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5-9 March 2013

Padova, Italy



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Executive summary

The ICES Working Group on Pathology and Diseases of Marine Organisms (WGPDMO) met from the 5 – 9 March 2013 at the Istituto Zooprofilattico Sperimentale delle Venezie in Padova, Italy. The meeting, chaired by Neil Ruane (Ireland), was attended by 13 participants representing 11 ICES Member Countries. In order to consider the 9 Terms of Reference, intersessional work was done by WGPDMO members and several working documents were provided in advance of the meeting.

The agenda items covered a wide range of topics related to diseases and pathology in wild and farmed finfish and shellfish.

The group produced a report on new disease trends in wild and farmed fish and shellfish in the ICES area, based on national reports received from 14 member countries. WGPDMO noted that the issue of sea lice infestations on wild salmonids is an area of increasing concern. In relation to farmed fish, amoebic gill disease has emerged as a major issue for Atlantic salmon farming in Ireland and Scotland. Pancreas disease (PD) caused by the salmonid alphavirus subtype 2 is also spreading in Norway, previously PD in Norway was only caused by subtype 3. For farmed shellfish, a new host species for *Bonamia exitiosa* was identified in the US and *Vibrio aestuarianus* has been linked to increased mortalities in Pacific oysters in Europe.

The Fish Disease Index (FDI) was adapted for use with flounder and cod, in addition to the existing method for dab. The FDI approach was also successfully applied to data on macroscopic liver neoplasms and liver histopathology. The FDI methodology is currently being prepared for publication as an ICES TIMES report. A number of additional working documents were discussed, such as “Disease interactions between farmed and wild finfish”, “Trends in important diseases affecting the culture of fish and molluscs in the ICES area” and “Disease-associated population effects in commercial marine fish and shellfish species”. All of which are planned to be published in the ICES Cooperative Research Report Series.

Five new ICES Identification Leaflets for Diseases and Parasites of Fish and Shellfish were published and are available on the ICES website. These include leaflets on ‘Heart and Skeletal Muscle Inflammation’; ‘*Ichthyophonus*’; ‘*Pseudoterranova* larvae in fish’; ‘*Anasakis* larvae in fish’ and ‘Marteiliosis of oysters’. A range of new leaflets are planned for publication in 2013 as well as the updating of older leaflets.

Specific recommendations from the meeting include (see Annex 2):

Investigations are initiated or continued in ICES Member Countries on *Mikrocytos mackini*, *Perkinsus* sp. and *Bonamia exitiosa* which continue to be detected in new shellfish host species.

ICES Member Countries should be aware of the emergence of *Vibrio aestuarianus* as an important pathogen of Pacific oysters which should be monitored.

WGPDMO request advice on how best to implement the proposed plan for maintaining and updating the disease maps

1 Administrative details

Working Group on Pathology and Diseases of Marine Organisms**Year of Appointment: 2013****Reporting year within current cycle: 1****Chair:**

Neil Ruane, Ireland

Meeting venue

Legnaro (Padova), Italy

Meeting dates

5–9 March 2013

2 Terms of Reference a) – i)

ToR a) New disease trends in wild and cultured fish, molluscs, and crustaceans based on national reports.

ToR b) Parasites and other infectious agents in marine finfish and shellfish species posing a hazard to human health.

ToR c) Disease interactions between farmed and wild finfish.

ToR d) ICES publication 'Trends in important diseases affecting the culture of fish and molluscs in the ICES area 2003 – present'.

ToR e) Maps of fish and shellfish diseases.

ToR f) The Fish Disease Index (FDI) in relation to results of FDI assessments of diseases of flounder and Baltic cod and liver histopathology and macroscopic liver lesions in the common dab.

ToR g) Disease associated population effects of commercial fish and shellfish species.

ToR h) ICES publications on pathology and diseases of marine organisms.

ToR i) Provide expert knowledge and advice on fish disease and related data to the ICES Data Centre on a continuous basis.

3 Summary of Work plan

ToR a) New disease conditions and trends in diseases of wild and cultured marine organisms will be reviewed. This is an annual, on-going ToR for WGPDMO and will provide information for ToR d.

ToR b) A range of parasites and other infectious agents reported by WGPDMO have the potential to be harmful to human health if ingested in under processed food. There is an upward trend in the consumption of raw fish and other seafood products which may increase this risk. Literature reviews of risk, prevention and mitigation strategies will be prepared.

ToR c) WGPDMO has produced reports on disease interactions between farmed and wild finfish since 2010. The reports will be reviewed and a decision made regarding their suitability for publication in an ICES journal. Contact with WGEIM and WGAQUA will be established should collaboration be deemed necessary.

ToR d) The previously published report now requires updating with new information on diseases of importance for aquaculture, including new and emerging diseases. An earlier draft of the document will be reviewed and final updates added during the meeting with a view to preparing the report for publication as an ICES Cooperative Research Report.

ToR e) Much of the information presented on the ICES website regarding the distribution of aquatic diseases is outdated. WGPDMO will develop a plan on the type of information considered to be useful for presentation on the ICES website and on ways of facilitating regular updates.

ToR f) Use of the FDI on fish species other than dab (i.e. flounder and cod) will be investigated. Furthermore, the FDI strategy and the assessment criteria proposed for macroscopic liver neoplasms and liver histopathology will be validated based on available national datasets.

ToR g) The potential risk to fish and shellfish populations due to disease is of considerable ecological and economical concern. Population dynamics and epidemiological models will be reviewed in light of their applicability for studies in wild aquatic animals.

ToR h) A number of ICES publications currently in preparation will be reviewed by WGPDMO. This is an on-going, annual ToR.

ToR i) This is an annual ToR in compliance with a request from the ICES Data Centre.

4 List of Outcomes and Achievements of the WG in this delivery period

- A report on new disease trends in wild and farmed fish and shellfish in ICES Member Countries, which is the only annual expert report available on this topic.
- The Fish Disease Index was successfully adapted for use with flounder and cod and will become available for use within the next 12 months (see section 5.6 for more details).
- ICES Disease Leaflet Series (new): No. 58 'Heart and skeletal muscle inflammation (HSMI) of farmed Atlantic salmon (*Salmo salar* L.) and the associated *Piscine reovirus* (PRV)' (E. Biering and A. H. Garseth).
- ICES Disease Leaflet Series (updated): No. 3 '*Ichthyophonus*, a systemic mesomycetozoan pathogen of fish' (S. R. M. Jones).
- ICES Disease Leaflet Series (updated): No. 7 '*Pseudoterranova* larvae ("cod-worm"; Nematoda) in fish' (M. Longshaw).
- ICES Disease Leaflet Series (updated): No. 8 '*Anisakis* larvae ("herring-worm"; Nematoda) in fish' (M. Longshaw).
- ICES Disease Leaflet Series (updated): No. 19 'Marteiliosis of oysters caused by *Marteilia refringens*' (T. Renault and S. E. Ford).

5 Progress report on ToRs and workplan

5.1 Produce an update of new disease trends in wild and cultured fish, molluscs and crustaceans based on national reports (ToR a).

The update in the following sections is based on national reports for 2012 submitted by Canada, Denmark, England and Wales, Finland, France, Germany, Ireland, Netherlands, Norway, Poland, Russia, Scotland, Sweden and the USA. It documents significant observations and highlights the major trends in newly emerging diseases and in those identified as being important in previous years.

5.1.1 Wild Fish

Viruses

Perch Rhabdovirus - Mortalities of several hundred wild perch occurred during the spawning migrating from brackish water to freshwater in South Zealand (Denmark). Perch rhabdovirus was isolated from the fish but further tests (e.g. infection trials) are required to establish whether the mortalities were caused by the virus.

Bacteria

Flavobacterium psychrophilum - Mortalities in spawning tench from the County of Kalmar on the Baltic Sea coast of Sweden during May 2012 were associated with the presence of skin lesions and muscle haemorrhaging. The bacterium was isolated from affected fish, representing the first isolation from tench in Sweden.

Skin ulcerations – The mean prevalence of skin ulcers in cod from the Polish EEZ of the Baltic Sea (ICES Subdivisions 25 and 26) increased to 5.3% from 4.4% in 2011.

Parasites

Crustacea – Copepoda

Lepeophtheirus salmonis – High levels of sea lice were again recorded on wild salmonids in Norway with an increased prevalence reported along the coast from Hordaland to Troms. It is believed that sea lice infestations have had population-reducing effects, particularly on sea trout but also on Atlantic salmon smolts in Norway. In the middle and outer Hardangerfjord, where the density of salmon farms is high, the lice infection on wild salmonids was higher in 2012 compared with 2011 and 2010. For example, at the Etne station in Hardanger in week 24, the prevalence on sea trout was

99%, mean intensity of infection was 139 lice, n = 205. In the Rosendal station in Hardanger in week 24, the prevalence was 100%, mean intensity of infection was 55 lice, n = 65. This can be compared to Sandnesfjorden, an area without salmon farming, where in week 23 the prevalence of sea lice on sea trout was 21%, mean intensity of infection was 1 lice, n = 14. In week 27, the prevalence was 64%, mean intensity of infection was 3 lice, n = 22 (see reference in Norwegian). http://www.imr.no/filarkiv/2012/12/rapport_lakselusinfeksjonen_pa_vill_laksefisk_langs_norskekysten_i_2012.pdf/nb-no

Other diseases

Hyperpigmentation - In the Irish Sea the prevalence in dab continued to follow an increasing trend at Liverpool Bay stations with the highest prevalence recorded in fish from Inner Liverpool Bay (21.3%).

Conclusions

- The prevalence of hyperpigmentation is increasing in the Irish Sea (Liverpool Bay).
- The potential effects of sea lice infestations on wild salmonid populations is an area of concern for both the aquaculture and wild fishery sectors and WGPDMO are currently looking at this issue (ToR c and ToR g).
- The WGPDMO noted with concern that some ICES Member Countries have not provided sufficient resources to support wild fish monitoring programmes, resulting in an insufficient spatial and temporal coverage of fish populations. It was emphasized that this lack of data will affect marine ecosystem health assessments in national and international programmes (e.g. under the EU Marine Strategy Framework Directive, OSPAR Coordinated Environmental Monitoring Programme (CEMP), and revised HELCOM monitoring programme). Additionally, there is a risk that emerging disease conditions affecting marine fish will not be detected.

5.1.2 Farmed Fish

Viruses

Infectious Salmon Anaemia Virus (ISAV) – In Canada, two ISA outbreaks were confirmed in Atlantic salmon in Newfoundland, representing the first occurrence in this region. In both cases there was a concurrent infection with *Renibacterium salmoninarum* and mortalities were low (< 2.4%). ISAV was also confirmed by qRT-PCR and virus isolation at two Atlantic salmon production sites in Nova Scotia (NS) for the first time since 2003.

Infectious Pancreatic Necrosis Virus (IPNV) - In Norway, the number of reported IPN outbreaks was 119, a decrease from 154 in 2011. The extensive use of IPN-resistant fish may be contributing to this reduction.

Viral Haemorrhagic Septicaemia Virus (VHSV) - VHSV was isolated from rainbow trout in the Åland restriction compartment of Finland. The number of VHS outbreaks in this restriction compartment has been fluctuating throughout the years since the first outbreak in 2000 and seems to be decreasing. In Scotland, VHSV was detected by PCR and cell culture in rock cook, ballan wrasse and goldsinny wrasse in a research facility. This is the first isolation of VHSV from cleaner fish.

Infectious Haematopoietic Necrosis Virus (IHNV) - In Canada, the virus was confirmed during routine monitoring of Atlantic salmon at three marine production sites in British Columbia (BC). The infections were associated with slightly elevated mortality (1-1.5%) and the affected stock was subsequently destroyed. The same U genotype was observed in all cases and these shared an identical G-gene sequence with a strain commonly occurring in wild Pacific salmon. Previously in BC, outbreaks of infection in Atlantic salmon occurred in 1992 (4 year duration of outbreak) and 2001 (2 year duration). Mortality during the latter outbreaks ranged from 20% to 94%.

Heart and Skeletal Muscle Inflammation (HSMI) - In Norway the number of outbreaks in Atlantic salmon was 142, a decrease from 162 in 2011.

Piscine Myocarditis Virus (PMCV) - In Norway, the number of cardiomyopathy syndrome (CMS) outbreaks in Atlantic salmon continued the upward trend with 89 diagnoses in 2012, from 74 in 2011. CMS was diagnosed for the first time in Ireland on an Atlantic salmon grower site. Clinical signs of disease were seen by histopathology and the virus detected by real-time PCR, however mortality levels were negligible.

Salmonid Alphavirus (SAV) - In Norway the number of pancreas disease (PD) outbreaks was 137, an increase from 89 in 2011. This increase is mainly due to the spread of the "new" SAV2 subtype north of Hustadvika in Møre and Romsdal county. In the endemic zone south of Hustadvika, the number of SAV3 diagnoses was similar to 2011. SAV2 has only been detected in Atlantic salmon, whereas 10 cases of SAV3 were in rainbow trout. In Scotland there was a slight decrease in salmonid alphavirus from 19% of cases investigated by Marine Scotland in 2011 to 13% in 2012. In Ireland PD continues to decline, with five cases reported in 2012 with mortalities < 5%.

Bacteria

Vibrio salmonicida - In Norway, 21 cases of cold-water vibriosis were reported, (18 affecting Atlantic salmon, 1 affecting rainbow trout and 2 affecting salmon and trout co-culture). Cold-water vibriosis is controlled by vaccination and there are no indica-

tions that failure of a specific vaccine is responsible for this increase. Genetic and biochemical studies do not indicate that the bacterium has changed with regard to virulence or antigenic properties.

Parasites

Crustacea

Lepeophtheirus salmonis – In Eastern Canada, abnormally heavy sea-lice levels appear to have been exacerbated by elevated water temperatures during summers of 2010 and 2012. However, sea lice levels have been managed when at least two bath treatment products have been available for use. In 2012, the reporting procedure for recording sea lice levels on Atlantic salmon in Norway was changed. Previously the highest average lice number per month per site was reported, whereas in 2012 this was changed to weekly reports of the individual averages per site. Reported lice from 2012 are therefore not directly comparable with numbers from previous years.

Paramoebida

Neoparamoeba perurans – In Norway, five cases of amoebic gill disease (AGD) in Atlantic salmon were diagnosed in late 2012, for the first time since 2006 when it first occurred. In Scotland there is an upward trend in AGD rising from 6% of investigated cases in 2011 to 39% in 2012. In Ireland, AGD has continued to be a significant issue for marine farming in 2012 with 15 clinical cases reported, up from 9 in 2011.

Conclusions

- SAV2 is spreading rapidly in Norwegian Atlantic salmon farming.
- AGD is a serious problem for marine farming in Ireland and Scotland and a small number of cases have also been diagnosed in Norway.
- There has been an increase in outbreaks of cold water vibriosis in Norway despite vaccination.
- The increasing use of IPN resistant fish in Norway is consistent with a reduction in the number of clinical cases reported.

5.1.3 Wild and farmed molluscs and crustaceans

Viruses

Ostreid herpesvirus 1 (OsHV-1) – The situation with OsHV-1 μ Var was similar to 2011. The virus continued to be detected by PCR and sequencing in Pacific oysters in England, France and Ireland, mainly from populations experiencing mortalities.

Bacteria

***Vibrio aestuarianus* in Pacific Oysters** - In France, massive mortality events associated with the bacterium were reported in 16 batches of adult oysters in moribund animals by real-time PCR (high percentages of positive individuals and high bacterial DNA loads). In all affected batches, OsHV-1 viral DNA was not detected or was present at very low levels by real-time PCR. Histology showed the presence of bacterial foci and lesions composed of necrotic haemocytes in affected oysters. This sign appears to be a characteristic of the bacterial infection on histological sections. Mortality in half-grown (1 - 2 yr. old) and adult (3 yr.) Pacific oysters was reported from 5 bays in Ireland. Oysters from two of these bays were confirmed positive for *V. aestuarianus*, for the first time in Ireland.

***Vibrio aestuarianus* in the Common cockle** - In August 2012, mortality outbreaks were reported from the 'Baie de Somme' in Northern France. The bacterium was isolated from 11 of 12 analysed individuals, representing the first report of this bacterium in this bivalve species in France. Characterization of the isolates collected from moribund cockles is ongoing.

Parasites

***Perkinsus marinus* in the Eastern oyster** - Levels of infection with *P. marinus* increased in Chesapeake Bay (USA) in 2012. The mean annual prevalence of this pathogen was 59%, possibly reflecting the effects of elevated water salinities.

***P. qugwadi* in Yesso scallop** - The parasite was detected in association with mortalities of cultured juvenile Yesso scallops from one location in British Columbia (Canada) in late 2011. Prevalence of infection (n = 100) was 44% by histology and 52% by PCR. This is the first observation of the parasite in 10 years.

Mikrocytos mackini - In 2011, *M. mackini* was found in the Kumamoto oyster, a new host species, from Humboldt Bay, California. Prevalence of infection ranged from 20% to 27% by histology. Histological presentation conformed to the pattern typically observed in the Pacific oyster, in that the parasite was observed to infect vesicular connective tissue cells in and around foci of strong host haemocyte infiltration.

***Mikrocytos* sp. in wedge-shell clams** - In France, in 2008, 2010 and 2011, mortality was reported among clams from wild stocks at different sites (Brittany: Bays of Audierne and Douarnenez and Charente Maritime: Oléron Island). *Mikrocytos*-like parasites were first detected by histological analysis. Sequence analysis of SSU rDNA and transmission electron microscopy showed that parasites affecting the wedge-shell clam belong to the genus *Mikrocytos*, but not to the species *M. mackini*. The parasite

was not detected by monthly sampling carried out from April 2011 to April 2012 in Charente Maritime (Oléron Island).

***Bonamia exitiosa* in eastern oyster** - In North Carolina, USA, *B. exitiosa* was found for the first time in this host species. Hatchery produced seed (6-17 mm in shell height) sampled in July 2012 were infected (93.8% prevalence), as determined using histology and *in situ* hybridization. Despite the high prevalence and intensities, no elevated mortality was documented.

***Haplosporidium nelsoni* in eastern oyster** - Levels of infection by *H. nelsoni* continued to decrease in the Chesapeake Bay region (USA) where the mean autumn prevalence reached a record low of 0.1% (n = 1,290). In 2012, the parasite was detected in Delaware Bay (USA) following its disappearance in 2011 (average prevalence 7.1%, n = 140).

***Proserhynchus squamatus* (Digenea) in blue mussel** - The parasite was detected by histology in 1/60 blue mussels examined from the Bay of Fundy, New Brunswick (Canada). The identity of the parasite was confirmed by the distinctive tri-lobed posterior appendage of the cercariae. This finding is a new locality record for the parasite.

Endosymbiotic bacterium associated with *Hematodinium* sp. in brown shrimp - An endosymbiotic bacterium residing within the spore stages of the parasite was described in England. The presence of the endosymbiont in apparently dispersive life stages of the parasite may provide evidence of mixotrophy in the free-living stages.

Other Diseases

Malpeque disease in eastern oysters - The disease was reported from histological sections in 2/120 oysters from Aspy Bay, Nova Scotia (Canada), representing a new locality.

Mortality in *M. edulis*, *C. gigas* and *O. edulis* - In Scotland, mortality in *M. edulis*, *C. gigas* and *O. edulis* (both cultured and wild) has been investigated in 2011 and 2012. In 2012, juvenile *C. gigas* (3 cases) and juvenile *M. edulis* (2 cases) suffered 10 to 50% mortality. In the former no significant pathology was observed although *Vibrio* spp. were detected. In the mussels, a severe pathology was observed, dominated by necrotic cells and granulocytomas representing non-neoplastic inflammatory cellular changes in affected individuals and *Vibrio* spp. were cultured.

***Karenia mikimotoi* blooms affecting oysters** - Along the Northwest coast of Ireland, a dinoflagellate bloom was reported in July and was associated with 60-100% mortality in both Pacific and European flat oysters.

Hematodinium sp - The long-nose spider crab, long-arm hermit crab and the flatback mud crab were identified as new and alternative hosts for the *Hematodinium* sp. pathogenic for the Chesapeake blue crab, in coastal lagoons in Virginia.

Conclusions

- *Vibrio estuarianus* has been associated with massive mortalities in adult Pacific oysters at several sites in France and in half-grown Pacific oysters in Ireland. The bacterium has also been associated with mortalities in cockles in France.
- Ostreid herpesvirus-1 μ Var continues to cause significant mortalities in juvenile Pacific oyster culture in England, France and Ireland.
- *Perkinsus qugwadi* was associated with mortality in Yesso scallop in British Columbia, Canada, for the first time in 10 years.
- *Mikrocytos mackini* was found in the Kumamoto oyster, a new host species, from Humboldt Bay, California. This is also the first report of this parasite from California.
- The Eastern oyster was identified as a new host species for *Bonamia exitiosa*, in North Carolina.

5.2 Parasites and other infectious agents in marine finfish and shellfish species posing a hazard to human health (ToR b).

A draft working report entitled "Parasites and other infectious agents in marine finfish and shellfish species posing a hazard to human health" was prepared interessionally by A. Alfjorden, M. Podolska, L. Madsen and T. Karaseva. The report provided a brief background to the issue of hazards to human health associated with the consumption of marine organisms and discussed examples from wild marine fish and other sources. Much of the remainder of the document was devoted to prevention or mitigation methods. The report emphasized that human infections derived from the consumption of seafood were underreported. The possibility that the document be further revised to provide a more focused coverage of potentially zoonotic agents most frequently observed in national reports presented to the WGPDMO, or deemed to be of high significance through an alternative ranking process was discussed. Similarly the possible inclusion in the report, of bacteria and virus agents of human disease transmitted by the consumption of seafood was discussed. The main aim of ongoing revisions to the manuscript is to ensure that this work is of significance to a broad readership. Venues for the publication of the manuscript were suggested, including the ICES Journal of Marine Science. A modified document will be presented to the WGPDMO at its 2014 meeting.

5.3 Disease interactions between farmed and wild finfish (ToR c)

A draft working document entitled “A summary of disease interactions between farmed and wild finfish” and prepared intersessionally by S. Jones, D. Bruno, L. Madsen and T.A. Mo, emphasized the growing awareness of concerns surrounding pathogen transmission from cultured to wild finfish. Information was organized into the following sections: a definition of disease, biology of pathogens and a description of the modes of pathogen transmission. Environmental and anthropogenic factors affecting pathogen transmission were assessed. The manuscript reviewed the scientific evidence and concluded that for most virus, bacterial and parasite pathogens, there was little evidence of transmission between cultured and wild finfish. In contrast, sea lice were cited as an example of a pathogen for which there is evidence in support of transmission to wild finfish. The manuscript described the management of sea lice infections within maricultured salmon populations and further evaluated the evidence of mariculture-derived sea lice in wild salmon. The evidence of impacts of these infections both at the individual and at the population level was reviewed. The manuscript emphasized the need for carefully planned and coordinated surveillance programmes permitting the objective assessment of mariculture-derived disease impacts in wild finfish. The manuscript will be prepared intersessionally for publication in an ICES Journal such as the ICES Journal of Marine Science.

5.4 Trends in important diseases affecting the culture of fish and molluscs in the ICES area (ToR d)

Information on the diseases affecting cultured fish and molluscs of commercial interest have been updated using data from previous WGPDMO reports and published literature. One of the major objectives of the report is to provide a valuable source of information on diseases that are not notifiable under EU Directives or to the World Organization for Animal Health (OIE). For finfish the major diseases have been completed. The re-emergence of amoebic gill disease means that this will now be added and also new information on trends on bacterial diseases in Finland will also be included. For molluscan pathogens, information on non-*Bonamia* haplosporidians, *Perkinsus marinus*, *Microcytos mackini* and QPX will be added and sections on *Vibrio splendidus* and *V. aesturianus* will be completed. Finally, information on *B. ostrea* and *Marteilia refringens* will be included in the report as both parasites have been detected in new locations in some EU Member States during the considered period. Work will continue intersessionally to complete the report for final review at the 2014 meeting with a view to publication as an ICES Cooperative Research Report (see Annex 4).

5.5 Maps of fish and shellfish diseases (ToR e)

Maps of fish and shellfish diseases can display the geographical distribution of various parameters such as the prevalence of diseases, summarizing quantities like the Fish Disease Index, or assessments made on the basis of BAC / EAC values. However, the relevant information is very unbalanced over the geographical area, the set of areas with information can change over the years, and some of the parameters may have a seasonal fluctuation each year but were nevertheless obtained in different seasons within a year. Therefore, a structured system of maps should be generated. Such

a system will be needed separately per parameter, because parameters may have different data densities. A possible structure for the display is described below and represents an extension of ideas put forward at the WGPDMO 2004 meeting (Section 13 ICES WGPDMO Report 2004). All levels of the display structures use the same geographical units for the display, e.g. ICES statistical rectangles.

- First level: Overview map showing for each geographical unit the amount of available data (i.e. number of time points with observations, year of last observation).
- Second level: Pop-up display started by user clicking on a geographical unit in the first level display. Provides a menu for the selection of detailed data for this unit. Selecting a menu item produces the display of the selected detail. Candidates for detail displays are (i) the raw data time-series for this unit, (ii) time-series of season-adjusted values (= seasonal effects are removed), (iii) population- and season-standardized time-series (effects of the population sex-length composition in the sample and seasonal effects are removed), (iv) time-series of assessments (green-yellow-red bar charts over time). The selection menu contains only those displays that exist for the selected parameter. This also facilitates the stepwise construction of the map.
- Third level: Accessible from the first and second level display. Return from the third level always to the calling level. Is used for background information: may contain a glossary of terms, biological background and a description of computational methods.

5.6 The Fish Disease Index in relation to results of assessments of diseases of flounder and Baltic cod, and liver histopathology and macroscopic lesions in common dab (ToR f)

The FDI has initially been developed for the assessment of diseases of common dab. The recommended form of the FDI for externally visible diseases uses 9 diseases. For datasets not comprising all these diseases, reduced FDI versions are available. As the reduced versions use less input information than the recommended full version, their ability to differentiate between disease conditions is less developed. Consequently the use of a reduced FDI may produce a geographically or temporally less differentiated assessment. However, background and environmental assessment criteria (BACs and EACs) exist for all FDI versions that were needed in the data situations encountered so far. BACs and EACS were developed from a reference dataset (source: BFCG fish disease data 1986-2010, split according to geographical areas Iceland+areas west of UK, / North Sea / Baltic Sea, with a total of 266,752 dab). Sex-specific BACs are defined as the 10th percentile of the FDI distribution in the area. EACs are defined as those FDIs which are associated with a 10% reduction in condition factor (CF), compared to the CF of fish with FDI = 0 (i.e. absence of all diseases). Annex 5 provides an overview of the FDI versions employed so far with BAC and EAC values for the North Sea area. The assessment of the FDI values can be done by presenting the proportions of fish with FDI below BAC / between BAC and EAC / above EAC. This representation allows a simple comparison with assessments of other parameters for the same time and region. Alternatively, mean values may be pre-

sented. Both representations allow the display of time-series. All representations can be included in disease maps discussed under ToR e).

FDI versions for the externally visible diseases of flounder and cod have been developed. The recommended versions are defined for 6 flounder and 7 cod diseases. BACs were calculated as for dab. However, a relation between condition factor and FDI, which had been used to define the EAC for dab, could not be found for flounder or cod. Therefore an alternative way to define EACs for these species was developed. In the absence of a readily available additional measure of harm for flounder and cod, use was made of the fact that the FDI itself expresses a form of harm to the fish. The FDI increases with the presence of more diseases or disease severity in a fish. Extremely high FDI values imply the joint presence of many unfavourable conditions. Therefore a high FDI value can be considered as an indicator of harm to the fish. From this consideration, the EAC was defined as the threshold separating “low” and “high” FDI values. The rationale for calculating this threshold starts from the assumption that the FDI component diseases occur just by chance and independently from each other. Under this assumption, a probability distribution for the FDI can be calculated, using the empirical prevalence of single diseases. Estimates for these are obtained from the reference dataset above, which contains additional data on 127,894 cod and 21,916 flounder specimens. The EAC is then defined as the FDI value that is (under the independence assumption above) exceeded with a defined small probability. This identifies uncommonly high FDI values. These may be due to either a locally increased prevalence of single diseases or to a non-independent occurrence of different diseases or a combination of both. Using the BAC and the EAC, the assessment of externally visible disease data can be performed as above.

The BAC and EAC's for macroscopic liver neoplasms and liver histopathology are defined as follows. There is no BAC for macroscopic liver neoplasms, and the presence of a (confirmed) liver neoplasm is by itself a harm to the fish. Therefore the presence of a liver neoplasm is equivalent to having exceeded the EAC. As a consequence, the assessment procedure for macroscopic liver neoplasms has only two components: no neoplasm is equivalent to “no harm” (typically: green marker), the presence of a neoplasm is equivalent to “harmful situation” (typically: red marker). There is no condition marked in yellow. BAC and EAC for liver histopathology are defined on the basis of the categories of liver histopathology findings: 1) no or non-specific lesions, 2) toxicopathic lesions and / or FCA, 3) neoplasms. The BAC separates findings of category 1 from those of category 2, and the EAC separates categories 2 and 3. The highest category observed determines the assessment of an individual. Typical marker colours are green, yellow, and red for the categories 1, 2, 3.

Technical details of the FDI calculation including the type and format of input data will be finalized and submitted for publication in the ICES TIMES Series (Annex 6).

The practical calculation of FDI values, BAC, EAC and the assessment of FDI values is currently done by running a set of SAS (SAS Institute Inc., Cary, NC, USA) programmes. SAS is a licensed software which might not be available for all institutions interested in doing these calculations. To make the FDI concept operational for all

interested institutions, a software solution without license restriction is necessary. A feasible solution for that is to rewrite the SAS programmes in the R software and to use an interface between a spreadsheet programme (e.g. Excel) and R for easy data in- / output. R is a free, open-source software package that can be used under mild license restrictions (GNU public license) and has become more and more popular in the scientific world. A spreadsheet programme is available for most computer users. Use of this environment avoids that users need to get involved with the internals of R. Moreover, the resulting package of R procedures can also be used by the ICES Data Centre to produce the information for the disease maps discussed under ToR e).

5.7 Disease associated population effects of commercial fish and shellfish species (ToR g)

There is increasing information from studies in wild freshwater and marine fish species that diseases affect growth, reproduction and survival of different life stages of fish and shellfish and thus, may have an impact on recruitment and stock structure. However, only in few cases have diseases been explicitly considered in population dynamics models. A draft manuscript "Disease-associated population effects in commercial marine fish and shellfish species" has been prepared which addresses diseases with documented or suspected population effects in gastropods, bivalves, crustaceans and fish and provides information on diagnostic criteria, causative agent, host range, geographical range, and individual and population effects. The aim of the manuscript is to raise awareness in the stock assessment community that diseases may play an important role in population dynamics and should be given greater consideration. Co-authors of the document (T. Lang, S. Feist, S. Jones, S. Ford, T. Renault) will work intersessionally to edit the document and consult with relevant ICES working groups prior to publication in the ICES Cooperative Research Report Series. A final draft will be circulated to WGPDMO members for discussion at the 2014 meeting prior to submission (Annex 7).

5.8 ICES publications (ToR h)

WGPDMO members were requested to propose titles of new Disease Identification leaflets to the editor. A number of new disease leaflets were proposed:

- *Vibrio aestuarianus* infecting oysters (T. Renault and M.A. Travers)
- *Vibrio splendidus* infecting oysters (T. Renault and M.A. Travers)
- *Vibrio harveyi* in abalone (T. Renault and M.A. Travers)
- *Nocardia crassostreae* infecting oysters (T. Renault and J.P. Joly)
- Ostreid herpesvirus-1 infections in bivalves (T. Renault)
- Francisellosis in farmed cod (A. Alfjorden)
- *Mycobacterium* spp. in wild fish (L. Madsen)
- Pseudomoniasis (*P. anguilliseptica*) in farmed fish (P. Vennerstrom)
- Amoebic gill disease (N. Ruane and S. Jones)

Consideration was given to the possible removal of four leaflets (Nos. 14, 15, 17 and 18) from the series and the editor will discuss possible options with ICES Publications

for their archiving and/or replacement and report back to the group at the 2014 meeting. The existing mollusc disease leaflets were reviewed and the following require updating in the light of new information available.

- No.11 Haemotopoietic neoplasia in the flat oyster
- No.13 Portuguese oyster virosis
- No.14 Rickettsial infection of the flat oyster
- No.15 Rickettsial disease of *Donax trunculus*
- No.16 Shell disease of oyster
- No.17 *Minchinia armoricanum* disease of the flat oyster
- No.18 Hemocyte disease of the flat oyster
- No.20 *Mytilicola orientalis* parasitism
- No.23 Gill disease
- No.24 *Mytilicola intestinalis* parasitism
- No.25 Viral gametocyte hypertrophy in oysters

5.9 Provide expert knowledge and advice on fish disease and related data to the ICES Data Centre (ToR i)

Members of the WGPDMO continue to provide support to the ICES data centre in relation to the clarification of details concerning the submission of data.

6 Revisions to the work plan and justification

- 1) Proposed new ToR j: Development of templates for National Reports (S. Jones, P. Vennerstrom, E. Biering, T. Renault, V. Oresland).

Justification: Variability exists within the National Reports for wild and farmed fin-fish and shellfish regarding disease occurrence e.g. prevalence, number of animals, species infected etc. Previously, WGPDMO has attempted to address this and draft standards and guidelines were drawn up and reported in Annex 9 of the 2012 WGPDMO report. This ToR will build on those guidelines in order to develop templates for National Reports with the aim of standardizing the reporting structure. The group recognized the need to relate this information where possible to specific fish stocks, thereby facilitating transfer of disease information to stock assessment working groups. This will aid in the assessment of new disease conditions and trends assessed annually by the group in ToR a.

- 2) ToR b) After discussion, WGPDMO have decided to combine the review documents on zoonotic parasite infections with the proposed review of zoonotic viral and bacterial pathogens.
- 3) ToR f) The FDI approach had to be adapted for use with species other than dab (i.e. flounder and cod). This was successfully done and is described in the previous section. In addition, the FDI approach was successfully applied to liver nodules and liver histopathology.

7 Next meetings

The 2014 meeting of the WGPDMO will take place at the ICES HQ, Copenhagen, Denmark, 25–28 February 2014 (Annex 8).

The 2015 meeting of the WGPDMO and final meeting of this reporting cycle is scheduled to be hosted by the Finnish Food Safety Authority, Helsinki (date TBC).

Annex 1: List of participants

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Annex 2: Recommendations

Recommendation	Adressed to
1. Investigations are initiated or continued in ICES Member Countries on <i>Mikrocytos mackini</i> , <i>Perkinsus</i> sp. and <i>Bonamia exitiosa</i> which continue to be detected in new shellfish host species.	ICES Secretariat/Delegates
2. ICES Member Countries should be aware of the emergence of <i>Vibrio aestuarianus</i> as an important pathogen of Pacific oysters which should be monitored.	ICES Secretariat/Delegates
3. WGPDMO request advice on how best to implement the proposed plan for maintaining and updating the disease maps (ToR e).	ICES Data Centre

Annex 3: Common and scientific names of host species in the report

Common name	Scientific name
clam, wedge-shell	<i>Donax trunculus</i>
cod, Atlantic	<i>Gadus morhua</i>
cockle, common	<i>Cerastoderma edule</i>
crab, Chesapeake blue	<i>Callinectes sapidus</i>
crab, flatback mud	<i>Eurypanopeus depressus</i>
crab, long-arm hermit	<i>Pagurus pollicaris</i>
crab, long-nose spider	<i>Libinia dubia</i>
dab, common	<i>Limanda limanda</i>
flounder, European	<i>Platichthys flesus</i>
mussel, blue	<i>Mytilus edulis</i>
oyster, Eastern	<i>Crassostrea virginica</i>
oyster, European flat	<i>Ostrea edulis</i>
oyster, Kumamoto	<i>Crassostrea sikamea</i>
oyster, Pacific	<i>Crassostrea gigas</i>
perch, Eurasian	<i>Perca fluviatilis</i>
rock cook	<i>Centrolabrus exoletus</i>
salmon, Atlantic	<i>Salmo salar</i>
salmon, Pacific	<i>Oncorhynchus tshawytscha</i>
scallop, yesso	<i>Patinopecten yessoensis</i>
shrimp, brown	<i>Crangon crangon</i>
tench	<i>Tinca tinca</i>
trout, rainbow	<i>Oncorhynchus mykiss</i>
trout, sea	<i>Salmo trutta</i>
wrasse, ballan	<i>Labrus bergylta</i>
wrasse, goldskinny	<i>Ctenolabrus rupestris</i>

Annex 4: Draft Resolution for an ICES Internal Publication (Category 1)

The report on **Trends in Important Diseases Affecting the Culture of Fish and Molluscs in the ICES Area 2003-2013**, edited by Neil Ruane (Ireland), Ryan Carnegie (USA), Susan Ford (USA), Tristan Renault (France), Simon Jones (Canada), Lone Madsen (Denmark), Pia Vennerström (Finland), is planned to be published in the ICES Cooperative Research Report series.

The Working Group on Pathology and Diseases of Marine Organisms agrees to submit the final draft of the proposed publication for review and approval by PUBCOM and SCICOM by 1st March 2014.¹

Supporting information

Priority:	WGPDMO last published a report on disease trends in 2004 (Cooperative Research Report 265. This document now requires updating.
Scientific justification:	WGPDMO produces important information on disease trends in its' annual reports and has noted that within the last decade, a number of economically important diseases have emerged for both fish and molluscan aquaculture. The group feels that it is important that this information is collated and disseminated to ICES scientists.
Resource requirements:	Additional costs may be required as the report will contain a number of photographs. The number will depend on cost and whether it is possible to print in colour or not.
Participants:	N. Ruane, R. Carnegie, T. Renault, S. Jones, L. Madsen, P. Vennerström.
Secretariat facilities:	Not known at present.
Financial:	Cost of production and publication of a XX-page CRR.
Linkages to advisory committees:	None.
Linkages to other committees or groups:	Would be of interest to other aquaculture WG's.
Linkages to other organizations:	None.

¹ Extension of this deadline can be requested up to one month before the deadline's expiration. If an extension of the deadline is not agreed upon or if the final draft is not forthcoming, the ICES Secretariat will have the option of cancelling the resolution.

Annex 5: FDI Assessment Criteria and Supporting Information for Common Dab in the North Sea

Combinations of externally visible diseases of dab (*Limanda limanda*) used for calculating the Fish Disease Index (FDI).

External Visible Disease NG... (N = 3,4,8,9) refers to the Fish Disease Index for the N graded diseases (fin rot and X-cell gill diseases ungraded) indicated in the respective column, either in its unadjusted form (EVDNGnnn) or in the form adjusted for season, length and sex (EVDNGSLS).

Assessment criteria (Background Assessment Criteria (BAC) and Environmental Assessment Criteria (EAC)) are provided separately for male and female dab from the North Sea.

Disease	Short name	Grades	Severity per grade	Disease is component of ...			
				EVD3G...	EVD4G...	EVD8G...	EVD9G...
<i>Acanthochondria cornuta</i>	Ac	0,1,2,3	1.24			X	X
Epidermal hyperplasia / papilloma	Ep	0,1,2,3	1.75	X	X	X	X
acute / healing fin rot / erosion	Fi	y/n	6.06				X
hyperpigmentation	Hp	0,1,2,3	1.97		X	X	X
<i>Lepeophtheirus</i> sp.	Le	0,1,2,3	1.20			X	X
Lymphocystis	Ly	0,1,2,3	1.84	X	X	X	X
<i>Stephanostomum baccatum</i>	St	0,1,2,3	1.00			X	X
acute/ healing ulcerations	Ul	0,1,2,3	2.41	X	X	X	X
X-cell gill disease	Xc	y/n	7.58			X	X
BAC, females, NS				1.786	3.29	3.07	2.79
BAC, males, NS				2.24	5.68	4.59	4.34
EAC, females, NS				6.56	29.31	7.81	7.39
EAC, males, NS				17.28	33.84	13.31	12.35

Annex 6: Draft Resolution for an ICES Internal Publication (Category 1)

The report on **Calculation of the Fish Disease Index (FDI): technical details**, edited by Werner Wosniok (Germany) and Thomas Lang (Germany), is planned to be published in the ICES TIMES series.

The Working Group on Pathology and Diseases of Marine Organisms agrees to submit the final draft of the proposed publication for review and approval by PUBCOM and SCICOM by 1st March 2014.²

Supporting information

Priority:	WGPDMO has been working on the development of a Fish Disease Index for a number of years and believes that the publication of the methodology is an important output for the group.
Scientific justification:	The Fish Disease Index approach has been developed for the analysis and assessment of data obtained by ICES Member Countries running regular fish disease surveys as part of their national environmental monitoring programmes. The FDI has now been developed for dab, flounder and cod and WGPDMO feel that it is important that this information is published and disseminated to ICES scientists.
Resource requirements:	No specific additional resources are required.
Participants:	W. Wosniok, T. Lang.
Secretariat facilities:	Not known at present.
Financial:	
Linkages to advisory committees:	
Linkages to other committees or groups:	
Linkages to other organizations:	OSPAR, HELCOM, EU MSFD

² Extension of this deadline can be requested up to one month before the deadline's expiration. If an extension of the deadline is not agreed upon or if the final draft is not forthcoming, the ICES Secretariat will have the option of cancelling the resolution.

Annex 7: Draft Resolution for an ICES Internal Publication (Category 1)

The report on the **Disease-associated population effects in commercial marine fish and shellfish species**, edited by Thomas Lang (Germany), Stephen Feist (UK), Simon Jones (Canada), Susan Ford (USA), Tristan Renault (France), is planned to be published in the ICES Cooperative Research Report.

The Working Group on Pathology and Diseases of Marine Organisms agrees to submit the final draft for review and approval to PUBCOM and SCICOM by 1st March 2014.³

Supporting information

Priority:	WGPDMO have long recognized the potential importance of disease on wild marine fish and shellfish stocks.
Scientific justification:	There is increasing information from studies on wild marine fish and shellfish species that diseases affect growth, reproduction and survival of different life stages and thus, may have an impact on recruitment and stock structure. However, disease effects are rarely considered in population dynamics models. Since the potential risk to fish and shellfish populations due to disease are of considerable ecological and economic concern WGPDMO recognized the need to highlight the current information in this area.
Resource requirements:	The material in the report is fairly straightforward, and therefore no specific additional costs are necessary.
Participants:	S
Secretariat facilities:	None at present.
Financial:	Cost of production and publication of a XX-page CRR.
Linkages to advisory committees:	
Linkages to other committees or groups:	Would be of interest to EGs on wild fish stocks and aquaculture.
Linkages to other organizations:	

³ Extension of this deadline can be requested up to one month before the deadline's expiration. If an extension of the deadline is not agreed upon or if the final draft is not forthcoming, the ICES Secretariat will have the option of cancelling the resolution.

Annex 8: WGPDMO draft meeting resolution (Category 2)

The Working Group on Pathology and Diseases of Marine Organisms (WGPDMO), chaired by Neil Ruane, Ireland, will meet in Copenhagen, Denmark, 25-28 February 2014 to work on ToRs and generate deliverables as listed in the Table below.

WGPDMO will report on the activities of 2013 (the second year) by 10 April 2014 to SSGHIE.

ToR	DESCRIPTION	BACKGROUND	SCIENCE	DURATION	EXPECTED DELIVERABLES
			PLAN TOPICS ADDRESSED		
a	New disease trends in wild and cultured fish, molluscs, and crustaceans based on national reports	New disease conditions and trends in diseases of wild and cultured marine organisms continue to appear and an annual assessment of these should be maintained.	1.3, 1.4, 2.2, 2.5	annual	Annual summary of trends to ICES Member Countries, OSPAR
b	Parasites and other infectious agents in marine finfish and shellfish species posing a hazard to human health	A range of parasites and other infectious agents reported by the WGPDMO in the annual update of disease trends have the potential to be harmful to human health if ingested in under processed food. There is an upward trend in the consumption of raw fish and other seafood products which may increase this risk. Literature reviews of risk, prevention and mitigation strategies will be prepared.	1.4, 1.7	Years 1, 2 and 3	Submit manuscripts for publication in peer-reviewed journal
c	Disease interactions between farmed and wild finfish	WGPDMO has produced reports on disease interactions between farmed and wild finfish on disease in 2010, 2011 and 2012. These reports reflect WGPDMO's activity in this field and are worthy for dissemination to a wider audience. The reports will be reviewed intersessionally and a decision made regarding their suitability for publication either as a single or multiple publications. These papers will be drafted for publication in the ICES Cooperative Research Report Series. Contact with ICES WGEIM will be established to exchange information on this subject and to collaborate if appropriate.	2.2, 3.1	Years 1 and 2	Manuscript submitted for publication as an ICES Coop. Res. Rep. OSPAR, WGPDMO
d	ICES publication 'Trends in important diseases affecting the culture of fish and molluscs in the ICES area 2003 - present'	The earlier "Trends" document provided valuable information to researchers and fisheries managers on trends of diseases in aquaculture and . That document requires updating with new information on those diseases of most importance for aquaculture, including new and emerging diseases, during 2003 to the present.	1.4, 3.1	Years 1 and 2	Manuscript submitted for publication as an ICES Coop Res Rep, WGPDMO
e	Maps of fish and shellfish diseases	The WGPDMO considers the information on the geographical distribution of fish and shellfish diseases provided on the ICES website (http://www.ices.dk/marineworld/fishdiseases/fishandshellfish.asp) as a valuable contribution to the scientific community reflecting WGPDMO's activities and expertise in this field. The maps give scientists, managers, laypersons and politicians having interest in or needing information on this field the possibility of obtaining a	1.4, 3.3	Years 1, 2 and 3	ICES websites, ICES Member Countries,

		rapid overview on selected diseases. However, much of the information presented at present is outdated and needs to be updated. The WGPDMO will develop a plan on the type of information considered to be useful for presentation on the ICES website and on ways facilitating a regular update. Contacts with the ICES Secretariat will be established to explore relevant requirements and steps to be taken			
f	The Fish Disease Index (FDI) in relation to results of FDI assessments of diseases of flounder and Baltic cod and liver histopathology and macroscopic liver lesions in the common dab	The FDI approach has been developed for the analysis and assessment of data obtained by ICES Member Countries running regular fish disease surveys as part of their national environmental monitoring programmes. There is need to review the results of an application of the FDI approach on fish species other than dab (e.g. flounder and cod). Furthermore, the FDI strategy and the assessment criteria proposed for macroscopic liver neoplasms and liver histopathology need to be validated based on available national datasets. Finalization and the application of the FDI as an assessment tool for environmental monitoring under OSPAR/HELCOM/EU MSFD is considered as a longer-term activity of WGPDMO.	1.2, 1.4, 3.3	Years 1, 2 and 3	Publish FDI methodology in the ICES TIMES series. ICES Member Countries, WGPDMO
g	Disease-associated population effects of commercial fish and shellfish species	There is increasing information from studies in wild freshwater and marine fish species that diseases affect growth, reproduction and survival of different life stages of fish and shellfish and thus, may have an impact on recruitment and stock structure. However, only in a few cases have diseases been explicitly considered in population dynamics models. The potential risk to fish and shellfish populations due to diseases is of considerable ecological and economical concern. Furthermore, population dynamics and epidemiological models will be reviewed in light of their applicability for studies in wild fish and shellfish. It is anticipated that the results of the review will be relevant to a range of ICES Expert Groups, including the stock assessment groups.	1.2, 1.4, 2.5, 3.1	Years 1, 2 and 3	Manuscript to be published as an ICES Coop Res Rep. ICES Member Countries, WGPDMO
h	ICES publications on pathology and diseases of marine organisms	A number of ICES publications, either web-based or in ICES publication series, are being prepared or updated at present, the progress of which has to be reviewed by WGPDMO. It will be necessary to consider ways by which these can be linked to each other. New publications have to be considered.	1.4, 3.1	annual	WGPDMO internal report
i	Provide expert knowledge and advice on fish disease and related data to the ICES Data Centre on a continuous basis.	In compliance with a request from the ICES Data Centre.	1.4, 3.3	annual	Data and data management advice, ICES, ICES Member Countries
j	Development of templates for the national reports from ICES Member Countries	Variability exists within the National Reports for wild and farmed finfish and shellfish regarding disease occurrence e.g. prevalence, number of animals, species infected etc. This ToR will aim to standardize the reporting structure. The group recognized the need to relate this information where possible to specific fish stocks, thereby facilitating transfer of disease information to stock assessment working groups. This will aid in the assessment of new disease conditions and trends assessed annually by the group in ToR a	1.3, 1.4	2	Reporting structure for aquatic diseases

Summary of the Work Plan

Year 1	Three terms of reference (a, h and i) are annual tasks and form a core part of WGPDMO activities. The WGPDMO will tackle these and all other ToRs.
Year 2	Terms of reference c and d will be finalized with the final review by the WGPDMO and submission of manuscripts for publication. A standardized reporting structure for diseases will also be introduced.
Year 3	Terms of reference b, e, f and g will be finalized. For some (b, f and g), manuscripts will receive a final review by the WGPDMO before submission for publication. For ToRe, the WGPDMO will review comments from ICES concerning updates to maps of diseases in fish and shellfish.

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 12–15 members and guests.
Secretariat facilities	Booking of Biscay Room, building access and set-up of IT facilities.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There is a very close working relationship with all the groups of SSGHIE. It is also very relevant to the Working Group on Environmental Interactions of Mariculture (WGEIM).
Linkages to other organizations	OSPAR, HELCOM