International Council for
the Exploration of the Sea

C.M. 1988/F:37
Session S

Report of the ICES Working Group on Pathology and Diseases of Marine Organisms

edited by

Emmy Egidius
Institute of Marine Research
Bergen - Norway

Secretary General of ICES
Palaegade 2-4
DK 1261 Copenhagen K
Denmark

I. INTRODUCTION

The 1988 meeting of the W.G. ON PATHOLOGY AND DISEASES OF MARINE ORGANISMS chaired by dr. E. Egidius was held at the Hanasaari Cultur Center 7 km west of Helsinki from March 23rd through March 25th. The terms of reference for the meeting are listed as Annex 2.

The chairman welcomed the participants and especially the new W.G. members from Spain. The local host and organizer of the meeting, dr. G. Bylund, wished the participants a special welcome to Finland and gave a short introduction to the Hanasaari Culture Center.

II. WORKING GROUP BUSINESS

The draft agenda was adopted with several additions and two rapporteurs were appointed for each session. The chairman reported from the 75th statutory meeting of ICES held in Santander, Spain in October 1987 with special reference to forthcoming meetings in the ICES system of interest to the WG. These are: At the 77th statutory meeting in Bergen, Norway, October 1988: theme sessions on MEDICATION IN MARICULTURE and on DEATH IN THE SEA: A PERSPECTIVE, the latter in the form of a poster session; and a minisymposium titled: CASE HISTORIES OF THE EFFECTS OF INTRODUCTIONS AND TRANSFERS ON AQUATIC RESOURCES AND ECOSYSTEMS. The 1988 Statutory meeting will be preceeded by a SYMPOSIUM ON THE EARLY LIFE HISTORY OF FISH from October 3rd to 5th. The chairman also drew the attention to the ICES Publication the JOURNAL DU CONCEIL that is now being planned published at a rate of 4 issues per year. The cycle from submitting a paper to eventual publication of the same on average takes one year. The Journal du Conceil welcomes manuscripts on all ICES relevant fields. The election of a new chairman from 1990 was also discussed.

III. ADVICE TO SACSA

Paralell to the WG meeting a convention of SACSA (Standing Advisory Committee for Scientific Advice) took place at the Hanasaari Center; discussing methods for the prevention of marine pollution by dumping from ships and aircrafts. In this context a contribution on FISH DISEASE IN THE NORTH SEA IN RELATION TO SEWAGE SLUDGE DUMPING by A.H. McVicar and coworkers was discussed by SACSA. The WG was asked for their opinion on the paper which then was

shortly discussed. Studying two pairs of dump sites/reference sites, relatively lower disease prevalences were found in dab from both dump sites. In the paper the authors pointed out that such results from field studies should be treated with caution, as there is insufficient information currently avaiable on the natural distribution of diseases even in areas in close proximity to each other, and on factors influencing hosts. The W.G. agreed to this view.

IV. NATIONAL DISEASE REPORTS

Summary formats of national disease reports presented are listed in Annex 5. In addition reports from Belgium and Poland were received and are also listed in Annex 5.

Highlights of national reports:

CANADA

In Canadian mariculture bacterial kidney disease is the disease of greatest concern in the culture of salmonids both at the east and the west coast. Monitoring of brood fish reproductive fluids and destruction of eggs from positive parents appears to be effective in controlling the disease on the Atlantic coast. Furunculosis impacts most heavily on fish in fresh water culture in the Maritime provinces, the disease is easily transmitted to marine cage sites at the time of smolt transfers. Testing for clinical disease and carrier testing by corticosteroid treatment is carried through for all smolt going to sea cages.

Gaffkemia, the bacterial blood disease of lobsters, continues to be the most important disease causing losses in commercial lobster holding facilities in the Maritime provinces. At present no regulations or policies exist to control the spread of the disease via live lobster movements.

The majority of the wild samples listed represent isolated incidents where a disease agent has been identified but the presence of the agent did not cause mortality.

Considerable effort has been devoted to parasite surveys, particularly for Pseudoterranova decipiens. Even so if there is little evidence that these infestations cause or may cause mortalities, the surveys are listed in the annex.

Canada also reported intoxications following consumptiuon by mussels in November affecting about 150 consumers of which 2 died

and about 12 were severely affected. Domoic acid was identified as the causative agent, a substance which previously had been isolated from algae such as Chondria and Polysiphonia. It is suggested that the impact of domoic acid depends upon its remaining in humans for extended periods with special effects on those suffering from renal and hepatic defects.

DENMARK

The Danish report indicated no special disease problems in mariculture on the mainland, but severe mortalities due to koldwater vibriosis in mariculture at the Faroe Islands were reported.

Among wild fish, locally restricted mass mortalities of eelpout (Zoarces viviparus) were observed leading to complete extinction of the species in the affected locallities. The fish revealed intensive skin haemorrhagies and ulcerations. Bacterial examination showed pure cultures of an atypical Aeromonas salmonicida strain.

Disease rates of dab in areas with oxygen deficiency show an increasing tendency. The disease frequencies in the Eastern North Sea which suffered from oxygen deficency in 1981-1982 on the other hand showed decreasing disease levelse from 1985 and on.
No explanation could be given for the occurrence of unusually yellowish flesh of plaice caught in the Skagerak. It is speculated that unusual feeding behavior may induce this condition which reduces the market value of the affected fish.

FINLAND

In Finland a new 5 year survey on diseases of coastal fish was initiated in 1987. Most attention will be focused on disease conditions of flounder, but 6 to 8 other fish species will also be sampled. In addition to observations for external conditions, a considerable part of the fish are subsject to macroscopical observations for internal lesions and disease symptoms. Bacteriological as well as virological tests are performed when systemic infections are indicated

A peculiar fin condition was recorded at high prevalences (11%) in pike-pearch in the Helsinki area. In affected fish one or even several fins are complitely absent. Most frequently however, segments of the fins are completely missing, a condition indicating that the lession originates from a very early developmental stage of the fish.

The high prevalence of lymphocystis in Baltic herring reported last year persists. In this fish species the infection occurrs at high

prevalence in the flesh and in all visceral organs.

In Finish mariculture vibriosis again is the greatest problem. For yet unknown reasons, vibriosis occurred rather frequently in vaccinated fish even though the water temperature was lower than normal last summer.

FRANCE

No studies on wild populations were carried out in France during 1987. The problem of nematode larval infections special in mackerel is a question of great concern.

A new strain of Vibrio anguillarum from sea bass was identified and this strain also was shown to be pathogenic to rainbow trout. Cataract problems were found in rainbow trout and in Atlantic salmon but no clear histopathology could be defined. Possible causes of the condition could be disturbance of protein composition, food composition and stress conditions due to transportation and/or overoxygenation of the water. Cataracts in sea bass were experimentally induced by adding thioacetamide to the food which also resulted in liver tumours.

In mollusc culture Bonamia persists. The deepwater culture in reduced densities of the European oyster in the Cancale region seems successful even if the parasite is present in the environment. An immunodiagnostic for Bonamia ostrea will be commercialized in the second half of 1988.

Abnormal mortality rates have been noted in Ruditapes philippinarum in the Aber region. It has not been possible to find any infectious cause of the mortalities and possible pollution problems are now being investigated.

An in vitro model of B. ostrea in blood cells of Ostrea edulis and Crassotrea gigas is now working and a compared immunology study with the two species has started.

The crustacean parasite Mytilicola intestinalis now is present in most of the larger mussel growing centra. A bath treatment against the parasite is under trial. Experiments show a significant difference in the growth of mussels that have been treated against the parasite and those who have not.

Richettsial infections have been found in different clam species (Pecten maximus, Chlamys opercularis). In certain sites in Britanny Pecten maximum shows a 100% infection by this pathogen. During winter 86/87 a 40% moprtality was reported. Work on the role of

this organism in the mortality is in progress.

WEST GERMANY

The FGD report presented the results of 7 years surveys on prevalences of lymphocystis, epidermal papilloma/hyperplasia and ulcerations in dab in the German Bight and the Southern North Sea. Disease frequencies were found to be elevated within the center of the German Bight, off the British coast, on the Dogger bank and partly in Danish coastal areas. Long-term data did not reveal any clear overall up- or downwards trends in disease prevalence. Only spring/early summer data on lymphocystis and epidermal papilloma indicate increasing frequencies during the last 7 years on the Dogger bank and in the vicinity of the dumping area for titaniumdioxide wastes within the German Bight.

Further a study on the relationship between oxygen deficiency and the occurrence of diseases in dab in the Eastern North Sea was reported. This area is known for the occurrence of serious ogygen deficiency situations particularely in hot and calm summers. Similar to data derived from Danish studies, the results indicate that decreased oxygen levels in bottom-near water subsequently seems to induce increased prevalences of lymphocystis, ulcerations and epidermal papilloma in dab of this area.

During a study on the biology of two microsporidian parasite species in smelt it was found that an infection of the skeletal muscle with Pleistophora ladogensis is connected with a lowered condition factor in the host fish. Together with former reports on lowered condition factors in cod and flounder due to infections with Lernaeocera branchialis and in smelt with Pseudoterranova decipiens, there now are several examples from the Elbe estuary that fish hosts are not adapted to, but suffer seriously from their parasites. It is assumed that some of such parasite species have strong effects on the natural mortality of their hosts.

Also in the FGD concern is expressed about the further spreading of Anguillicola crassus, a recently introduced nematode living in the swinbladder of the eel. Preliminary results indicate a high pathogenicity of the parasite. In Elbe-eel the prevalence was found to be 54% during autumn 1987.

A television report on the occurrence of nematodes in fish flesh in July 1987 induced one of the most serious crises in the German fishing industry with the fish consumption being reduced for more than 50% during several month, although the problem is known since 1582!

During a cruise in December it was found that 32.5% of herring between 20 and 27 cm total length caught in ICES subdivisons 22 and 24 (west of Bornholm) were infected with Anisakis larvae, whereas only 1.3% were infested in ICES subdivisions 25 and 26 (east of Bornholm). Infestation rate and intensity both were length dependent.

During a 3 year program starting in April 1988, regional differences in nematode burden in sea fish, its possible relation to the stock size of seals and the resistence of nematodes from different hosts and areas to freezing will be studied. Another 3 year program on "Fish diseases in the Wadden Sea" was started in December, involving working groups from several institutes in northern Germany. The aim of this program is to evaluate the possibility for establishing a stress-effect monitoring program based on fish diseases in a large sense (externally visible disease symptoms, liver abnormalities, lysosyme stability test in relation to contaminant burden, mixed-function oxidases etc.)

IRLAND

The most important feature in the Irish report was the detection of Bonamia in oysters in Cork harbour early in 1987. Mortalities were highest in market size 4 year old oysters, estimated to be about 90%. The parasite later also was found in several sites in the Clew Bay area in western Ireland, but here no mortalities were reported.

THE NETHERLANDS

The Dutch surveys on diseases of dab, flounder and cod included in standard stock assesment surveys were carried on in early spring and early autumn this being the 6th annual survey in a series over 10 years.

In another Dutch study on the flatfish species flounder, dab and plaice the results support those of previous field studies in the 1983-86 period. The evidence clearly suggest that a relationship exists between several diseases of flounder (lymphocystis, ulcers, fin erosion and liver tumours) and pollution, whereas disease levels in dab and plaice did not show such a trend.

In August another disease problem was discovered in the south-west area of the Wadden Sea. 50% of flounder from a location were the lake Ijsel flows into the Wadden Sea were found to be afflicted with skin ulcers resembling those seen in vibriosis infections. The fish had an extremely poor condition and the disease evidently resulted in high mortalities. Various bacteria including Vibrio sp. were

isolated from the blood of the diseased fish. At present the theory is that in addition to salinity stress and pollution factors the coincidence of cyanoalgae blooms may play a significant part in the development of the disease.

With regard to Bonamia in oyster areas at the Yerseke bank still one infected specimen was found. New experimental oyster plantings in the area for challenge tests are sheduled for 1988.

The swimbladder nematode (Anguillicola crassa) in eel has given incresed mortaslity levels in cultured eels. Inflammations of the swimbladder of eel due to the presence of the parasite are observed both in fresh and sea water.

NORWAY

In Norway farming of salmonids has become a most important industry , unfortunately with diseases still as its main problem. Again in 1987 cold-water vibriosis was the economically most important disease in the farming industry. A vaccine against the disease is on large scale trial and sofar the results are very promising with an average of 93% protection.

In spite of drastic measurements to combat the disease, furunculosis is still present at 11 sites in the region were it was imported with smolts from Scotland in 1985.

Yersinosis has spread along the whole coast and appears both in fresh and sea water farms.

Several new diseases in salmonid farming have been reported. Infectious animia (I.A.) in Atlantic salmon has been known for several years. The symptoms of the disease are often much like the ones seen in cold-water vibriosis, that is extended hemorraghes in internal organs, in other cases there are no symptoms at all. Histologically the liver is most affected with hemorraghes and necrosis. The disease seemingly is of infectious nature as it has occurred in smolts after sea water transfer from sites were it was known in the broodstock. Most probably the infection is of viral origin.

SPAIN

Spain reports a dramatic decrease in the culture of flat oysters the last few years. The main cause is Bonamia wich is present in Gallician waters and give cumulative mortalities of 50% by the end of the second year. There are few areas left with native flat

oysters and the main activity is based on the importation of flat oysters from all over Europe.

In the most valuable clam species for culture, Venerupis decussata, two protozoan diseases have been detected. The one is due to a Perkinsus-like organism and was found in clams imported from Portugal, the other is a Haplosporidian found in native V. decussata.

In fish culture vibriosis is a problem in rainbow trout and turbot. Bacterial kidney disease has been islolated for the first time in Spain.

SWEDEN

In Sweden a study was made on the occurrence of Anisakis in fresh Baltic herring caught for human consumption. A prevalence of 0.9% was found in the gut area. In an examination of 1380 filets no Anisakis were found. Compared with earlier findings of infection levels of 80% in herring from the northern part of the Swedish west coast, the prevalence in the Baltic was very low.

The swimbladder nematode (Anguillicola sp.) in eel was found for the first time in Sweden in 1987.

In the Ringhals-Värø area, an area affected by thermal discharges from the Ringhals nuclear power plant and by effluents from the Värø pulp mill, vertebral compression (platyspondyli) was found in cod. 7.6% of cod showed the condition in the Ringhals-Värø area, whereas only 1.6% was found 15 km ofshore. During surveys in 1982-85 only 0.1% were found of the same condition. The origin of the high insidence of platyspondyli is not known.

In mariculture vibriosis still is the most important disease. Furthermore IPN was found in 2, BKD in 13 and furubculosis in 6 farms.

UNITED KINGDOM

The United Kingdom report for England and Wales reported two specific investigations into the prevalence of disease in North Sea fish stocks. The first was on dab in the Humber/Dogger bank area in January. Prevalences of epidermal diseases were similar to those reported by other workers. 200 liver samples were examined histologiocally for pathological changes and for PCBs. Histology revealed 12.5% prevalence of hyperchromic nodules in the livers. These nodules were diagnosed mainly as hepatic hyperplasias, pre-neoplastic lesions and occasional hepatomas. Chemical analysis of

livers for PCBs indicated levels were well within normal limits for the north coast area.

The second investigation involved a disease specialist taking part in an annual North Sea groundfish stock assessment survey during August/September. In this survey 77 stations spread over the whole North Sea up to 62 N were trawled for fish. Statistically viable numbers of diseases were only recorded in dab, which were by fare the most common fish of the 57 species caught. Epidermal diseases, especially ulcers, were recorded at highest prevalences in the Firth of Forth, Humber and on the Dogger bank, where total catches also were highest of this species. Many of these skin diseases showed evidence of healing, thus demonstrating there transient nature. Histology of dab livers revealed low numbers of pathological changes. These included responses to nematode infestations, ichthyophonus and necrosis. In addition the all over combined prevalence of hepatic hyperplasia, pre-neoplastic lesions and hepatoma was less than 5%. Diseases in other fish species were not recorded quantitatively because of their low prevalence rate. The majority of fish appeared to be generally healthy.

Laboratory studies into the side-effects of contaminated sediments on fish have been commensed at FDL, Weymouth. The objective is to record uptake of contaminats and disease changes by chemical and pathological techniques, including measuring variations in the immuno-competence of fish held on heavy-contminated and less-contaminated sediments. Methodologies are being worked out. In addition to these studies, there is to be MAFF collaboration with the Dutch programme at the island of Texel.

Bonamia levels in the wild Ostrea edulis stocks in the River Fal in Cornwall have not increased. There is no evidence of the disease in other natural O. edulis stocks around England and Wales.

Scottish surveys show that ichthyophonus has a significant prevalence in haddock as has vertebral anomalies. In common dab lymphocystis and skin hyperplasia/papilloma were recorded in most ICES rectangles. For gill x-cells extreme variability in prevalence levels between closely adjacent areas was again apparent.

As already mentioned earlier in this report (Advice to SACSA) an intensive investigation of sewage dump areas off the Firth of Forth and closely adjacent control areas, disease levels in the common dab were significantly lower in the area receiving sludge continously over the previous 6 month in comparisoin to a rested dump area and the control areas

In salmon farming there have been a number of new occurrences of IPNV in sea sites in 1987, in most cases the origin of the infection is

uncertain. One case of clinical IPN was seen in salmon post smolts after one month in sea water. This is the first such case in Scotland. Furunculosis continues to be a major disease problem. Sites become infected either by movement of infected smolts from fresh water or by lateral transmission between sea sites. Antibiotic resistance is an increasing problem. Pancreas disease continues to increase in prevalence although its effects are very variable. BKD is present, to keep year-classes separated seems to be a possible manner in reducing the spread of the infection.

V. LEGISLATION ON FISH DISEASES IN MEMBER COUNTRIES

B. Hill presented an up-dated overview on data concerning the legislation in relation to imports of fish, molluscs and crustaceans in the ICES countries. The overview sofar did not give a complete picture. It became clear that some data were inaccurate and furthermore one main difficulty was that the legislation only tells what should be done, but not at all what is done. Smuggling of organisms and illegal culture seems to be practisised. Dr. Hill had prepared a questionaire which the members were asked to fill in and which hopefully will give more exact information for the next WG meeting. It was suggested that when the task was compiled it would be useful to have it published by ICES.

VI. STATUS ON DISEASE LEAFLETS

10 new disease leaflets were published in 1987 bringing the total number now published up to 40. 9 new leaflets are cleared for publication and are on its way through translation. The 10th leaflet for this packet will be ready within the end of May. Nearly 20 new titles and authors have been suggested for coming leaflets.

VII. DISEASE AVOIDANCE AND PREVENTION

J.E. Stewart reviewed this topic which is of the utmost importance for the aquaculture industry. Aquaculture practice in affluent countries has placed an emphasis on the need for identification of disease causing agents, the development of methods to treat these diseases and treat the diseases on the level of the individual. This approach or philosophy is very similar to the practice of medicine in relation to human health problems or with veterinary medcine concerned with large domestic animals: it is a very costly process.

Since aquaculture practice in both fresh and sea waters involves the mass rearing of animals and plants at one trophic level or another ranging from phytoplankton feeders to strict carnivores and in the plant field several different genera of seaweeds, it is probably wiser to consider methods of health care more suited to maintenance of a system rather than the needs of individuals. Good examples exist in the healt care principles followed in the poultry industries and in raising many plant crops. In both, the process begins with a careful development and selection of the particular genetic strain; this should at least be a hardy, rapid growing, efficient user of food, resistant to diseases and provide an attractive, saleable product. The area chosen for growth should match as closely as possible the environmental requirements of the animal or plant and should not contain undue challenges or disease threats. Care must be taken through the provision of disease free seed, vaccination, rigorous screening of introductions and where necesssary draconian methods of elimination to ensure that disease is avoided in the first place or can be kept in check.

Record keeping on all essential parameters is essential. This must include, for example, accurate inventories, environmental factors (eg. salinity, temperature, oxygen, turbidity, ammonia, etc.) food type and amount fed, growth rates, general and unusual treatments, measurements of condition factors, representative and regular disease screening and mortalities among others. If all of this data is plotted regularly via the use of the readily available and affordable Personal Computers using an appropriate program, the operator by comparision with standard data and his/hers own past records should be able to assess the health of the system and pinpoint any particular problem with accuracy. The disease screeening should be placed on a regular basis and should be used to provide warnings of impending problems rather than be aimed at individuals. Thus we recommend that the diagnostic tools and treatment should be the integrated evaluation of the system, good husbandery and good records used to avoid disease.

Accordingly research needs should be defined more broadly to ensure an integrated approach. At a minimum, these should include programs on:

1. Production genetics.

2. Development of preventive methods for disease.

3. Development of desirable environmental features information

4. Sensible list of parameters to be measured.

5. Development of condition factors such as haematological standards, skin appearance, blood enzymes etc

6. Computer programs specific to particular operations and adequate to provide integration of and evaluations and diagnosis of the system.

7. Presentation of the avaiable information as above for as many species as possible to ensure that disease avoidance and prevention is a central and key feature of any culture program.

The Working Group agreed that it would be necessary to further discuss this topic on its next meeting and eventually prepare a document describing mariculture approaches and concepts focused on avoidance and prevention of disease.

VIII. THE NEMATODE PROBLEM

A. McVicar reviewed this topic and stressed the importance of correct identification of nematode larvae and the means of detection used. Direct examination of filets will only reveal a small proportion of larvae compared to a pepsin digest method. Identification of larvae nematodes is difficult and specialist advice should be sought when necessary.

J. Stewart informed the WG about current developments using ultra-sound for the detection of larvae. This technique can detect virtually 100% of larvae present and the possibility of detection of larvae in live fish is at present being studied in Canada. Dr. Stewart also informed the group on the progress of the international seal worm workshop in Halifax, the second part of which will be held later this spring. The aim of the workshop is to produce an interim report and later a final report dealing with life cycles, industry implications and further work needed. Whilst there is a good deal known about some aspects of the life cycles there are still many gaps in our knowledge. Alternatives to culling of seals could involve attempts to control seal fertility, use of anthelmintics or immunological methods.

H. Moller proposed holding a ccolllquium dealing with the problems of nematodes in fish the two days prior to the WG meeting in 1989. He also outlined the commencement of a FRG 3 year study of this problem which will involve the co-operation of a number of FRG institutions and groups. The study will look at different worm species in the Wadden Sea area. The relationship between the

increase in the seal population and the increase in the worm burden in the area will also be studied as well as the effect of freezing on killing worms.

IX. ENVIRONMENTAL IMPACT OF MEDICATION IN FISH FARMS

E. Egidius presented a report on environmental effects of medication in fish farms, indicating that although antibiotics and chemicals had been used for many years, it is only recently that research on the impact of such compounds on the fish farms environment has been started.

Degradation of Neguvon and Nuvan in seawater is affected by temperature and PH and it has been shown that degradation is slower in shellfish than in fish. Reference was also made to Norwegian studies on degradtion of rotenone and its possible effects on oysters.

Because of the oral administration of antibacterial compounds to farmed fish, residual concentrations in fish flesh and in the environment cause concern. Withdrawal periods after use of anti-bacterial compounds and before fish sale, is regulated and strongly enforced in most countries. Cases in the Norwegian salmon industry were residues of oxytetracycline remaind high for a much more extended period than normal (up to 5-6 month) were discussed.

Results of assays of sediments under fish farms, reference areas well away from farms and in laboratory experiments, indicated that antibacterial compounds degraded rapidly if present on the surface of sediments but slowly when embedded within the sediments. 18 - 20% of the total sediment bacterial load showed resistance to oxytetracycline compared with 0.8 - 1% in the reference area. This picture persists for a considerable time, uptil know measured for 9 month. The question wether the extended resistance is associated with the persistence of the antibiotic in the sediments, is being studied and possible changes in the bacterial species composition in the sediments assessed. Studies on antibiotic accumulation and bacterial resistance have also commenced in other countries e.g. Finland and Denmark with little evidence of long-term resistance. English studies on the economic use of antibiotics , particularly refering to temperature, were discussed. Although generally studies are performed on various compounds used, associated with registration inadequacions, information on the qualitative and quantitative use of antibacterial drugs was discussed (particularly in relation to temperature, stage of disease process, condition, physiological age status and strain of fish). Reported differences in the kinetics of oxilinic acid in salt and fresh water were discussed

and comment was made on the possibility of resistance being transferred to other bacteria of public health significance. Rotation of drugs was recommended in different countries, but also more education of fish farmers and veterinarians on drug problems in fish farming is required. In Finland the amount of antibiotics used in fish farming was related to the the availaility and efficacy of Vibrio anguillarum vaccine. Differences in the general availability of drugs for use in fish farms between countries was noted and contradictory information in the literature on the effect of oxytetracycline on depression of the immum capacity of fish was discussed. The usefulnes of the concept of degree/days in drug kinetic studies (including degradation and withdrawl periods) was noted.

X. PRESENTATION OF A DUTCH LARGE SCALE DISEASE - POLLUTION EXPERIMENT

Because of the difficulty in establishing a conclusive cause and effect relationship between pollution and disease, a large scale experiment has started at the Dutch island Texel. The experiment will be carried out in tanks with one species of fish, flounder, which will be exposed to contaminants in sediments from Rotterdam harbour sludge, to highly eutrophic water, and to relatively unpolluted sediments from the Wadden Sea area. A pilot study will be carried out initially from April 1988 - 89 using about 200 flounders per tank. This will be followed by the main study from 1989 to 1992 with about 1000 fish pr tank. Fish will be screened monthly for evidence of external diseases, and fifty fish will be sacrified every 3 month for detailed histological, bacteriological and immunological examination. Food will consist of live organisms.

XI. BIOLOGICAL EFFECTS SEA-GOING WORKSHOP

An ICES sea-going workshop on biological effects methods is proposed for two weeks during the summer of 1989 (C.Res. 1987, 3:5) The aim of the workshop is to compare different methods of biological effects monitoring including pathological symptoms.A similar workshop was planed some years ago on board the R/V Anton Dohrn, but it was not carried through mainly because of lack of interest.

In August-September 1986 a biological effects workshop was held in Oslo, Norway for 3 weeks. The full report of this workshop has not yet being published. Before the results of this workshop have been published, it is unpossible to evaluate the usefulness and necessity for yet another workshop. It is therefore proposed to postpone the

workshop for one year, and also to take into consideration the report from the coming sea-going workshop on methodology of fish disease surveys to be held onboard the R/V Argos later this spring.

With its present knowledge the WGPDMO is not convinced of the effort of the planned combined sea-going workshop, mainly beacuse the group does not see any clear aim for it. The W.G. doubt that new information will result from the excersise because, at least concerning pathology, a clear relation to polution has not yet been established. If this sea-going workshop is to take place in 1989, the WGPDMO recommends that at least 2 experienced members of the group should be invited to participate.

XII. SEA-GOING WORKSHOP ON METHODOLOGY OF FISH DISEASE SURVEYS

E.Lindesjoo, who in the absence of J.Thulin will be in charge of the cruise, informed about the workshop onboard the R/V Argos. The cruise will go from April 17th to April 23rd starting and terminating in Gothenburg, Sweden. The aim of the workshop is to discuss developments in methodology since the first similar workshop held in january 1984 abord the R/V Anton Dohrn. The following themes will be discussed:

1. Adoption of survey and sampling design which fulfil the requirements of statistical evalution.
2. Definition of standardized disease parameters.
3. Discuss and if possible define indicator species.
4. Discuss "normal" levels and variations in frequencies.
5. Look for disease trends in different areas.
6. Create new parameters/techniques/formats for monitoring purposes.

XIII. NEOPLASTIC LIVER LESSIONS FOR THE PURPOSE OG ENVIRONMENTAL MONITORING

H. Kranz presented a paper on the above mentioned topic. She first went through the history of aflatoxin induced tumours in salmonid fish.These experiences initiated the research on other carcinogens and carcinogenic response in other fish species, e.g. the highly

sensitive rainbow trout strain (Shasta strain). A review of Couch and Harsbargers work which included 94 experiments with carcinogenic substances was presented. In 93% of the experiments tumours developed in the livers of the fish a fact which stress the importance of this organ in carcinogenicity studies. A review of investigations in pollution areas during which high prevalences of hepatomas were observed together with examples of negative findings was also given.

A comparision of monitoring infectious diseases and liver tumours was presented and the possibilities of using liver pathology in biological effects monitoring was discussed.

The function of the liver in metabolic processes was summarized togteher with mechanisms involved in the detoxification processes, e.g. metallothionines and the MFO-system. The chemical detoxification of xenobiotics result normally in decreased toxicity, but in other cases the metabolites can turn out to be more toxic or even carcinogenic. This can result in focal alterations of liver enzymes which can be detected histologically. If the enzyme changes are of carcinogenic origin, they can develop to true tumours.

F. Baudin-Laurencin and S. Mellergard in addition to this presentation, added some of their experiences. During studies on liver pathology macroscopic examination will not always be able to clear out wether a nodule is a neoplastic or a fat or glucogen nodule. Combined with histology liver pathology can be used for biological effects monitoring, but it will be time consuming and demand trained personal. However, it seems possible to use macroscopic liver lessions in biological effects studies provided that a proper classification of different lessions is avaiable.

XIV. WORKSHOP

As usual the working group dedicated one afternoon session to the presentation of new diseases and interesting findings in disease work throug diapositives and microscopic slides with short comments.

F. Baudin-Laurencin presented different eye lessions in sea-bass; cataracts due to feeding with thioacetamide; necrosis in nervous tissue and retina due to a viral infection; and degeneretative changes in retina due to nutritional factors and light. A case of "sleeping disease" in rainbow trout was also presented.

T. Lang demonstrated lessions in the lower jaw of whiting found during a recent cruise in the North Sea.

G. Bylund demonstrated different fin lession in pike-perch and rough; skin hyperplasia in pike observed only in the spring; and some nodular changes in the livers from flounder. Further Bylund reported "fat" nodules in the spleens of up to 24% of pike-perch in certain areas arround Helsinki. Also, some transparancies of Gyrodactylus salaris infection in Atlantic salmon were shown.

T. Wicklund demonstrated different ulcerative conditions observed in flounder.

D. Vethaak showed pictures of similar ulcerations in flounder from Dutch waters.

E. Lindesjoo demonstrated examples of vertebral compressions in cod.

A. Figureiras gave a presentation on mussel culture in Gallicia and demonstrated examples of diseases in mussels.

E. Egidius showed microscopical slides of livers from Atlantic salmon with infectious anemia (I.A.) and of cardiomyopathy also seen in Atlantic salmon.

F. Baudin-Laurincin also presented microscopic slides of the cataracts induced by thioacetamide in the feed of sea-bass.

G. Bylund demonstrated the microscopical picture of the "fat" nodules in the spleen of flounder.

Tumoural appearance in pancreatic and coecal tissue of Salvelinus fontinalis was also demonstrated.

XV. AQUACULTURE GLOSSARY AND DEFINITIONS OF PATHOLOGICAL TERMS

At the 1986 statutory meeting of ICES a glossary of Aquaculture terms was presented. The WGPDMO has been asked to comment specially on the pathological terms in this list.

Since 1982 the WG already has busied itself with preparing a list, in English and French, of the most common pathological terms used in fish disease work. Until now this work has resulted in the agreement on about 10 terms. This time F. Baudin-Laurencin presented as a basis for discussion, a list of 21 terms each in 3 versions: one version from B.-L. himself (in French and English), one from D. Bucke and a third from a medical glossary. It was decided that it would be to time consuming to try to reach agreement on a uniform definition for the list presented at the meeting. It was

recommended that F. Baudin-Laurencin and D. Bucke meet sometime during the coming 6 month to prepare single agreed defenitions for the proposed terms. It also was proposed that an existing glossary produced by the American Fisheries Society on fish health should be used as a basis for compiling of appropiate terms to define.Both the AFS list and the proposed terms will be circulated to the WG members well in advance for the next WG meeting.

Meanwhile it is suggested that the pathological terms in the Aquaculture glossary should be in accordance with the list prepared by the WGPDMO.

It also was pointed out that D. Bucke tries to assemble a round table discussion, possibly in connection with the 1989 EAFP international symposium, about tumour diagnosis and definitions.

XVI. STANDARDIZATION AND COMPUTERIZING OF FISH DISEASE DATA

The formats used in connection with the annual national disease reports from member countries are seemingly not very suitable for computerizing the data. It was decided that the formats will be kept as they are for the time being, as they give a brief comparable overview of the disease status in the different countries which could be specified on request. Further discussion on the topic of computerizing of certain data for eventually showing trends in disease development in certain areas, was postponed to the sea-going workshop onboard the R/V ARGOS.

XVII. RECOMMENDATIONS

In view of the present extremely limited data submitted on diseases of molluscs (despite the serious consequences of epidemics such as Bonamia and MSX) and the value of molluscs generally in environmental studies, it is recommended that member countries increase there efforts on baseline monitoring of wild and cultivated molluscs using histological methods and include the results in their annual reports to the Working Group.

Because of the increasing public attention being given to nematode larvae in the flesh of marine fish, it is recommended that a collocquium entitled "Nematode problems in North Atlantic fish" should be held for 2 days immediately prior to the next WGPDMO meeting in Kiel with dr. H. Moller as convenor in order to receive comprehensive reports on recent progress in research on

identification and biology of nematodes in marine fish and to discuss the scientific and commersial implications and possible solutions.

After review by the WGPDMO 1989 meeting in Kiel, the report of the second sea-going workshop on Methodology of Disease Suveys (R/V ARGOS, April 1988) should be published as a Cooperative Research Report.

The Working Group should meet again for 4 days in Kiel, Federal Republic of Germany, from April 5. through 8. 1989 under the chairmanship of Dr. E. Egidius to:

- discuss information on the current disease status of ICES member countries and on new disease problems in free -living and cultivated marine organisms.
- discuss possible approaches to computeration of the data on fish and shellfish diseases from ICES member countries.
- complete the comparison of national legislation for control of diseases in mariculture.
- initiate the preparation of a document for publication describing mariculture approaches and concepts which focus on the avoidance and prevention of disease rather than reliance on mitigation.
- receive and discuss progress reports on research into problems of medication in mariculture, including its impact on the environment.
- discuss the report of the second sea-going workshop on Methodology of Disease surveys and to finalize the report for publication
- receive and discuss progress reports on the Dutch and British experimental studies on the effects of contaminated marine sediments on the health of fish.
- receive and discuss a progress report on the German multi-disciplinary study on fish diseases in the Wadden Sea.
- consider recent development of molluscan diseases of economic importance in ICES member countries.
- receive reviews on immune mechanisms in molluscs and in crustaceans.
- continue work on the glossary of pathological terms.

ANNEXES

1. LIST OF CONTENTS

2 TERMS OF REFERENCE:

a) discuss and exchange information on current disease status in member countries and on new disease problems in free-living and cultivated marine organisms;

b) compare and discuss national legislation concerning fish health;

c) further discuss and evaluate data on the impact of medication in fish farms on the environment. Collect chemotherapeutics and ensuing hazard including, in particular, the development of drug resistance in fish farms in member countries and make appropriate recommendations;

d) review and discuss the present state of knowledge on the existence of immunosystems in molluscs and crustaceans;

e) review the information available from the seal-worm workshops in Halifax, Canada, and continue evaluation of data on the impact of parasites impairing the value of fisheries products. In view of public concern about the presence of live nematodes in fish flesh destined for human consumption, the Working Group should make recommendations on work leading to the elimination of this problem;

f) improve knowledge in the identification of parasitic nematodes and their life cycles;

g) evaluate available information and make appropriate recommendations on the use of neoplastic liver lesions for the purpose of environmental monitoring;

h) continue work in definitions and the preparation of a glossary of fish health terms.

List of Participants

J.E. Stewart
Dept. of Fisheries & Oceans
Biological Sciences Branch
Habitat Ecology Division
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, N.S. B2Y 4A2
Canada 902-426-8145

Stig Mellergaard
Danish Institute for Fishery and Marine Research
Fish Disease Laboratory
Bülowsvej 13
DK-1870 Fredriksberg C
Denmark 45-1-352767

Helene Kranz
Zoologisches Institut & Zoologisches Museum
Martin-Luther-King-Platz 3
D-2000 Hamburg 13 040-41233945
FRG

Thomas Lang
Bundesforschungsanstalt für Fischerei
Bei der Alten Liebe 1
2190 Cuxhaven FRG 04721-37362

Heino Möller
Institut für Meereskunde
Dusternbrooker Weg. 20
D-2300 Kiel 0431-5973914
FRG

Göran Bylund
Institute of Parasitology
Åbo Akademi
Porthansgatan 3
20500 Åbo
Finland 921-654301

Tom Wiklund
Inst. of Parasitology
Åbo Akademi
Porthansg. 3
20500 Åbo
Finland 921-654302

Felix Baudin Laurencin
Lab. National Pathologie des Animaux Aquatiques
Box 70
29263 Plouzane
FRANCE 98-224040

John McArdle
Fisheries Research Centre, Abbotstown
Castleknock, Dublin 15
Ireland 01-210111
Telex 31236

Paul van Banning
Netherlands Institute for Fishery Investigations
P.O. Box 68
1970 AB Ymuiden
The Netherlands

Dick Vethaak
Ministry of Transport and Public Works
Public Works Department - Tidal Waters Division - Ecotoxicology
c/o RIVO, P.O. Box 68
1970 AB Ymuiden
The Netherlands 02550-64646

Emmy Egidius
Inst. of Marine Research
C. Sundtsgt. 37
N-5004 Bergen
Norway 47-5-318500
Telex 42297 OCEAN
Fax 47 5 231094

Antonio Figueras
Instituto investigaciones Marinas
Muelle de Bouzas
36208 VIGO
SPAIN 986-292758 - 231930
Fax 986 292762

Jose Masso
Instituto Espanol de Oceanografia
Box 1552 VIGO
SPAIN 986-492111

Eric Lindesjöö
Department of Zool.
Uppsala Univ. Box 561
S-75122 Uppsala
Sweden 018-182638

Barry Hill
Ministry of Agriculture, Fisheries and Food
Fish Disease Laboratory
The Nothe
Weymouth, Dorset DT4 8UB
ENGLAND 305-772137
Fax 770955
Telex 417104 FSHWEYG

Alistair H. McVicar
Dept. of Agriculture & Fisheries for Scotland,
Marine Laboratory,
P.O. Box 101, Victoria Rd.,
Aberdeen, Scotland 0224-876544

TASK LIST FOR 1989 MEETING:

IMMUNOLOGY, CRUSTACEANS:	J. E. STEWART
IMMUNOLOGY, MOLLUSCS:	H. GRIZEL
LEGISLATION:	B. HILL
IMPACTS OF MEDICAMENTATION:	E. EGIDIUS
SEA-WORK COMPUTER PROGRAM:	T. LANG
MARICULTURE COMPUTER PROGRAM:	B. HILL
DISEASE AVOIDANCE:	J. E. STEWART
REPORT DUTCH AND BRITISH EXPERIMENTS:	D. VETHAAK
REPORT GERMAN EXPERIMENTS:	H. MØLLER
REPORT 2. SEA-GOING WORKSHOP:	A. Mc VIEAR
GLOSSARY AND PATHOLOGICAL TERMS:	F. BAUDIN-LAURENCIN AND D. BUCKE

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: BELGIUM YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID) F2/3-31	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
1. Lymphocystis	Flounder		312-700	> 20	8- 6.7	Mai-Oct.	
	Dab		460-690	> 15	-	Mai-Oct.	
	Plaice		672-920	> 20	- 0.2	Mai-Oct.	
2. Ulcers	Flounder		460-690	> 20	0.63-	Mai-Oct.	
	Dab		312-700	> 15	- 0.35	Mai-Oct.	
3. Fin erosion	Flounder		312-700	> 20	0.63- 0.57	Mai-Oct.	
	Plaice		672-920	> 20	1.7 -	Mai-Oct.	
	Whiting		392-120	> 20	0.9 - 1.3	Mai-Oct.	
4. Skeletal def.	Dab		460-690	15	0.43- 0.35	Mai-Oct.	
	Plaice		672-920	> 20	0.85 -	Mai-Oct.	
	Sole		552-276	> 20	0.7 -	Mai-Febr.	
	Cod		101-126-116	> 20	1 - 2.15- 1	Feb. -Mai-Oct.	
5. Epidermal papilloma	Dab		460-690	> 15	-	Mai-Oct.	
	Plaice		672-920	> 20	-	Mai-Oct.	No observations
	Flounder		312-700	> 20	-	Mai-Oct.	
6. Gill x-cell	Dab		460-690	> 15	-	Mai-Oct.	
7. Lernaeocera branchialis	Cod		136-101-116	> 20	15 -23 -15.5	Mai-June-Oct.	
	Whiting		392-120-488	> 20	16.4-13.2 - 8	Mai-June-Oct.	
8. Mycobacterium	Cod		136-101-116	> 20	0 - 1 - 3.4	Mai-June-Oct.	
9. Liver tumors	Cod		136-101-116	> 20	1.5 - 0 - 0	Mai-June-Oct.	
	Flounder		312-350	> 20	0.6 - 0.5	Mai-Oct.	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: BELGIUM YEAR: 1987.

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
10. Glugea stephani	Flounder		156-350	> 20	5.7 - 1.1	Mai-Oct.	
	Dab		230-345	> 15	5.2 -11.3	Mai-Oct.	
	Plaice		336-460	> 20	0.4 - 0.8	Mai-Oct.	
11. Cryptocotyle	Cod		136-101	> 20	8.6 -	Mai-Oct.	
	Whiting		392-488	> 20	4.5 - 6.9	Mai-Oct.	
12. Stephanostomum	Plaice		336-460	> 20	77 -70	Mai-Oct.	
	Dab		460-690	> 15	54 -52	Mai-Oct.	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

WILD POPULATIONS: COUNTRY: Canadian Atlantic Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Roccus soxatilis	4T	1	35	unknown	December	Isolated samples from commercial fisheries.
Ulcers	Hippoglossoides platessoides	4V	1	-	unknown	November	
X-cell Lesion	Gadus morhua	5Z	1	-	unknown	October	
Vibriosis Vibrio anguillarum	Salmo salar	3P	2	-	unknown		Due to very low water levels and high temperatures in rivers, the salmon remained in the estuary for an extended period.
Vibriosis Vibrio anguillarum	Salmo salar	4W	1	57	unknown		
Enteric Redmouth Yersinia ruckeri	Salvelinus alpinus	2H	37		6	October	Bacteria isolated from broodfish.
Bacterial Kidney Disease Renibacterium salmoninarum	Salvelinus alpinus	2H	37		3	October	
Infectious Pancreatic Necrosis Virus	Mya arenaria	4T	36	-	40	June	Detected during a survey.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: Finfish, Shellfish COUNTRY: Canada, Atlantic Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
		4VN,4VS	1477	31-40	2-10	May thru Nov.	
		4W,4X,5ZE	1338	31-40	7-54	Jan thru Oct.	
Urastoma sp.	Crassostrea virginica	4TN	15	-	100	Sept.	Infestation was not deemed to be the cause of the mortalities.
Myxosporidian	Gadus morhua	4TN	205	13-127	9-56	Apr-Nov.	Negative stages lined kidney tubules.
Myxosporidian	Melanogrammus aeglefinus	4TN	123	18-65	3-13	June-Nov	
Hexamita sp.	Melanogrammus aeglefinus	4TN	129	18-65	93-100	Apr-Nov.	In rectum, no obvious damage.
Hexamita sp.	Gadus morhua	4TN	183	13-127	32-77	Apr-Nov.	
Goussia sp.	Gadus morhua	4TN	205	13-127	4-48	Apr-Nov.	Epithelial cells of kidney tubules were damaged.
	Melanogrammus aeglefinus	4TN	96	18-65	6-19	June-Nov	
Trichodina spp.	Gadus morhua	4TN	44	18-57	4-33	April	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: Finfish, Shellfish COUNTRY: Canada, Atlantic Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Pseudoterranova decipiens	Hippoglossoides platessoides	2J	265	31-40	3-4	Nov.	Sealworm Survey
		3K	387	31-40	0-1	Nov-Dec.	
		3L	646	31-40	0-2	May,Oct.	
		3O	200	31-40	4	May	
		3PS	249	31-40	29-46	Mar.	
		4R	319	31-40	15-51	Jan,Aug, Oct.	
		4S	645	31-40	50-75	Jan,Jul, Aug.	
		4T	1775	31-40	45-90	Jan thru Nov.	
		4VN	254	31-40	80-81	May,Oct, Nov.	
		4VS	1223	31-40	63-89	Apr,May, Jul,Oct.	
		4W	782	31-40	73-97	Jan,Apr, May,Oct.	
		4X	492	31-40	40-91	Jan,Apr, Jul.	
		5ZE	64	31-40	30	Mar.	
	Raja radiata	4W	14	22-49	38	July	
Anisakis simplex	Raja radiata	4W	14	22-49	7	July	
	Squalus acanthias	4W	12	30-67	8	July	
	Amonodytes dubius	4VS	144	16-28	12	April	
Pleistophora hippoglossoideos	Hippoglossoides platessoides	2J,3K,3L,30	1498	31-40	0	May,Oct, Nov,Dec.	
		3PS,4R,4S, 4T	2988	31-40	0-2	Jan thru Nov.	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: Finfish, Shellfish COUNTRY: Canada, Atlantic Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Pseudoterranova decipiens	Halichoerus grypus	4T	19	150-235	100	Jan.	Sealworm Survey.
		4W	7	180-230	100	Jan.	
		4X	32	120-230	100	Apr.-May	
	Phoca vitulina	4X	16	95-165	100	Apr.-May	
Anisakis simplex	Halichoerus grypus	4T	19	150-235	68	Jan.	
		4W	7	180-230	57	Jan.	
		4X	32	120-230	66	Apr.-May	
	Phoca vitulina	4X	16	95-165	75	Apr.-May	
Contracaecum osculatum	Halichoerus grypus	4T	19	150-235	100	Jan.	
		4W	7	180-230	86	Jan.	
		4X	32	120-230	25	Apr.-May	
	Phoca vitulina	4X	16	95-165	6	Apr.-May	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: DENMARK YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Dab	North Sea (N) Area framed by F6-F8 & 36-42	North Sea n=5840	7-40 cm	N: 5.1 S: 0.9 K: 5.4	May	
Epidermal hyper-plasia/papilloma		Skagerak (S) Area framed by F6-G0 & 42-44	Skagerak n=1070		N: 2.9 S: 0.3 K: 2.4		
Ulcers		Kattegat (K) Area framed by G0-G2 & 41-44	Kattegat n=2111		N: 1.0 S: 1.4 K: 0.4		
Myxobolus aeglefini	Plaice		North Sea n=3059	10-55 cm	N: 11 S: 32 K: 18		
Lymphocystis			Skagerak n=683		N: 0.3 S: 0.3 K: 2.0		
Ulcers			Kattegat n=299		N: 0.2 S: 0.6 K: 0.3		

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: Fed. Rep. Germany YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	L. limanda	37F6-F7	5587	10-31	3.13	Jan.	German Bight
Epidermal Papilloma	"	"	"	"	1.74	"	
Ulcerations (acute + healing)	"	"	"	"	0.38	"	
Ulcerations (healed)	"	"	"	"	1.95	"	
x-cell gills	"	"	"	"	1.06	"	
Lymphocystis	"	38F2,39F3	1109	9-34	11.18	"	Dogger Bank
Epidermal Papilloma	"	"	"	"	2.43	"	
Ulcerations (acute + healing)	"	"	"	"	3.61	"	
Ulcerations (healed)	"	"	"	"	4.60	"	
x-cell gills	"	"	"	"	3.70	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: Fed. Rep. Germany YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	L. limanda	37F6-F7 38F6-F7	2633	11-32	11.43	June	German Bight
Epidermal Papilloma	"	"	"	"	4.87	"	
Ulcerations (acute + healing)	"	"	"	"	1.01	"	
Ulcerations (healed)	"	"	"	"	4.69	"	
x-cell gills	"	"	"	"	0.23	"	
Lymphocystis	"	38F2, 39F3,40F4	1610	14-38	23.53	"	Dogger Bank
Epidermal Papilloma	"	"	"	"	4.43	"	
Ulcerations (acute + healing)	"	"	"	"	11.01	"	
Ulcerations (healed)	"	"	"	"	15.16	"	
x-cell gills	"	"	"	"	0.84	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: Fed. Rep. Germany YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Ulcerations (acute + healing)	Gadus morhua	ICES-Subdiv. 22	326	31-67	12.88	Dec.	Baltic sea
Pseudobranchial tumor	"	"	"	"	2.15	"	
Skeletal deformities	"	"	"	"	0.61	"	
Ulcerations (acute + healing)	"	ICES-Subdiv. 24	1301	17-74	17.91	"	
Pseudobranchial tumor	"	"	"	"	0.08	"	
Skeletal deformities	"	"	"	"	3.61	"	
Ulcerations (acute + healing)	"	ICES-Subdiv. 25	3411	14-82	9.56	"	
Pseudobranchial tumor	"	"	"	"	0.00	"	
Skeletal deformities	"	"	"	"	1.96	"	
Ulcerations (acute + healing)	"	ICES-Subdiv. 26	973	20-115	9.46	"	
Pseudobranchial tumor	"	"	"	"	0.00	"	
Skeletal deformities	"	"	"	"	0.62	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: Fed. Rep. Germany YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Anisakis spec.	Clupea harengus	ICES-Subdiv. 22	107	20-27	39,3	Dec.	Baltic Sea
"	"	ICES-Subdiv. 24	290	"	30,0	"	
"	"	ICES-Subdiv. 25	580	"	0,5	"	
"	"	ICES-Subdiv. 26	221	"	0,5	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: Finland YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Skin ulcers	Plat. flesus		2040		6.5	April-December	
''	Lucioperca luc.		350		1.1	''	
Lymphocystis	Plat. flesus		2040		8.7	''	
Fin lesions	Lucioperca luc.		350		11.7	''	
''	Osmerus eperl.		270		1.5	''	
''	Rutilus rut.		793		15.6	''	
''	Perca fluviatilis		1588		14.6	''	
Skeletal deform.	Lucioperca luc.		350		1.7	''	
''	Esox lucius		966		1.2	''	
Neoplastic cond.	Esox lucius		966		1.1	''	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
lymphocystis-infection	flounder (Platichthys flesus)	F4/33	540	20-45	20,9	September	
		F4/34	733	"	22,1	"	
		F3/31	697	"	23,0	"	
		F5/35	294	"	11,9	"	
		F5/35	528	"	12,9	"	
		F8/35	293	"	5,1	"	
		F3/32	476	"	3,4	"	
skin ulcers		F4/33	540	20-45	3,0	September	
		F4/34	733	"	3,7	"	
		F3/31	697	"	1,9	"	
		F5/35	294	"	27,9	"	
		F5/35	528	"	2,7	"	
		F8/35	293	"	0	"	
		F3/32	476	"	0,6	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
fin rot	flounder (Platichthys flesus)	F4/33	540	20-45	0,9	September	
		F4/34	733	"	1,1	"	
		F3/31	697	"	not examined	"	
		F5/35	294	"	2,7	"	
		F5/35	528	"	0,9	"	
		F8/35	293	"	0,3	"	
		F3/32	476	"	0,5	"	
skeletal deformities		F4/33	540	20-45	0,6	September	
		F4/34	733	"	0,3	"	
		F3/31	697	"	0,5	"	
		F5/35	294	"	0	"	
		F5/35	528	"	0,4	"	
		F8/35	293	"	0,7	"	
		F3/32	476	"	0,3	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
glugea stephani	flounder (Platichthys flesus)	F4/33	540	20-45	2,8	September	
		F4/34	733	"	1,9	"	
		F3/31	697	"	0,7	"	
		F5/35	294	"	0,8	"	
		F5/35	528	"	1,5	"	
		F8/35	293	"	0,3	"	
		F3/32	476	"	0,2	"	
liver nodules/ tumors (> 2 mm)		F4/33	540	20-45	3,5	September	
		F4/34	733	"	5,0	"	
		F3/31	697	"	0	"	
		F5/35	294	"	not examined	"	
		F5/35	528	"	0,6	"	
		F8/35	293	"	0	"	
		F3/32	476	"	0,2	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
lymphocystis-infection	dab (*Limanda limanda*)	F4/33	1023	>15 cm	3,8	March	Hook of Holland
		F5/36/35	708	"	11,4	"	
		F3/33	634	"	4,6	"	T_1O_2-dumping area
		F4/33	507	"	0,6	September	Hook of Holland
		F5/36/35	376	"	0,8	"	
		F3/33	277	"	0,7	"	T_1O_2-dumping area
		F2/33	277	"	0,4	"	
epidermal hyperplasia/ papilloma		F4/33	1023	"	7,7	March	Hook of Holland
		F5/36/35	708	"	4,5	"	
		F3/33	634	"	7,4	"	T_1O_2-dumping area
		F4/33	507	"	0,2	September	Hook of Holland
		F5/36/35	376	"	0,3	"	
		F3/33	277	"	0	"	T_1O_2-dumping area
		F2/33	277	"	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
skin ulcers	dab (*Limanda limanda*)	F4/33	1023	>15 cm	0,7	March	Hook of Holland
		F5/36/35	708	"	0,3	"	
		F3/33	634	"	0,5	"	T_1O_2-dumping area
		F4/33	507	"	1,0	September	Hook of Holland
		F5/36/35	376	"	0,3	"	
		F3/33	277	"	1,1	"	T_1O_2-dumping area
		F2/33	277	"	1,1	"	
fin rot		F4/33	1023	"	0	March	Hook of Holland
		F5/36/35	708	"	0	"	
		F3/33	634	"	0,2	"	T_1O_2-dumping area
		F4/33	507	"	0,4	September	Hook of Holland
		F5/36/35	376	"	0,3	"	
		F3/33	277	"	0	"	T_1O_2-dumping area
		F2/33	277	"	0,7	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
skeletal deformities	dab (*Limanda limanda*)	F4/33	1023	>15 cm	0	March	Hook of Holland
		F5/36/35	708	"	0	"	
		F3/33	634	"	0,4	"	T_1O_2-dumping area
		F4/33	507	"	0	September	Hook of Holland
		F5/36/35	376	"	0	"	
		F3/33	277	"	0	"	T_1O_2-dumping area
		F2/33	277	"	0	"	
Glugea stephani		F4/33	1023	"	12,3	March	Hook of Holland
		F5/36/35	708	"	6,2	"	
		F3/33	634	"	8,7	"	T_1O_2-dumping area
		F4/33	507	"	11,8	September	Hook of Holland
		F5/36/35	376	"	10,6	"	
		F3/33	277	"	7,9	"	T_1O_2-dumping area
		F2/33	277	"	2,5	"	
liver nodules/ tumors (>2 mm)		F4/33	1023	"	3,1	March	Hook of Holland
		F5/36/35	708	"	2,0	"	
		F3/33	634	"	3,6	"	T_1O_2-dumping area
		F4/33	507	"	0,6	September	Hook of Holland
		F5/36/35	376	"	0,5	"	
		F3/33	277	"	0,7	"	T_1O_2-dumping area
		F2/33	277	"	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: The Netherlands YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
lymphocystis infection	plaice (Pleuronectes platessa)	F4/33	342	>15 cm	1,2	September	(Hook of Holland)
		F5/36/35	306	"	1,3	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)
epidermal hyperplasia /papilloma		F4/33	342	"	0	"	(Hook of Holland)
		F5/36/35	306	"	0	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)
skin ulcers		F4/33	342	"	0,3	"	(Hook of Holland)
		F5/36/35	306	"	0	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)
fin rot		F4/33	342	"	0,3	"	(Hook of Holland)
		F5/36/35	306	"	0	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)
skeletal deformities		F4/33	342	"	0	"	(Hook of Holland)
		F5/36/35	306	"	0	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)
Glugea stephani		F4/33	342	"	2,0	"	(Hook of Holland)
		F5/36/35	306	"	0,3	"	
		F3/33	161	"	3,7	"	(T_1O_2-dumping area)
liver nodules/ tumors (>2 mm)		F4/33	342	"	0,3	"	(Hook of Holland)
		F5/36/35	306	"	0	"	
		F3/33	161	"	0	"	(T_1O_2-dumping area)

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SE (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: THE NETHERLANDS YEAR: 1987

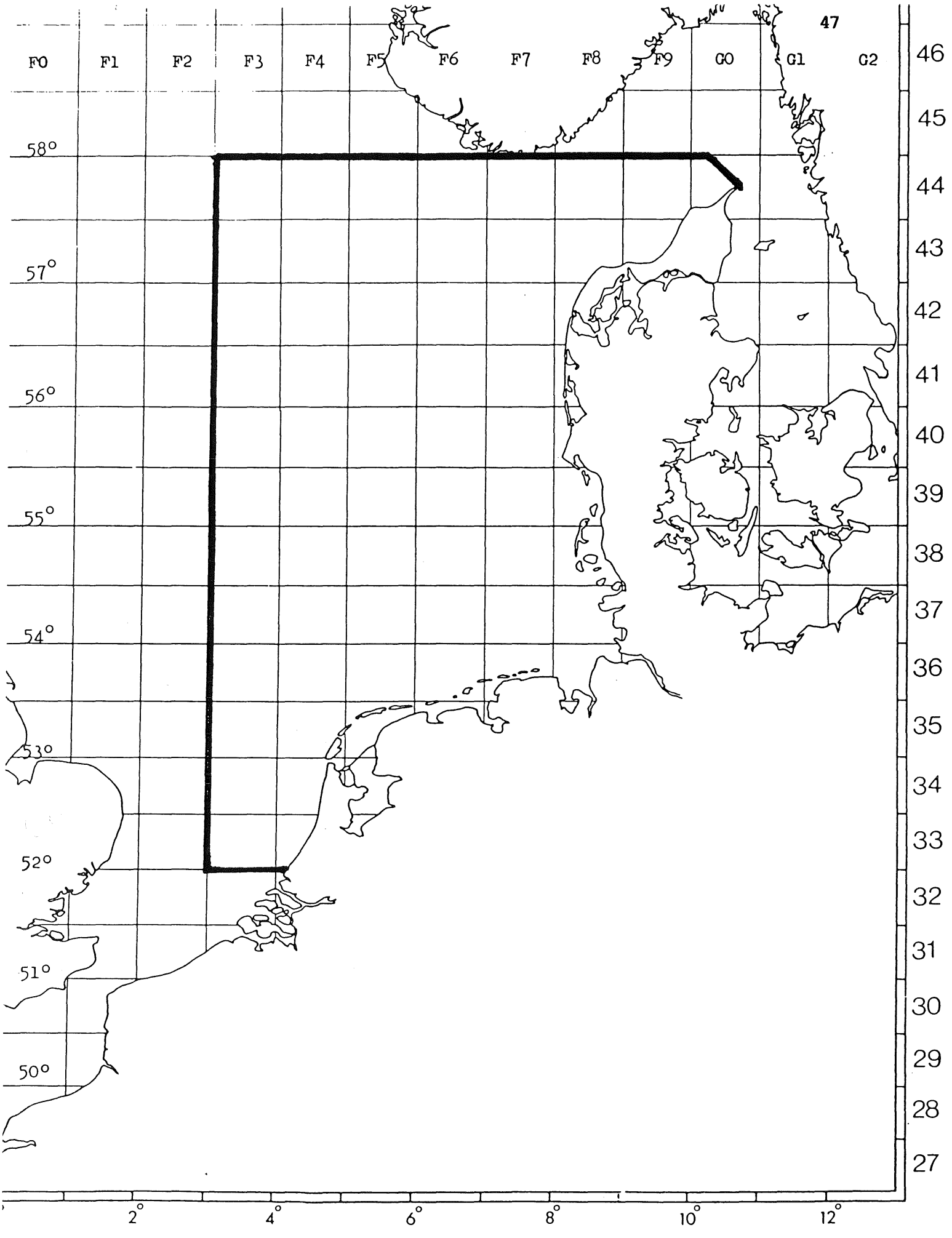
DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Dab (Limanda limanda)	area framed by F3 - F9 and 33 - 44.	4657 4491	15 - 30 ,,	1.9 % 1) (13.8 %) 2) 2.1 % (11.4 %)	Febr.-Apr. Sept.-Oct.	1) average 2) max. prev. observed in one sample with > 50 specimens
Epidermal papilloma	,,	,,	,,	,,	4.1 % (12.4 %) 2.3 % (11.4 %)	,,	,,
Skin ulcers	,,	,,	,,	,,	1.4 % (6.2 %) 2.5 % (5.8 %)	,,	,,
Glugea stephani	,,	,,	,,	,,	6.5 % (12.9 %) 8.6 % (16.8 %)	,,	,,
Myxobolus aeglefini	,,	,,	,,	,,	- 3.1 % (17.3 %)	,,	infected area not sampled in Febr.-Apr. period.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: THE NETHERLANDS YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Plaice (Pleuronectes platessa)	area framed by F3 - F9 and 33 - 44	3183	15 - 35	0.6 % 1) (1.5 %) 2)	Febr.-Apr.	1) average 2) max. prev. observed in one sample with >50 specimens.
			4534	,,	0.7 % (1.8 %)	Sept.-Oct.	
Skin ulcers	,,	,,	,,	,,	0.5 % (1.5 %)	,,	
					<0.1% (0.7 %)		
Glugea stephani	,,	,,	,,	,,	1.5 % (2.8 %)	,,	
					2.3 % (3.9 %)		
Myxobolus aeglefini	,,	,,	,,	,,	-	,,	infected area not sampled in Febr.-Apr. period.
					19.4 % (47.7 %)		
X-cell gill tumor	Cod (Gadus morhua)	,,	584	15 - 92	0.8 % (4. 9 %)		
			2495		0.4 % (0.9 %)		
Mycobacteriosis	,,	,,	,,	,,	0%		
					1.7 % (5.2 %)		


47
F0
F1
F2
F3
F4
F5
F6
F7
F8
F9
G0
G1
G2
58°
57°
56°
55°
54°
53°
52°
51°
50°
46
45
44
43
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
2°
4°
6°
8°
10°
12°

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: POLAND YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Hyperaemia of skin sections	Cod/Gadus morhua/	38 : 63 39 : 63 38 : 62 38 : 61 39 : 61 38 : 60	3550	30 - 90	2.0	March - Oct.	
Fin erosion	"	" "	"	" "	1.2	"	
Ulcerations acute and healed	"	" "	"	" "	2.5	"	
Anisakis sp.	Herring /Clupea harengus/	38 :64 38 : 63 38 : 62 38 : 61 38 : 60 37 : 60 37 : 59	10675	44	0 -85	Jan.- Dec.	
Ulcerations	Sprat /Sprattus sprattus/	39 : 62 38 : 61 38 : 60	16800		0.7	Aug.	

Table 1
(continued)

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES : ANNUAL REPORT

WILD POPULATIONS: COUNTRY: Poland YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Flounder (Platichtys flesus)	37 : 63 38 : 63 38 : 62 38 : 61	860	20	4.8	Jan.-Feb.	
Ulcerations	"	" "	"	"	0.5	"	
Pigment anomalies	"	" "	"	"	1.7	"	
Skeletal deformities	"	" "	"	"	0.3	"	
Ulcerations	Eel (Anguilla anguilla)	Gdańsk Bay Puck Bay	346	46 - 85	2.3	March-Nov.	
Hyperaemia of fins	"	"	"	" "	15	"	
Myxidium giardi	"	"	"	" "	3.0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: SPAIN YEAR: 1985-1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lernaeocera branchialis	Melanogrammus aeglefinus	IIb	343		0.58%	1985 VIII-IX	
Idem.	Gadus morhua	IIb	11251		0.49%	1985 VIII-IX	
Idem.	Gadus morhua	IIb	15129		0.85%	1987VI-VII	
Anisakis (?)	Micromesistius poutassou	Santander					No a quantitative or seasonal studies done.
Idem.	Trachurus trachurus	Idem.					
Idem.	Engraulis engrasicholus	Idem.					
Nematodes Cestodes Trematodes	Scyliorhinus Canicula	NW Spain	57		91%		
"	-Conger conger	"	110		89%		
"	-Trisopterus luscus	"	24		63%		
"	-Micromesistius poutassou	"	67		88%		
"	-Trachurus trach.	"	89		89%		
"	-Hyperopius lanceolatus	"	99		89%		
	-Trigla lucerna		14		42%		
	-Lepidorrhombus wiffiagonis		65		57%		

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: SPAIN YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Nematodes Cestodes Trematodes	Lepidorhombus bossei	NW Spain	23		30%		
"	Scophtalmus maximus	"	10		100%	-	
"	Michrochirus variegatus	"	52		63%		
Icthyophonus	Dicentrarchus labrax	Mediterranean	66		20%		

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASE: ANNUAL REPORT

(A) WILD POPULATIONS

COUNTRY: Sweden

YEAR: 1987-March 1988

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER OF FISH/SHELLFISH EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Anisakis simplex	Clupea harengus	grid 25	2274	10-25	0,9	November	whole fish examined
" "	"	"	1380	"	0	"	filet examined
Anguillicola spp.	Anguilla anguilla	27, G6/44	-	60	-	September	1 infected eel
" "	"	27, G6/43	60	60-68	6,7	Dec.87-March 88	
Platyspondyli	Gadus morhua	21, G2/43	330	6-39	7,6	May-Oct.	year classes 85/86
"	"	21, G1/43	305	24-39	1,6		

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: ENGLAND AND WALES YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Epidermal Hyperplasia/ Papilloma	Dab	32 F1	150x2 =300	15-20	0 4	April	2 sites 30 km apart
			"	20-25	4 13	"	
			"	>25	5 19	"	
			150	15-20	0	September	1 of these sites
			150	20-25	1	"	
			120	>25	2	"	
Lymphocystis			150x2 =300	15-20	2 6	April	
			"	20-25	5 21	"	
			"	>25	4 17	"	
			150	15-20	0	September	
			150	20-25	1	"	
			120	>25	2	"	
Ulceration			150x2 =300	15-20	1 1	April	Not including healed ulcers
			"	20-25	2 1	"	
			"	>25	3 1	"	
			150	15-20	0	September	"
			150	20-25	1	"	
			120	>25	1	"	
Cellular change/ Neoplasia in Liver			50x2 =100	15-20	0 2	April	Mostly small basophilic or eosinophilic
			"	20-25	4 0	"	
			"	>25	2 0	"	
			50	15-20	0	September	foci. Some larger nodules
			50	20-25	6	"	
			39	>25	13 (5 fish)	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: ENGLAND AND WALES YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Epidermal Hyperplasma/ Papilloma	Dab	31 F0	150	15-20	1	September	Site mostly in 31 F0 but over-lapping with 32I
			150	20-25	1	"	
			103	>25	5	"	
Lymphocystis			150	15-20	1	"	
			150	20-25	1	"	
			103	>25	4	"	
Ulcer			150	15-20	1	"	Not including healed ulcers
			150	20-25	0	"	
			103	>25	1	"	
Cellular change/ neoplasia in liver			50	15-20	8	"	Mostly small basophilic or eosinophilic foci. Some larger nodules
			50	20-25	12	"	
			35	>25	8 (3 fish)	"	

INTERNATIONAL COUNC.. FOR THE EXPLORATION OF THE SEA (ICE.,

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1987

*Nos. in brackets = nos. caught

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	36 F0	1523	>15	2.95	January	Special fish diseases cruise on charter vessel.
LY	"	"	"	"	7.2	"	
U	"	"	"	"	8.5	"	
Liver pathology	"	"	50	>25	12.00	"	Neoplasia & pre neoplasia (neoplastic lesions)
EH	"	33 F3	35 (35)*	>15	0	September	Fish stock assessment cruise (CIROLANA 7/87) North Sea. All commercial fish were examined for gross anomalies, but only in dab were diseases significantly prevalent for presentation.
LY	"	"	"	"	0	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	>20	0	"	
EH	"	34 F2	100 (546)*	> 15	0	August	" " "
LY	"	"	"	"	0	"	
U	"	"	"	"	2.0	"	
Liver pathology	"	"	"	"	8.0	"	
EH	"	34 F3	81 (91)*	>15	0	September	" " "
LY	"	"	"	"	0	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	"	>20	2/10	"	Early neoplasi

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	34 F4	174 (1065)*	>15	0	September	
LY	"	"	"	"	0	"	
U	"	"	"	"	0.6	"	
Liver pathology	"	"	10	>20	2/10	"	Early neoplasia
EH	"	35 F3	156 (156)*	>15	0	"	
LY	"	"	"	"	0	"	
U	"	"	"	"	1.9	"	
Liver pathology	"	"	10	>20	0		
EH	"	35 F2	117 (843)*	>15	0	"	
LY	"	"	"	"	0	"	
U	"	"	"	"	26.0	"	
Liver pathology	"	"	10	> 20	1/10	"	Early neoplasia
EH	"	36 F2	120 (887)*	>15	0	"	
LY	"	"	"	"	4.0	"	
U	"	"	"	"	16.7	"	
Liver pathology	"	"	10	20-25	0/10	"	
			10	>25	2/10	"	Early neoplasia
EH	"	36 F3	72 (72)*	>15	0	"	
LY	"	"	"	"	4.2	"	
U	"	"	"	"	1.4	"	
Liver pathology	"	"	10	>20	1/10	"	Early neoplasia

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1986

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	36 F4	150 (3022)*	>15	0	September	
LY	"	"	"	"	0	"	
U	"	"	"	"	4.0	"	
Liver pathology	"	"	10	>20	0	"	
EH	"	36 F5	106 (1544)*	>15	6.6	"	
LY	"	"	"	"	3.8	"	
U	"	"	"	"	5.7	"	
Liver pathology	"	"	10	>20	0	"	
EH	"	37 S2	92 (131)*	>15	0	August	
LY	"	"	"	"	5.4	"	
U	"	"	"	"	3.3	"	
Liver pathology	"	"	10	>20	0		
EH	"	37 F1	100 (405)*	>15	0	"	
LY	"	"	"	"	5.0	"	
U	"	"	"	"	10.0	"	
Liver pathology	"	"	10	>20	1/10	"	Early neoplasia
EH	"	37 F0	100 (2007)*	>15	0	"	
LY	"	"	"	"	2.0	"	
U	"	"	"	"	21.0	"	
Liver pathology	"	"	20	>20	1/20	"	1 nematode infestation 3 early neoplasi:

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	38 E8	60 (60)*	> 15	0	August	
LY	"	"	"	"	5.0	"	
U	"	"	"	"	3.3	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	38 E9	103 (474)*	> 15	1.9	September	
LY	"	"	"	"	0.9	"	
U	"	"	"	"	1.9	"	
Liver pathology	"	"	10	> 20	2/10	"	Nematode infestation
EH	"	38 F0	152 (152)*	> 15	1.9	"	
LY	"	"	"	"	3.9	"	
U	"	"	"	"	1.9	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	38 F1	109 + 146 (4874)* (2921)*	> 15	1.8 + 0	"	
LY	"	"	" "	"	7.3 + 3.4	"	Two hauls in the same ICES square
U	"	"	" "	"	13.8 + 18.5	"	
Liver pathology	"	"	10 + 10	> 20	2/10 + 2/10	"	Early neoplasia
EH	"	38 F3	101 (2141)*	> 15	1.0	"	
LY	"	"	"	"	3.9	"	
U	"	"	"	"	16.8	"	
Liver pathology	"	"	10	> 20	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	38 F4	106 (308)*	>15	1.9	September	
LY	"	"	"	"	2.8	"	
U	"	"	"	"	10.4	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	38 F5	164 (1627)*	>15	1.2	"	
LY	"	"	"	"	0.6	"	
U	"	"	"	"	4.3	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	38 F6	74 (1331)*	>15	2.7	August	
LY	"	"	"	"	1.3	"	
U	"	"	"	"	2.7	"	
Liver pathology	"	"	10	>20	0	"	
EH	"	39 F3	166 (1831)*	>15	2.4	"	
LY	"	"	"	"	4.8	"	
U	"	"	"	"	18.1	"	
Liver pathology	"	"	10	>20	0		
EH	"	39 F6	118 (667)*	>15	0.8	"	
LY	"	"	"	"	2.5	"	
U	"	"	"	"	5.1	"	
Liver pathology	"	"	10	>20	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	38 F7	139 (3026)*	>15	2.1	August	
LY	"	"	"	"	1.4	"	
U	"	"	"	"	12.2	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	40 E9	175 (175)*	> 15	0	"	
LY	"	"	"	"	5.7	"	
U	"	"	"	"	2.3	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	40 F1	104 (375)*	> 15	1.9	"	
LY	"	"	"	"	7.7	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	> 20	1/10	"	Nematode infestation
EH	"	40 F2	193 (193)*	> 15	1.0	"	
LY	"	"	"	"	7.8	"	
U	"	"	"	"	2.6	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	40 F3	131 (1941)*	> 15	0	"	
LY	"	"	"	"	3.0	"	
U	"	"	"	"	12.9	"	
Liver pathology	"	"	10	>20	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	40 F4	108 (941)*	> 15	0.8	August	
LY	"	"	"	"	0.9	"	
U	"	"	"	"	7.4	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	40 F5	116 (1025)*	> 15	0.8	"	
LY	"	"	"	"	2.6	"	
U	"	"	"	"	4.3	"	
Liver pathology	"	"	10	> 20	2/10	"	Nematode infestation
EH	"	40 F6	102 + 139 (3341)* (4571)*	> 15	0.9 + 0	"	Two hauls in the same ICES square
LY	"	"	" "	"	2.9 + 2.9	"	
U	"	"	" "	"	5.9 + 10.1	"	
Liver pathology	"	"	10 10	> 20	1/10 + 1/10	"	Ichthyophonus and early neoplasia
EH	"	41 F7	109 (2355)*	> 15	0	"	
LY	"	"	"	"	4.6	"	
U	"	"	"	"	12.8	"	
Liver pathology	"	"	10	> 20	1/10	"	Early neoplasia
EH	"	41 F6	284 (616)*	> 15	0.3	"	
LY	"	"	"	"	1.0	"	
U	"	"	"	"	4.2	"	
Liver pathology	"	"	10	> 20	0	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	42 F5	133 (467)*	> 15	0.7	August	
LY	"	"	"	"	4.5	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	42 F3	157 (1748)*	> 15	0.6	"	
LY	"	"	"	"	2.5	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	42 F2	155 (414)*	> 15	0.6	"	
LY	"	"	"	"	1.9	"	
U	"	"	"	"	0.6	"	
Liver pathology	"	"	10	> 20	2/10	"	Nematode infestation
EH	"	42 F0	100 (373)*	> 15	0	"	
LY	"	"	"	"	5.0	"	
U	"	"	"	"	0		
Liver pathology	"	"	10	> 20	3/10	"	1 Ichthyophonus 2 nematode infestations
EH	"	42 E8	100 + 103 (947)* + (746)*	> 15	0 + 0.9	"	
LY	"	"	" "	"	4.0 + 3.9	"	Two hauls in the same ICES square
U	"	"	" "	"	15.0 + 4.8	"	
Liver pathology	"	"	10 + 10	> 20	1/10 -	"	Nematode infestation

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	41 E8	195 (1078)*	> 15	0	August	
LY	"	"	"	"	4.6	"	
U	"	"	"	"	22.1	"	
Liver pathology	"	"	10	> 20	6/10	"	3 nematode infestations 3 early neoplasia
EH	"	43 F0	92 (167)*	> 15	0	"	
LY	"	"	"	"	1.8	"	
U	"	"	"	"	3.3	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	44 F4	108 (144)*	> 15	0	"	
LY	"	"	"	"	4.6	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	> 20	1/10	"	Nematode infestation
EH	"	45 F2	105 (766)*	> 15	0	"	
LY	"	"	"	"	2.8	"	
U	"	"	"	"	0.9	"	
Liver pathology	"	"	10	> 20	0	"	
EH	"	45 E8	163 (163)*	> 15	0	"	
LY	"	"	"	"	7.4	"	
U	"	"	"	"	2.5	"	
Liver pathology	"	"	10	> 20	1/10	"	Nematode infestation

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
EH	Dab	45 E7	138 (1254)*	15	0.7	August	
LY	"	"	"	"	6.5	"	
U	"	"	"	"	8.7	"	
Liver pathology	"	"	10	20	2/10	"	Nematode infestation
EH	"	47 E7	56 (56)*	15	0	"	
LY	"	"	"	"	3.6	"	
U	"	"	"	"	5.3	"	
Liver pathology	"	"	10	20	4/10	"	3 nematode infestations 1 Ichthyophonus
EH	"	47 E8	100 (100)*	15	3.0	"	
LY	"	"	"	"	8.0	"	
U	"	"	"	"	2.0	"	
Liver pathology	"	"	10	20	1/10	"	Early neoplasia
EH	"	48 E8	54 (144)*	15	0	"	
LY	"	"	"	"	3.7	"	
U	"	"	"	"	0	"	
Liver pathology	"	"	10	20	0	"	
EH	"	31 E5	70	20 - 31 cm	1.4	October	R.V. CLIONE 136/87 for sediment analysis Scientists trained by FDL Weymouth for fish sampling in Bristol Channel (not a special fish disease cruise).
LY	"	"	"	"	1.4	"	
U	"	"	"	"	5.7	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: ENGLAND AND WALES YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)		MONTH OF SAMPLING	REMARKS
Lymphocystis	Flounder	32 F1	150x2 =300	20-25	3	3	April	2 sites 30km apart
			"	25-30	4	8	"	
			"	30-35	15	25	"	
			"	>35	27	33	"	
			150	20-25	5		September	1 of these sites
			150	25-30	9		"	
			150	30-35	26		"	
			67	>35	18		"	
Ulceration			150x2 =300	20-25	0	3	April	Not including healed ulcers
			"	25-30	1	5	"	
			"	30-35	0	1	"	
			"	>35	2	1	"	
			150	20-25	4		September	"
			150	25-30	1		"	
			150	30-35	0		"	
			67	>35	1		"	
Cellular change/ neoplasia in liver			50x2 =100	20-25	6	4	April	Continuous range of conditions from small basophilic and eosinophilic foci through to hepatomas
			"	25-30	2	0	"	
			"	30-35	8	0	"	
			"	>35	18	4	"	
			50	20-25	2		September	
			50	25-30	0		"	
			50	30-35	12		"	
			37	>35	35 (13 fish)		"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS: COUNTRY: ENGLAND AND WALES YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Lymphocystis	Flounder	31 F0	150	20-25	3	September	Site mostly in 31 F0 but over-lapping with 32 F0
			150	25-30	11	"	
			150	30-35	11	"	
			41	>35	7 (3 fish)	"	
Ulceration			150	20-25	2	"	Not including healed ulcers
			150	25-30	3	"	
			150	30-35	3	"	
			41	>35	2 (1 fish)	"	
Cellular change/ neoplasia in liver			50	20-25	4	"	Continuous range of conditions from small baso-phillic and eosin-ophilic foci through to hepatomas
			50	25-30	2	"	
			50	30-35	16	"	
			20	>35	(8 fish)	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales

YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Ulcers - single	Dab	29 E6	6724	> 12	4.99	July	Fish examined on MFV using light ground (no bobbins) otter trawl.
" multiple	"	"	"	"	1.75	"	
Fin rot	"	"	"	"	0.50	"	
EH	"	"	"	"	0.03	"	
Ulcers - single	Plaice	"	906	"	0.33	"	Length of haul 3-3½ hrs. No internal examination of fish or record of parasites.
" multiple	"	"	"	"	0.22	"	
Fin rot	"	"	"	"	0.44	"	
Lymphocystis	"	"	"	"	0.11	"	
None recorded	Whiting	"	421	All	-	"	Information received from a non-Government source.
" "	Pout	"	493	"	-	"	
" "	Lemon sole	"	115	"	-	"	
" "	Hake	"	13	"	-	"	
" "	Dover sole	"	32	"	-	"	
Ulcers - single	Dab	38 E9	7538	> 12	1.29	May	Fish examined on MFV using fly-seine. Length of haul 1¼ hrs. No internal examination of fish.
" multiple	"	↕	"	"	0.29		
Fin rot	"		"	"	0.62	"	
EH	"		"	"	0.04	"	
Lymphocystis	"	38 E8	"	"	1.61	"	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS:

COUNTRY: England and Wales YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	MONTH OF SAMPLING	REMARKS
Fin rot	Plaice	38 E9 38 E8	297	12	1.68	May	
Ulcers - single Fin rot	Lemon sole " "	" "	479 "	All "	0.41 0.41	" "	Only parasite recorded was Clavella sp. in Gadoids.
Ulcers - multiple Clavella spp.	Cod "	" "	506 "	" "	0.20 4.15	" "	
Fin rot Clavella spp.	Haddock "	" "	172 "	" "	0.58 17.44	" "	Information received from a non-Government source.
Clavella spp.	Whiting	"	229	"	8.3	"	
Fin rot Lymphocystis	Flounder "	" "	37 "	" "	2.7 8.1	" "	
Furunculosis	Sea trout (Salmo trutta)	River Tyne N.E. coast	120 spawners	Adult spawners	0.25	November	FDL Weymouth monitoring programme for wild fish
IPN (Te)	Sea trout	River Conway N. Wales	110	" "	2 pools of 5 fish tested positive	December	
Bonamia ostreae	Ostrea edulis	29 E4	330	Adult	Prevalence in spot samples ranged 0-8.3% (overall 3%)	October	FDL Weymouth monitoring programme for oysters

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Gill x-cell lesions	Limanda limanda	41E7	2500	10–36	1.2	May/June	Combined data from sewage sludge dump and control sites
		41E8	737	10–35	2.0	May	
		44E6	161	8–31	39.1	June	
		44E7	32	15–32	0.0	June	
		45E6	725	11–31	0.3	June	
		45E7	611	11–31	0.0	June	
		46E5	188	12–34	1.1	June	
		46E6	183	13–34	0.5	June	
		46E7	694	11–29	0.0	June	
		46E8	310	13–36	0.0	June	
		46E9	6	15–27	0.0	June	
		47E6	2	27–29	0.0	June	
		47E7	24	13–25	0.0	June	
		47E8	513	12–35	0.0	June	
		47E9	52	14–33	0.0	June	
		48E8	76	12–31	0.0	June	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

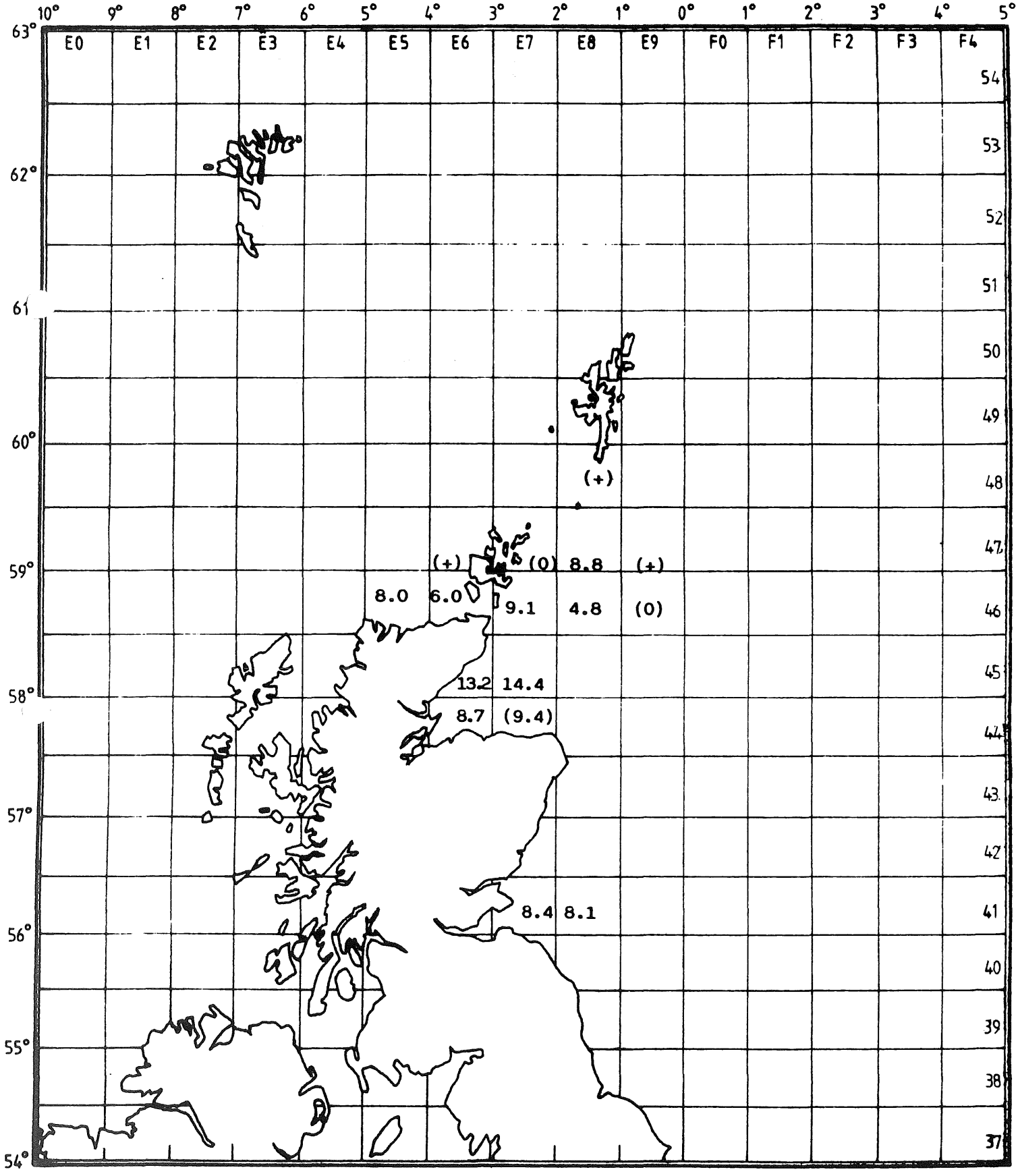
(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALANCE (%)	TIME OF YEAR	REMARKS
Lymphocystis	Limanda limanda	41E7	2500	10–36	8.4	May/June	Combined data from sewage sludge dump and control sites
		41E8	737	10–35	8.1	May	
		44E6	161	8–31	8.7	June	
		44E7	32	15–32	9.4	June	
		45E6	725	11–31	13.2	June	
		45E7	611	11–31	14.4	June	
		46E5	188	12–34	8.0	June	
		46E6	183	13–34	6.0	June	
		46E7	694	11–29	9.1	June	
		46E8	310	13–36	4.8	June	
		46E9	6	15–27	0.0	June	
		47E6	2	27–29	50.0	June	
		47E7	24	13–25	0.0	June	
		47E8	513	12–35	8.8	June	
		47E9	52	14–33	11.5	June	
		48E8	76	12–31	10.5	June	

Scotland

Dab Lymphocystis (% prevalence)

( ) indicates presence or absence where sample size <100



INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

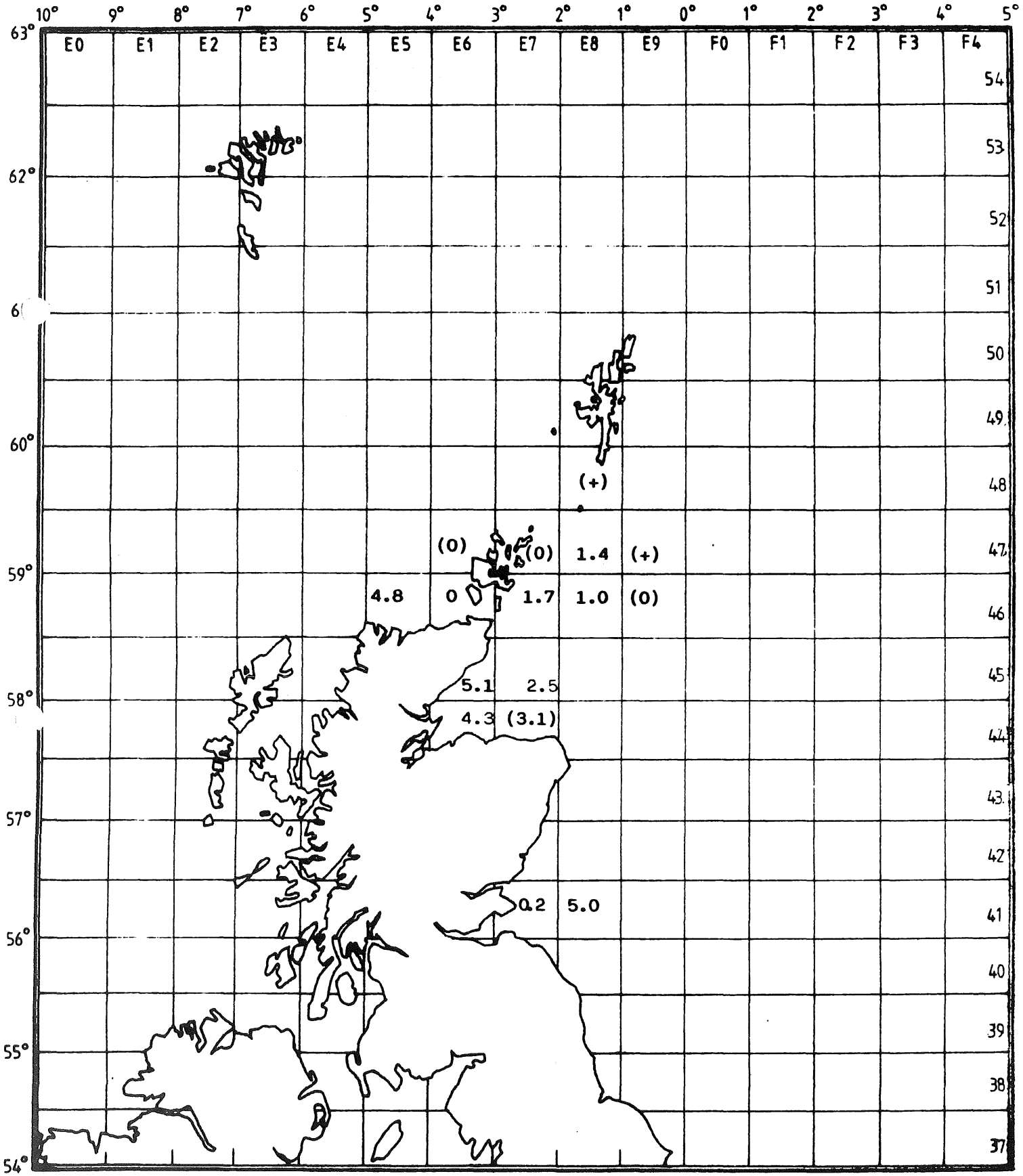
(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Hyperplasia/ Papilloma	Limanda limanda	41E7	2500	10–36	0.2	May/June	Combined data from sewage sludge dump and control sites
		41E8	737	10–35	5.0	May	
		44E6	161	8–31	4.3	June	
		44E7	32	15–32	3.1	June	
		45E6	725	11–31	5.1	June	
		45E7	611	11–31	2.5	June	
		46E5	188	12–34	4.8	June	
		46E6	183	13–34	0.0	June	
		46E7	694	11–29	1.7	June	
		46E8	310	13–36	1.0	June	
		46E9	6	15–27	0.0	June	
		47E6	2	27–29	0.0	June	
		47E7	24	13–25	0.0	June	
		47E8	513	12–35	1.4	June	
		47E9	52	14–33	1.9	June	
		48E8	76	12–31	1.3	June	

Scotland

Dab Hyperplasia/Papilloma (% prevalence)

( ) indicates presence or absence where sample size <100



INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

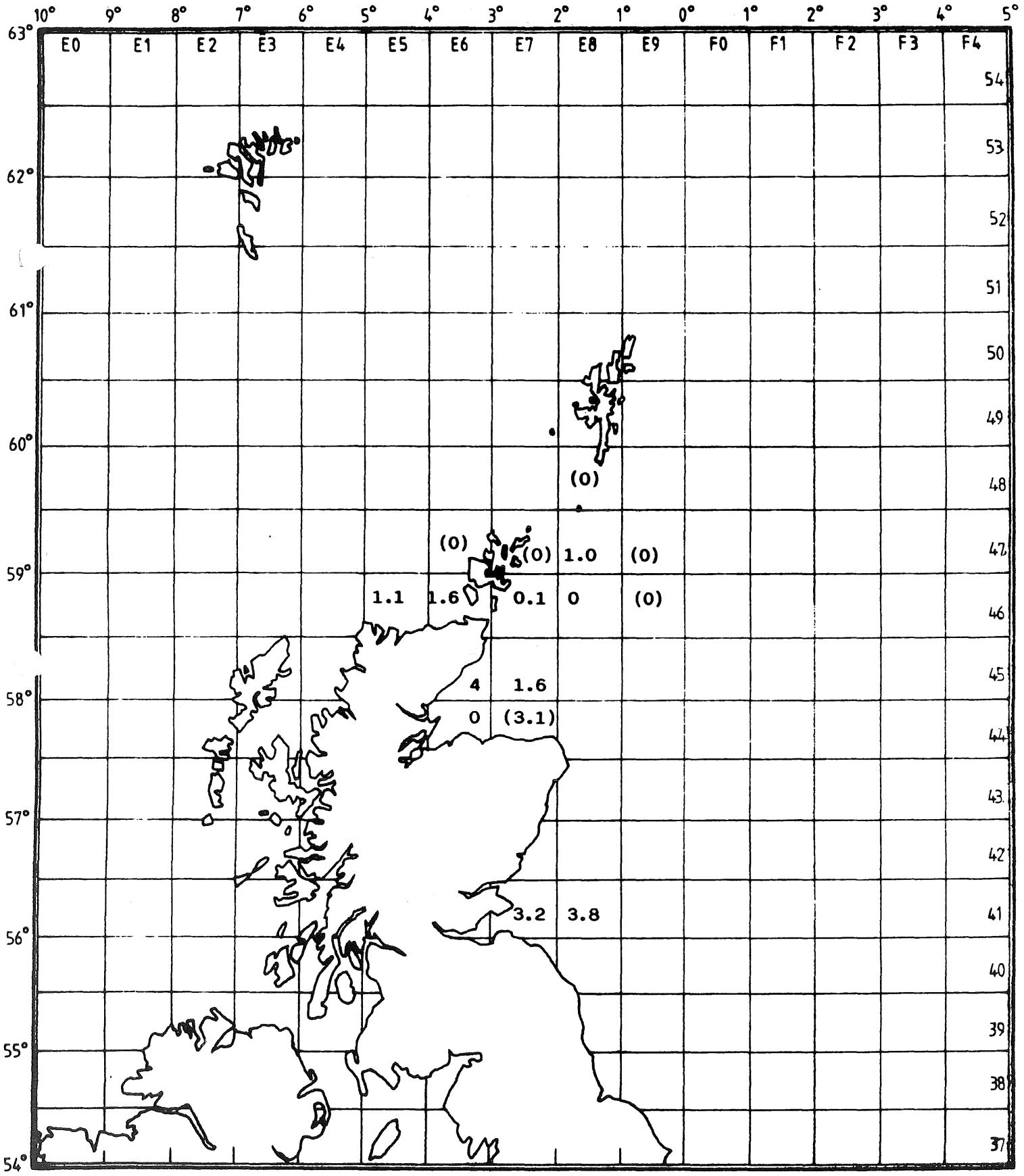
(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Skin ulcers	Limanda limanda	41E7	2500	10–36	3.2	May/June	Combined data from sewage sludge dump and control sites
		41E8	737	10–35	3.8	May	
		44E6	161	8–31	0.0	June	
		44E7	32	15–32	3.1	June	
		45E6	725	11–31	4.0	June	
		45E7	611	11–31	1.6	June	
		46E5	188	12–34	1.1	June	
		46E6	183	13–34	1.6	June	
		46E7	694	11–29	0.1	June	
		46E8	310	13–36	0.0	June	
		46E9	6	15–27	0.0	June	
		47E6	2	27–29	0.0	June	
		47E7	24	13–25	0.0	June	
		47E8	513	12–35	1.0	June	
		47E9	52	14–33	0.0	June	
		48E8	76	12–31	0.0	June	

Scotland

Dab Ulcers (% prevalence)

( ) indicates presence or absence where sample size <100



INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

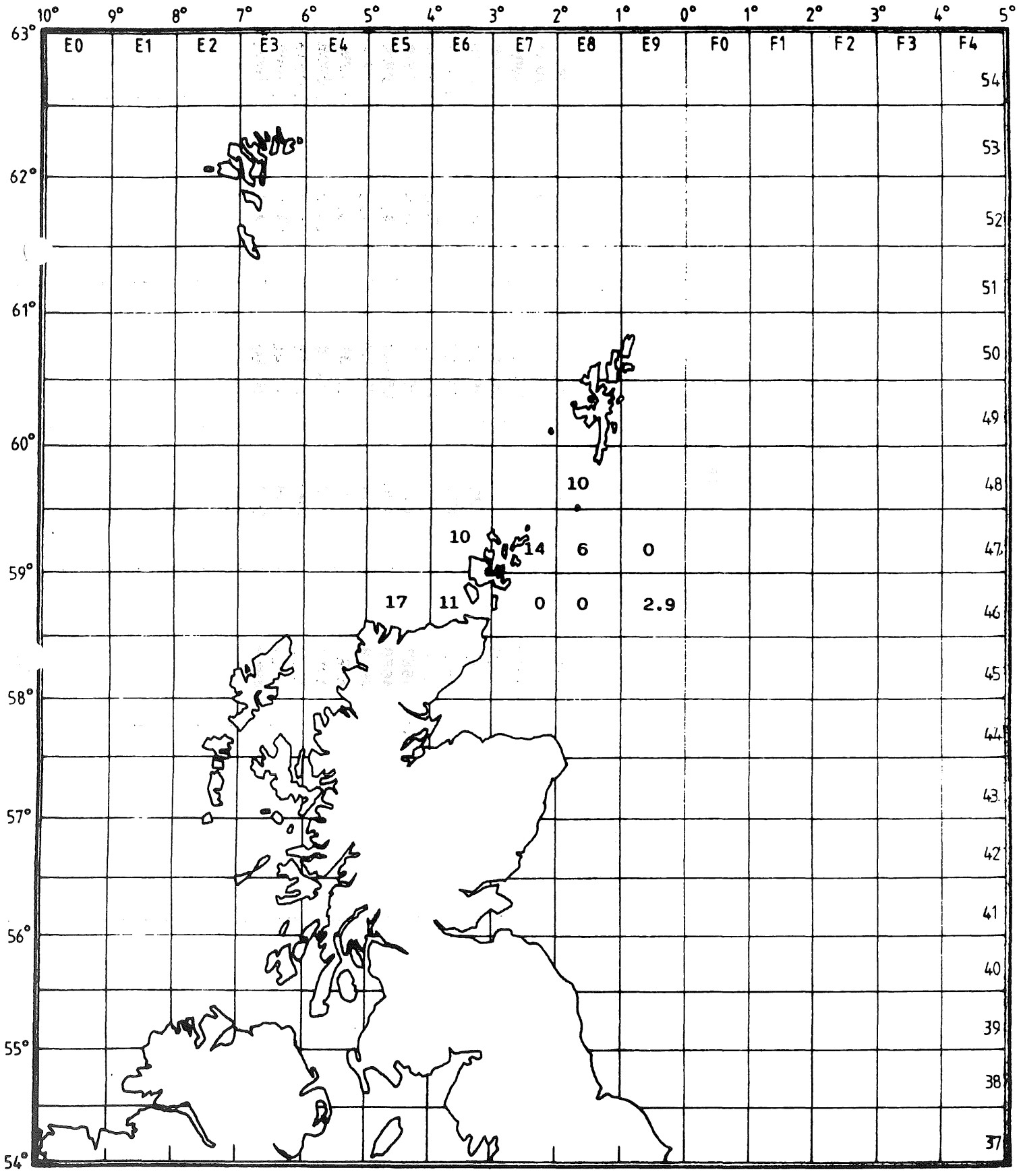
FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Ichthyophonus	Melanogrammus aeglefinus	46E5	200	26–62	17.0	June	
		46E6	109	26–42	11.0	June	
		46E7	50	26–45	0.0	June	
		46E8	50	26–35	0.0	June	
		46E9	34	26–39	2.9	June	
		47E6	50	26–44	10.0	June	
		47E7	50	26–38	14.0	June	
		47E8	100	26–48	6.0	June	
		47E9	38	26–41	0.0	June	
		48E8	100	26–50	10.0	June	

Scotland

Haddock Ichthyophanus (% prevalence)



INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

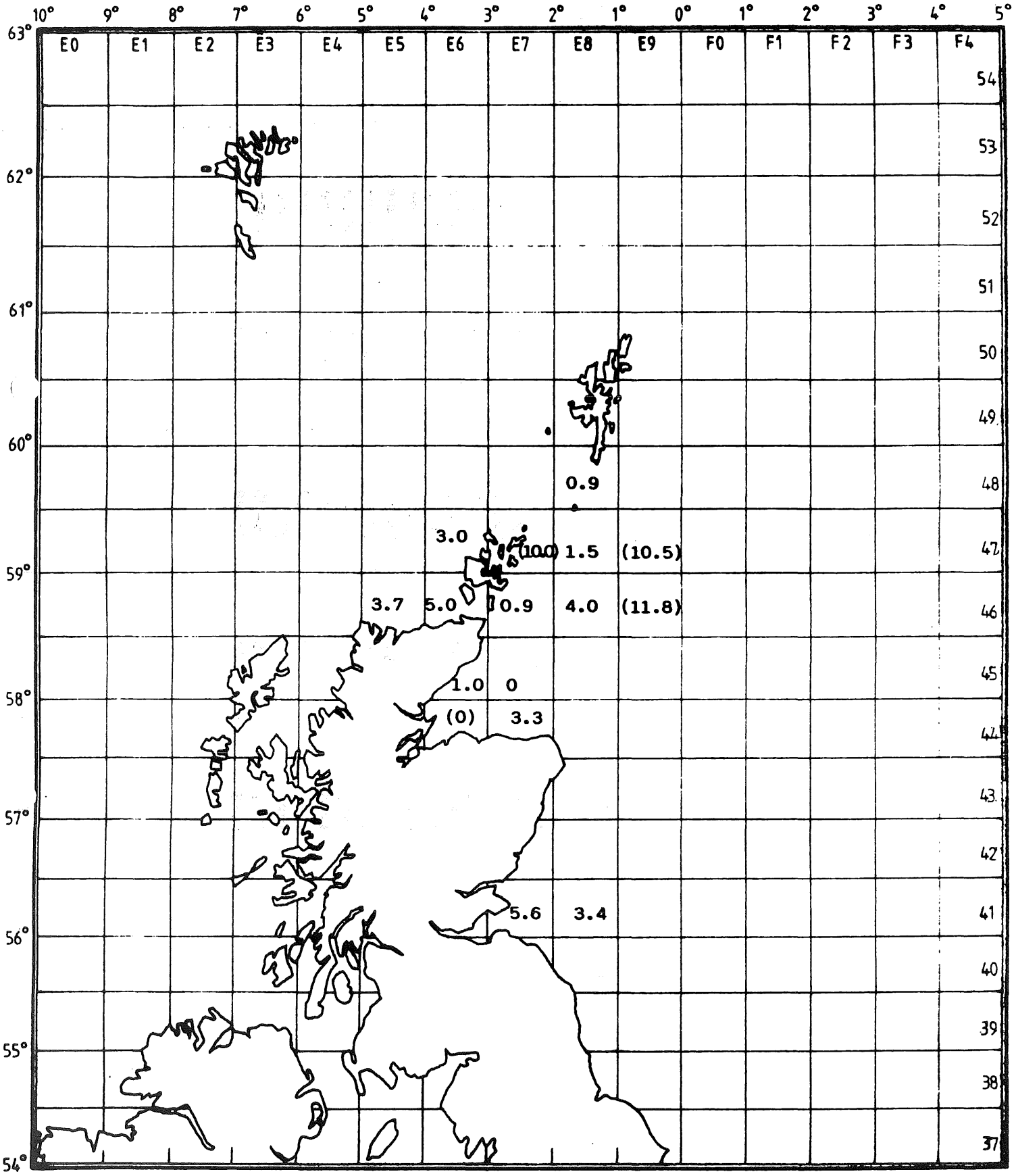
(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Vertebral anomaly	Melanogrammus aeglefinus	41E7	994	22–48	5.6	May/June	Combined data from sewage sludge and control sites
		41E8	119	26–46	3.4	May	
		44E6	3	27–32	0.0	June	
		44E7	153	26–44	3.3	June	
		45E6	103	26–40	1.0	June	
		45E7	228	26–42	0.0	June	
		46E5	431	26–62	3.7	June	
		46E6	240	26–47	5.0	June	
		46E7	110	26–45	0.9	June	
		46E8	100	26–52	4.0	June	
		46E9	34	26–39	11.8	June	
		47E6	100	26–44	3.0	June	
		47E7	50	26–38	10.0	June	
		47E8	200	26–48	1.5	June	
		47E9	38	26–41	10.5	June	
		48E8	217	26–50	0.9	June	

Scotland

Haddock vertebral anomalies (% prevalence)

( ) indicates presence or absence where sample size <100



INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Pseudobranch swelling	Gadus morhua	41E7	518	16–81	1.7	May/June	Combined data from sewage sludge dump and control sites
		41E8	186	17–71	4.3	May	
		44E6	11	12–16	0.0	June	
		44E7	30	12–44	6.7	June	
		45E6	35	16–62	0.0	June	
		45E7	54	12–49	0.0	June	
		46E5	4	21–29	0.0	June	
		46E6	10	21–47	0.0	June	
		46E7	12	19–86	0.0	June	
		46E8	6	32–81	0.0	June	
		46E9	5	45–73	0.0	June	
		47E6	1	27	0.0	June	
		47E7	2	17–23	0.0	June	
		47E8	59	27–77	1.7	June	
		47E9	26	18–95	0.0	June	
		48E8	78	23–88	0.0	June	

INTERNATION... COUNCIL FOR THE EXPLORATION O. THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(A) WILD POPULATIONS COUNTRY: SCOTLAND YEAR: 1987

DISEASE/PARASITE	HOST/SPECIES	LOCATION (ICES GRID)	NUMBER EXAMINED	SIZE RANGE (cm)	PREVALENCE (%)	TIME OF YEAR	REMARKS
Ichthyophonus	Pleuronectes platessa	41E7	233	18–56	0.0	May/June	Combined data from sewage sludge dump and control sites
		41E8	79	18–47	0.0	May	
		44E6	145	5–45	0.0	June	
		44E7	18	18–31	0.0	June	
		45E6	89	11–34	0.0	June	
		45E7	4	20–31	0.0	June	
		46E5	48	21–36	2.1	June	
		46E6	49	7–39	0.0	June	
		46E7	18	19–39	0.0	June	
		46E8	3	32–50	0.0	June	
		47E6	3	23–30	0.0	June	
		47E7	1	22	0.0	June	
		47E8	35	24–48	2.9	June	
		48E8	3	30–39	0.0	June	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE: COUNTRY: CANADA, ATLANTIC COAST YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Bacteria Kidney Disease *Renbacterium salmoninarum*	*Salmo salar*	New Brunswick	2	June-July September		Stocks destroyed
" "	*Salmo salar*	Nova Scotia	1	July		Stocks destroyed
Vibriosis *Vibrio ordali*	*Salmo salar*	New Brunswick	6	Sept. to Dec.		Chronic low level mortalities mainly caused by *Vibrio ordali*
Vibriosis *Vibrio ordali*	*Salmo gairdneri*	Nova Scotia	1	August		
Vibriosis *Vibrio ordali*	*Placopectens* sp	Nova Scotia	1	November		Juveniles
Furunculosis *Aeromonas salmonicida*	*Salmo salar*	New Brunswick	1	October		Few mortalities

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE: COUNTRY: Canada, Pacific Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	PREVALENCE (eg. % MORTALITIES)	REMARKS
Furunculosis *Aeromonas salmonicida*	*Oncorhynchus tshawytscha*	British Columbia	5	Mar to May, July		
Chaetoceros Bloom	*Salmo salar*		1	March		As the farmers now deal with *Chaetoceros* blooms on their own, the number of outbreaks reported is not representative of the large numbers of mortalities especially in October.
	Salmo gairdneri		1	Oct.		
	Oncorhynchus tshawytscha		2	April, May Oct.		
	Oncorhynchus kisutch		1			

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE: COUNTRY: Canada, Pacific Coast YEAR: 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	PREVALENCE (eg. % MORTALITIES)	REMARKS
Denman Island Disease (Protozoan microcell)	Crassostrea gigas	British Columbia	5	Jan. to May	1-30	Accurate % prevalence are difficult to determine.
Fatal Inflammatory Bacteremia Actinomycete (Nocardia sp)	Crassostrea gigas	British Columbia	5	Jan., April Aug. & Oct.	1-30	Most mortalities occur in late summer and fall,
Bacterial Kidney Disease (Renibacterium salmoninarum)	Salmo salar	British Columbia	2	Jan., Aug., Sept.		
" "	Salmo gairdneri	British Columbia	1	May		
" "	Oncorhynchus tshawytscha	British Columbia	12	Jan. to Nov		
" "	Oncorhynchus kisutch	British Columbia	6	Jan. to Aug		
Furunculosis Aeromonas salmonicida	Salmo salar	British Columbia	1	July		

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: DENMARK YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Vibriosis	Rainbow trout (Salmo gairdneri)	In all cage cultures	One per fish farm	April-Nov	Low mortalities	
Furunculosis			One per fish farm	June-Nov	Low mortalities	Due to the relatively cold summer serious disease problems were not observed.
VHS		Four farms		May-June	Low mortalities	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASE: ANNUAL REPORT.

(B) MARICULTURE COUNTRY: Finland YEAR 1987

Disease/Parasite	Host Species	Number of outbreaks	Time of year	Significance (eg % Mortalities)	Remarks
Vibriosis	S. gairdneri S. trutta	c. 30	June - Dec.	Signif. losses	Also in vac cinated fis
Furunculosis	S. salar	5	June - Dec.	Signif. losses	
Yersiniosis	S. gairdneri	1	Autumn	No losses	
Pseudomonas sp.	S. gairdneri	4	June - Dec.	Mortalities	
IPN	S. gairdneri	1	Nov	No symptoms	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE (FINFISH) COUNTRY: FRANCE YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Bacteriosis						
- Vibriosis	Rainbow trout	Tréguier	3	April	20 %	- Treatment : Oxolinic acid Trimethoprim-Su
	Coho	Tréguier	1	May		- Vaccination
	Turbot	Morbihan	1	Summer	10 - 50 %	New Vibrio strain
	Sea-bass	Méditerranée	?	All the year		
- Renibacteriosis	Coho	Brittany		Winter	less than 5 %	
- Yersiniosis	Rainbow trout	Tréguier	1 case		No mortality	
- Myxobacteriosis	Atlantic Salmon	Brest	1	July	Low mortality	
Parasitism						
- Lepeophteirius	Rainbow trout	Brest	1	Summer		
- Trichodina	Turbot	Brest	1	September	Low mortality	
- Trichodina and other ciliates	Elvers	Ile d'Yeu	1	May	Low mortality	
- Exophiala sp.	Atlantic Salmon	Brest	1		Occasional	in Kidney
	Turbot		1		"	in Kidney
Phytoplancton Bloom	Rainbow trout	Brittany (Douarnenez)	1	April	15 tons	Disteplanus speculum
General Pathology						
Cataract	Rainbow trout Atlantic Salmon	Brest		Summer	No mortality	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: IRELAND YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Furunculosis	Atlantic salmon	west + s.w. of Ireland	2	summer + winter	6% (In the one case)	Prevalence less than previous years
Pancreas disease	Atlantic salmon	west of Ireland	8	summer	Up to 20%	Most serious disease problem in country.
Sea Lice	Atlantic salmon	West of Ireland	0			No serious losses in 1987
New diseases	Atlantic salmon	west/n.west	5	summer	Up to 12% losses	Sudden peak in mortalities
Bonamia	Oysters	south west	2	winter	90% in one case 0% in other case	Serious problem

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY:NORWAY YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Cold water vibriosis/ Vibrio salmonisida	Atlantic salmon (r.b. trout)	all along coast		whole year peak late autumn/winter	high mortalites	Economically most important disease in salmon industry. Vaccine under trial.
Vibriosis Vibrio anguillarum	Atlantic salmon r.b. trout, char, cod, turbot, halibut	all along coast	variable	often in young fish being addapted to sea water, of the marine species in young fish	can give high mortalities	
Furunculosis Aeromonas salmonicida var. salm.	Atlantic salmon	Namdal region	present in 11 sites			After import from Scotland in 1985
Yersinosis Yersinia ruckerii	Atlantic salmon	all along coast	present in large amount of sites	whole year	variable	Both in fresh and sea water

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: NORWAY YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Bacterial kidney disease, Renibacterium salmoninarum.	Atlantic salmon, wild and cultured	west coast	present in many sites	not many outbreaks		
IAS - infectious anemia in salmon	Atlantic salmon	Bergen region		whole year	can give high mortalities	most probable a new vir infection
Heart disease	Atlantic salmon	several regions	variable	whole year	low mortalities over extended periods	often affects largest a best conditioned fish

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: POLAND YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Furunculosis	Salmo salar	Puck Bay	1	May	Low mortalities	

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: SPAIN YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Bacillar necrosis (V. tubiashi, Vibrio spp.)	Ostrea edulis	NW Spain		All year	High mortalities	Only larval stages
Bonamia ostreae	Ostrea edulis	NW Spain	25 %	Max. April	50%	
Perkinsus spp.	Venerupis decussata	NW Spain	38%	Summer	High	Clams imported from Portugal
Haplosporidium SSO like	Mytilus edulis	NW Spain	3%	Summer	None	
Nematopsis	Cardium edule	NW Spain	90%	All year	?	
Marteilia maurini	Mytilus edulis	NW Spain	90% max	All year	?	
Steinhausia mytilovum	Mytilus edulis	NW Spain	3%	All year	None	
Ciliates	Mytilus edulis	NW Spain	90% max	All year	None	
Hemocytic disorder	Mytilus edulis	NW Spain	3%			
Proctoeces maculatus	Mytilus edulis	NW Spain	5%	Summer		
Rudolphinus crubiculum	Mytilus edulis	NW Spain	3%	Summer		
Modiolicola gracilis	Mytilus edulis	NW Spain	3%	Summer		
Mytilicola intestinalis	Mytilus edulis	NW Spain	100% max.	All year		
Haplosporidium spp.	Venerupis decussata	NW Spain	50%	November	70% in depuration	plants.
Vibrio alginoliticus	Penaeus kerathurus	Mediterranean	100%	Summer	High mortalities	Mysis I and II It did not appear in P. japonicus.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: SPAIN YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Vibrio anguillarum	Coho salmon	NW Spain		Winter and		
	Turbot	"		Autumn	HIGH	Mainly juveniles
	Rainbow trout	"				
	Sea bass	Mediterranean				
Vibrio spp.	Coho salmon	NW Spain		All year		
	Turbot	"		around	No significant	ADULTS
Renibacterium salmoninarum (BKD)	Coho salmon	NW Spain			" "	Subclinical
Myxobacteriosis	Coho salmon					
	Turbot	NW Spain		All year	" "	Associated with Vibrio
IPN	Coho salmon	NW Spain				Carrier in ovarian fluid
Reo-like virus	Turbot	NW Spain		IX-X	Low but continous	Adults
Trichodina	Turbot	Nw Spain			No mortalities	
Icthyophonus	Sea bass	Mediterranean		All year	No mortalities	Mainly adults
Scyphidia macropodia	Eel	SW Spain			No mortalities	Juveniles

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASE: ANNUAL REPORT.

(B) MARICULTURE COUNTRY: Sweden YEAR 1987

Disease/Parasite	Host Species	Number of outbreaks	Time of year	Significance (eg % Mortalities)	Remarks
IPN	Salmo gairdneri	2			one new in
BKD	" "	13			" " "
vibriosis	" "	current problems			
furunculosis	" "	6			

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE

COUNTRY: England and Wales

YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
Myxobacteriosis	Atlantic salmon (*Salmo salar*)	N.E. England	1	Overwinter	Low mortalities	FDL Weymouth investigations Primary physical damage, little response to treatmer
Furunculosis	" "	S. Wales	1	Summer	" "	Successful treatment with oxytetracyclin
Pancreas disease	" "	S. coast	1	Autumn	" "	First recognition in England and Wales not associated with IPN.
Bonamia ostreae	*Ostrea edulis*	Poole	Spread of infection to two previously clean areas	All year	> 50%	Reduction in reports of clinical disease following adoption of MAFF guidelines, but infection still recognised in the Fal and Helford estuaries, Poole and Emsworth Harbours, and the Essex coats.
Minchinia spp.	*Crassostrea virginica*	Poole	1	" "	Mortalities due to *Minchinia* uncertain	Low numbers of parasites but significant pathology.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

FISH AND SHELLFISH DISEASES: ANNUAL REPORT

(B) MARICULTURE COUNTRY: SCOTLAND YEAR : 1987

DISEASE/PARASITE	HOST SPECIES	LOCATION	NUMBER OF OUTBREAKS	TIME OF YEAR	SIGNIFICANCE (eg % MORTALITIES)	REMARKS
IPN virus	Atlantic salmon and rainbow trout	N Isles W Isles W Coast	11 new occurrences 1 clinical outbreak	Clinical outbreak June	Few thousand mortalities in clinical outbreak	
Furunculosis	Atlantic salmon	As above	Over 50% sea sites affected	Mostly May-November	10% max	Cost of treatment major penalty
Sea lice	Atlantic salmon	As above	Most sites affected	All year	1 mortality due to lice. Some mortalities due to treatment	Cost of treatment major penalty
Pancreas disease	Atlantic salmon	As above	At least ca 20-30 sites affected	March-November	Variable. High mortalities in a few sites	
BKD	Atlantic salmon and rainbow trout	W Coast	Six sites affected	All year	Low mortalities	
ERM	Rainbow trout	W Coast	One site affected	All year	Significant	Introduced from fresh wa
Vibrio	Atlantic salmon and rainbow trout	W Coast N & W Isles	Widespread	All year	Low mortalities	Associated with stress o damage