the Wadden Sea (gobies, hooknose, eelpout, sea scorpion) the total disease prevalence was below 0.4%. In whiting, plaice and sole it was between 0.5 and 2.5%. Smelt, cod, eel, dab and flounder suffered for 6-8% from external lesions. An additional 29% of smelt suffered from granulomatosis in the buccal cavity. The prevalence of most diseases increased with increasing fish length. Most disease types occurred all year round. The most prominent seasonality was observed in yellow pest of cod with a maximum in winter and in papillomatosis of smelt with a maximum during the spawning season of the host. Similar geographical patterns in the prevalence were observed for (1) two types of skeletal deformities (smelt: shortening of opercula; cod: spinal compression); (2) lymphocystis in dab and flounder; (3) papillomatosis in smelt; and dab, and (4) for several infectious ulcerative diseases. Most of the ulcerative diseases of cod and flounder occurred with highest prevalences on central estuarine stations, suggesting an impact of the relatively low, or highly variable salinity on disease development. Buccal granulomatosis of smelt and papillomatosis of eel showed the highest prevalence in the Elbe estuary as the most heavily polluted region of the Wadden Sea. A causal relationship between disease development and pollution, however, is not yet clear and would need experimental evidence. The disease types found are ranked into three priority groups regarding their indicator value for a pollution effect monitoring on the basis of fish diseases.

There is evidence that the total disease prevalence of fish in the Wadden Sea is higher than in other shallow coastal regions outside the North Sea. Little is known on the effect of these diseases on single fish and fish populations.

Two disease conditions were recorded for the first time during this survey. These were: (1) yellow pest of cod which occurred with a prevalence of up to 14% in single estuarine samples. It causes the most serious lesions and is supposed to be lethal; (2) a conspicious yellow skin tumour of hooknose was found associated with lentivirus-like particles in the tumour tissue. In total, however, the effects of a number of pathogenic parasites on fish survival is considered to be more serious than that of deformities and infectious diseases.

Finland (G. Bylund)

The field sampling activities were mainly focused on flounder. As in previous years the prevalences of skin ulcers and liver tumours/nodules are currently high (5.2 and 2.6%, respectively). Experimental works in order to evaluate the aetiological significance of an atypical *Aeromonas salmonicida* isolated from ulcerated flounders are in progress.

New experimental works were initiated in order to evaluate the effects of pulp mill effluents on fish health.

France (F. Baudin-Laurencin)

The only pathological problem observed in fin fish was in sea trout caught in two estuaries in the south-west area of France. In June-July, post-mortem flesh liquefactions appeared in about 50% of the fish (upon a catch of about 4 tons in summer - and totally 8 tons during the fishing period). Many areas are concerned: English Channel, Iroise sea, bay of Biskay, off Scotland). The parasite can be found thoughout the year but the pathogenicity appears only in winter.

An *Hematodiuium* sp. was identified as the pathogen responsible for mortalities in crab (*Cancer parurus, Liocarcinus puber*) which have occurred since 1986.

Netherlands (P. van Banning)

Recordings of selected diseases of marine wild fish for base-line data were carried out in connection with the general stock assessment surveys in the south-east part of the North Sea (coastal waters of the Netherlands, Germany and Denmark). A total number of 2775 dabs (*Limanda limanda*), 3431 plaice (*Peuronectes platessa*) and 248 cods (*Gadus morhua*) were examined for grossly visible anomalies and diseases. A comparison with the data from the foregoing year (1989) shows an increasing trend for the prevalences of *Glugea* sp. infection and the liver nodules. A decreasing trend was noticed for the lymphocystis and papilloma diseases.

Norway (B. Hjeltnes)

Furunculosis has spread to the wild stock of Atlantic salmon and is registered in some Norwegian rivers.

BKD has been diagnosed in one wild salmon.

IPNV was detected at low prevalences in Atlantic salmon in some rivers.

Gyrodactylus salaris has spread to two rivers. The parasite has been detected in 34 rivers. According to a four-year plan twenty rivers are to be treated with rotenone. Of the thirteen rivers already treated two are now regarded free of the parasite.

Sweden (J. Thulin; J. Höglund)

The non-indigenous parasites *Auguillicola* sp. and *Pseudodactylogyrus* sp. have been found in Baltic eel from the thermal discharge areas of Oskarshamn and Forsmark nuclear power stations, the latter being the northernmost locality reported. Although *Anguillicola*-infected silver eels have been recorded from localities north, in between and south of these localities yellow eels were uninfected. The thermal discharge areas might serve as the transmission foci of the parasite.
The projects concerning diseases and parasites of fish in the Bothnian Bay, of fish in a thermal discharge area as well as the monitoring of ulcers and skeletal deformities of cod in the Baltic continue. The 1990 results were similar to those of last year.

United Kingdom

a) England and Wales (D. Bucke)

The programme for monitoring wild stocks of fish has continued, using programmed cruises on MAFF's research vessels. The emphasis for monitoring has been to concentrate on the stations designated by the North Sea Task Force and, as far as possible, to use the methodologies recommended by ICES. Three cruises were used for fish disease investigations and a total of 8000 dab were examined from : (1) north-east coast waste disposal sites (April); (2) North Sea groundfish survey (August-September); (3) the Channel and south-west North Sea (October). Results of disease prevalences in dab from programmes 1 and 2 were very similar to previous years. For programme 3, stations in the Channel and south-west North Sea (apart from those in ICES Rectangle 30FO) were not suitable for disease monitoring because of an absence of dab at the time of sampling. Disease prevalences for dab sampled in ICES rectangle 30FO were low (<2%) by North Sea standards. Attention was given to other anomalies in dab and other fish species. Dab showing marked degrees of "green pigmentation" of the epidermis were present at up to 10.8% prevalence on some stations in the southern North Sea. No aetiology has been diagnosed. Hypodermal lipoma of dab was of low prevalence and restricted to stations in the northern North Sea. Vertebral compression in haddock was recorded off the north-east coast of England. Visceral granulomatosis in cod was again restricted to the

south-western North Sea (low prevalence in fish >50 cm length). Dermal necrosis of cod continues to be present at a low level in an area of the north-east coast of England. The aetiology of this disease has not been resolved.

Reduced catches of sea trout have been reported during the year, especially off the west coasts of England and Wales. No investigations for a disease aetiology have been made.

A research project into "stress" in dab, by measuring and quantifying haemosiderin in splenic melanomacrophage centres from samples collected from over 60 stations in the North Sea, has been investigated.

b) Scotland (A. McVicar)

A research vessel survey of the Firth of Forth sewage dump sites, adjacent reference areas and a distal reference area showed no significant difference in disease levels of common dab and haddock. Comparison of standardised data for four years from the same sites showed that year to year variation in disease prevalence can be large. Significantly lower prevalences of Zoogonoides in the close vicinity to the Clyde sewage dump site in comparison to more distal areas may have a basis in the reduced survival of the free living cercaria in dilute sewage. Monthly sampling of common dab disease levels on a Forth sewage dump site showed marked temporal and spatial variations with no correlation to sewage input. The spatial distribution of X-cell in dab gills in the Moray Firth sampling area showed high but consistant variation over short distances. This complex distribution was shown to be most associated with a particular depth of water (10-20 m).

No significant new diseases or disease trends were observed in Scottish waters.

ANNEX 4

SYNOPSES OF NATIONAL REPORTS ON DISEASE STATUS IN MARICULTURE

a) FIN FISH

Canada (G. Olivier)

Vibrio salmonicida, the causative agent of "Hitra Disease" or cold-water vibriosis has been identified in Atlantic salmon (Salmo salar) for the second time in North America, but this time in the province of Nova Scotia. The disease only affected one farm wich experienced chronic low level mortalities in April and May 1990. On the east coast, furunculosis has spread to three cage sites following the outbreaks of 1989. For the first time there may have been a case of transmission of furunculosis in the sea between two cage sites. BKD and Vibriosis continue to be problematic as well as cold sore diseases (*Flexibacter* sp.) in winter.

On the west coast, infectious pancreatic necrosis virus (IPNV) isolated for the first time from Atlantic salmon in British Columbia was found to be non pathogenic. BKD remains the number one concern of the west coast industry. A survey funded by the British Columbia Ministry of Agriculture and Fisheries was initiated in the winter of 1989-90, results of this survey, carried out on 30% of the farms, indicate that 70% of the winter mortalities were due to BKD. Preliminary results of a second survey carried out in the fall of 1990 shows that BKD accounted for 59% of moribund chinook salmon and 42% of Atlantic salmon. During these surveys the investigators noted a significant increase of BKD infection in Atlantic salmon. Also of concern on the west coast are; marine anaemia, vibriosis, furunculosis, *Loma salmonae* infection of the gills and infections of the flesh by *Kudoa*.

Denmark (I. Dalsgaard)

The most serious disease problem in Danish marine fish farming was VHS infections in 43% of the farms. The mortality varied between 10% and 30%.

The fish stocks of 80% of the fish farms had been vaccinated against vibriosis, furunculosis and ERM, but outbreaks of vibriosis and furunculosis were observed in the vaccinated stocks. Only Vibrio anguillarum serotype O1 was isolated from vibriosis outbreaks.

Problems with sea-lice (*Caligus* sp.) were observed for the first time in Denmark at two marine rainbow trout sites.

Finland (G. Bylund)

The most important problem is the rapid spread of furunculosis in the sea farming area. Also IPN infections are rapidly increasing but clinical disease in the fish (rainbow trout) has never been observed. Another significant problem is the increasing occurence of vibriosis in vaccinated fish. One new case of BKD was recorded.

A research program on drug kinetics in rainbow trout was finished and includes works on drug residues in wild fish and persistence of antibacterial drugs in fish farm sediments.

France (F. Baudin-Laurencin)

On the Atlantic coast, the situation in 1990 was not very different from that observed in 1989, particularly the data concerning Vibriosis and sealice. Pancreas disease appeared again, and high mortality was observed. In two cases IPN virus was found before the PD lesions were noted. *A. salmonicida* was for the first time reported in turbot. A new bacteriosis (with *Serratia liquefaciens*) was the cause of a chronic mortality and nodular granulomatous lesions in 1 kg turbots.

Picorna-like virus which is increasingly involved in pathological problems in Mediterranean farmed sea-bass and was the cause of a high mortality in a sea bass hatchery on the Atlantic Coast.

Although it was not observed on the Atlantic Coast, Pasteurellosis (*P. piscicida*) is an epidemic disease which has appeared for the first time in all the sea bass farms, and subsequently in wild fish, of the Mediterranean.

Germany (T. Lang)

Due to the low significance of mariculture in the former area of the Federal Republic there is no real new developments to report.

Unfortunately, there is also no information available at present on disease problems of rainbow trout (*Oncorhynchus mykiss*) cultivated in the Baltic Sea in the territory of the former German Democratic Republic.

Ireland (J. McArdle)

Pancreas disease is the most serious disease problem in farmed Atlantic salmon in Ireland: very high mortalities occurred on two farms. Sporadic autbreaks of furunculosis occurred in farmed Atlantic salmon. A vibriosis-type condition caused serious losses on a number of salmon farms but it is not clear if the vibrios isolated were primary pathogens or secondary invaders. Vaccination appeared to give good protection but antibiotics were not very effective against this problem. Erythrocytic Inclusion Body Syndrome (EIBS) was observed at 23 marine salmon farms but it's significance is not clear. A number of new disease agents were detected in farmed salmon including larval stages of gnathids, microsporidean parasites and a Dermocystidium-like agent

Norway (B. Hjeltnes)

Furunculosis is the main bacterial problem in cultivation of Atlantic salmon. The disease is still spreading and 395 farms are registered as infected. Furunculosis is now endemic from Rogaland to Nordland. There have been a slight increase in salmon farms infected with BKD.

Infectious Salmon Anemia (ISA) was diagnosed in 97 farms (1989: 64 farms). All attempts to cultivate the causative agent have so far given negative results. EIBS was detected on Atlantic salmon in 48 farms. Salmon lice is still the major parasite problem in farming of Atlantic salmon. The cardiomyopathic syndrome (CMS) and Pancreas Disease (PD) have become serious problems in cultured Atlantic salmon. PD and IPN is probably the main cause of mortalities of smolts after transfer to sea.

So far, vibriosis has been the most serious bacterial disease in other farmed marine fish, causing yearly losses up to 50 % of the total production of cod and turbot fry. Infectious Pancreatic Necrosis Virus has in 1989 and in 1990 been isolated from moribund, farmed Norwegian turbot and halibut. Atypical furunculosis was diagnosed in turbot.

Sweden (J. Thulin, J. Höglund)

The disease situation in farmed fish is very similar to that of last year with the exception of furunculosis where the number of outbreaks has been doubled.

United Kingdom

i) England & Wales (D. Bucke)

There is little marine fish farming activity in England and Wales : no significal disease problems have occurred.

ii) Scotland (A.H. McVicar)

A significant decline in the rate of growth of the farming of Atlantic salmon was recorded in 1990 partly attibutable to decreased survival of fish in sea water, earlier harvesting to avoid loss of stocks due to disease, and to a loss of confidence in the industry due to inability to control disease. Furunculosis and lice continue to pose the greatest problems both causing significant mortality and difficulty in treating. A new vaccine against furunculosis is being developed and is at the stage of field evaluation. Pancreas Disease has been less severe than in previous years, but has caused problems in some areas particularly in association with other diseases (IPN, furunculosis). Fading smolt syndrome has caused losses up to 25% in Shetland, but the cause of the condition has not been determined.

b) SHELLFISH

Canada (S. McGladdery)

Molluscs

Pacific coast of Canada (S.M. Bower): There were no significant changes in the disease status of Pacific bivalves. Observations of note were: a haplosporidian in the connective tissue of 70% mussels from one location off Vancouver Island; a *Pseudoklossia*-like eucoccidian in *Protothaca staminea*; a banana-shaped eucoccidian in *P. staminea*; (and *Tapes philippinarum* = first observation) and the parasitic copepod, *Herrmanella* sp. on *P. staminea*.

Atlantic coast of Canada (S.E. McGladdery): There were no significant changes in the disease status of east coast bivalves. Observations of note were: hemic neoplasia found in mussels for the first time (no associated mortality); chronic heavy mortalities and reduced post-processing survival of mussels from certain locations (cause yet to be established). Losses were commercially significant.

France (E. Miahle)

Molluscs

Ostrea edulis/Bonamia ostreae

Bonamiasis continues to represent the chief limitation on flat oyster production. Progress in terms of disease management, despite the availablility of several diagnostic methods is relatively slow.

Results from recent bonamiasis study, clearly demonstrate that the parasite can not be detected by classical diagnostic methods during the first weeks or months whatever the infection doses. Alternative methods, such as PCR, would become useful for high sensitive diagnostic.

In addition, controlled experimental infections have enable establishment of 50% ID (infections dose) figures. Thus, it is now possible to objectively compare disease sensitivity between different oyster populations.

Attempts to select *Bonamia*-resistant oysters, show a significant decrease in susceptibility to the parasite in F1 oysters (from "naturally-resistant" old oysters and from oysters inoculated by purified parasite, "resistant" strains of oysters should be compared with oysters from eradication experiments in terms of short-term and long-term resistance.

Ostrea edulis/*Marteilia refringens*

No significant or new data about marteiliasis, which continues to be a problem in several areas. Results acquired with *Bonamia* suggest that it could be interesting to initiate similar investigation into *Marteilia* resistance.

T. philippinarum/brown ring disease (Vibrio)

Antibiotic treatments appeared relatively efficient for preventing this disease, since significant decreases in prevalence were observed in 1990. Specific monoclonal antibodies for Vibrio P1 were prepared in order to perform an epidemiological survey by direct identification of Vibrio P colonies blotted on Whatman paper.

Crassostrea gigas/ ?

Some abnormal mortalities were observed in some hatcheries, but no pathogen has yet been observed.

Tapes decussatus (wild stocks)/*Perkinsus atlanticus*

Some populations were found with high prevalence of *Perkinsus atlanticus*.

Pecten maximus/Gill-Rickettsiale

Very high prevalences and infections were observed in several wild and hatchery-produced scallop stocks.

Ireland (J. McArdle)

Molluscs

Bonamia ostreae remains the only significant disease of bivalve molluscs in Ireland. No new outbreaks of disease occurred in 1990.

Nematopsis sp. was detected in cockles (*C. edule*) for the first time.

Crustaceans

No diseases reported.

Netherlands (P. van Banning)

Molluscs

The protozoan parasite *Bonamia ostreae* has spread further in the stock of the European flat oyster *Ostrea edulis* in Lake Grevelingen in the Netherlands. Only the oysters of the most eastern point of the Grevelingen were found to be free of bonamiasis.

In spring 1990, the prevalences of bonamiasis were in the stock of wild oysters in the order of 4-24% and in the areas with oyster culture in the order of 16-24%. Based on fresh empty shells, the estimates of moralities reached in spring the orders of 2-40% and 25-44%, respectively.

At the end of May 1990 a sharp increase of oyster mortality was observed, which was not in the expectation calculated from the prevalences of bonamisasis of dead oysters reached within 2 weeks the order of 80-97% for the whole oyster stock of the Grevelingen. Based on different biological impressions (e.g. discoloration of sediments, absence of fish and algae), it was concluded that a disturbed environmental factor (probably oxygen depletion) was involved. The combination of bonamiasis and the environmental disorder has reduced the stock of oysters in the Grevelingen to such a point that the experimental research programme for bonamiasis must stop by lack of oysters. The situation in Lake Grevelingen is considered as serious for the commercial possibilities of the Dutch oyster production in the coming years.

United Kingdom (D. Bucke)

Molluscs

Bonamia continues to be present in native stocks of oysters on many relaying sites in southern England. Where MAFF guidelines are adopted, the on-growing of clean stock on infected sites for one season to fatten has been possible without clinical losses.

Crustacea

Gaffkaemia was confirmed in native stocks of lobsters on a holding site on the north coast of Wales. The case was tentatively linked to imports of North American lobsters and no evidence of infection in wild stocks in the vicinity was detected. The site was cleared and holding facilities disinfected. There were no other apparent disease problems in shellfish stocks in England and Wales.

ANNEX 5

ANALYSIS OF PROGRESS WITH TASKS

1. Tasks completed

i) WGPDMO Glossary of Pathology

Final draft has been sent to the Chairman of the EIFAC/ICES Study Group for terms to be incorporated into the enlarged EIFAC/ICES "Glossary on Biological and Technical Terms Relevant to Aquaculture".

ii) Examination and report on health status of sea trout stocks

Available data appraised and conclusions presented in this report (see **4.5**).

iii) Review of current and historical data on lethal diseases of wild marine fish

Overview papers prepared as intersessional tasks, considered at WG meeting in Ostend and conclusions reached and recommendations made (see **4.6**).

2. Tasks to be continued

i) Statistical analysis of data on disease prevalence rates in marine fish stocks

To be progressed at ICES HQ during **next WGPDMO meeting** (proposed for March 1992).

ii) Updating of disease aspects of the ICES Code of Practice on Introductions and Transfers

Review of current molluscan disease control measures to be completed and proposals for amending the mollusc sections of the Code to be formulated as an **immediate intersessional task** by correspondence and final proposals to be sent to WGITMO in time for their meeting in **July**.

iii) Training Guide for marine fish disease surveys

Training Guide in final stage of preparation is to be completed **(intersessional task 1991)** for submission by Chairman of WGPDMO to ACMP for consideration at its meeting as a possible ICES publication.

iv) Video to accompany Training Guide

Proposals on how such a video might be produced to be compiled **(intersessional task 1991)** and considered **(WG meeting 1992)** with the aim of reaching a decision on whether to pursue this project.

v) Diagnostic fiches Nos.51-60

These are to be drafted **(intersessional task 1991)** and approved **(WG meeting 1992)** for editor to submit for publication.

3. Tasks on which progress has not been made

Describe distribution of parasites and diseases harmful to Atlantic salmon in NASCO's N.E. Atlantic Commission and W. Greenland Commission areas

Needs for this requested task insufficiently clear. Refer back to NASCO for clarification.

4. New tasks

i) Disease interactions between wild and farmed fish

Compile (**intersessional task 1991**) and evaluate (**WG meeting 1992**) the information requested from ICES member countries on evidence for disease interactions between wild and farmed fish populations in order to assess whether there is evidence for farm diseases impacting on wild fish stocks.

ii) Update of fish disease elements of Code of Practice on introductions, etc

Compile (**intersessional task 1991**) data on current diagnostic and control measures for fish diseases in ICES countries outside the EC and, together with information on the new EC requirements, conduct a review (**WG meeting 1992**) of the fish disease elements of the Code of Practice and submit recommendations to WGITMO.