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Report of the Working Group on Introduction and Transfers of Marine Organisms (WGITMO)

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International Council for the Exploration of the Sea

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Executive Summary

In 2008 the ICES Working Group on Introductions and Transfers of Marine Organisms (WGITMO) met in Copenhagen, Denmark with Stephan Gollasch, Germany (serving as interim chair for Judith Pederson who was unable to attend). There was no rapporteur. The meeting venue was the ICES headquarters with Adi Kellermann and Claus Hagebro as our hosts. Representatives from Belgium, Canada, Croatia, France, Germany, Ireland, Italy, Norway, Spain, Sweden, United Kingdom, and the United States of America attended the meeting.

Synopsis of progress with Terms of Reference at the WGITMO 2008 meeting

This section addresses the terms of reference discussed at the meeting and gives a brief overview of the highlights. Each Term of Reference (ToR) is discussed below in more detail and appears in the order as discussed based on the Agenda (joint meeting and WGITMO meeting).

(ToR a) The OSPAR report on changes in distribution and reproductive periods of marine bioinvaders that are probably related to warmer temperatures was revised. In the course of preparing the report, several issues emerged that need to be addressed.

(ToR b) The revised National Report format was used by most to prepare the annual reports. Most contributors prepared excel sheets and/or provided data on locations, but these were not mapped for the March meeting. One additional section has been added to the National Reports-a section on Species Not Yet Reported or Observed. WGITMO is considering how to communicate information on marine invaders, especially those spreading or newly arrived in one country and to alert neighbors that may want to undertake preventative effots and/or other measures if the species is already present but previously unreported. We prepared a draft report last year but did not prepare a press release. Discussion at this year's meeting identified limits for press releases according to ICES protocols on these issues.

(ToR c) The final draft of a five year plan was not completed because of changes in membership. Two areas were not completed (algae and fish), but will be worked on during intercession. This document is not ready for publication.

(ToR d) A half-day risk assessment workshop with WGBOSV resulted in fruitful discussions. There are suggestions for revising the Rapid Response document to incorporate some new insights and approaches. The model of focusing in depth on a topic should be addressed at future meetings.

(ToR e) A summary of the status of the Alien Species Alert Report on *Crassostrea gigas* served to stimulate discussion. The report will be worked on during intercession and a final should be available next year.

(ToR f) A discussion on topics of joint interest to WGITMO, WGBOSV, and PICES Working Group 21 was focused on database management of nonindigenous species information, but not including algae which is a serious limitation. A detailed database is being developed for PICES, but is still being tested. Although this database can be adapted for ICES countries, WGITMO could not make a commitment at this time given the stage of development of the database, i.e. it is being beta tested by the PICES countries to identify areas that are not working.

(ToR g) There was confusion about the request for looking at targeted fish species in relation to the Code of Practice. Thus, there was not a draft report prepared.

Synopsis of WGITMO and WGBOSV meeting

Because WGITMO and WGBOSV share one day of meetings, the following minutes cover the joint meeting first and the WGITMO meeting second reflecting the order of the meetings. The three issues for the 2008 WGIMTO and WGVOSV meeting were (1) the joint effort with PICES WG 21 (the equivalent of both WGBOSV and WGIMTO), (2) issues related to hull and other hard surface vessel fouling where WGBOSV has taken the lead in drafting a Code of Practice, and (3) invitation to special topic workshop, Risk Assessment Approaches. The discussions focus on the terms of reference for 2007. In addition, future topics of interest to both Working Groups were discussed, specifically, collaboration with the World Organization for Animal Health (OIE).

Synopsis of highlights of the National Reports

The following highlights the new introductions and other important actions by ICES countries. WGITMO had planned to have a map of new introductions in 2007 to include with this report, but not all the data were available as of this writing. Instead, a map of new introductions reported in 2006. We are considering how best to illustrate changes over time for specific species. As noted in past comments, we are looking to ICES for guidance in how to maintain such a database and support mapping efforts.

We continue to strive to improve the national reports to make them relevant. We are adding a new section called, Species Not Yet Arrived to better document dispersal. A few members have included this in the 2008 reports. The following table provides a quick overview of the number of new reports, range expansions, and attempted eradications. Three ICES countries did not have new species introductions reported or range expansions; nor did Italy.

Table 3.1 New species reported by WGITMO countries along with range expansions and eradication efforts. For names of species see highlights, for more information see full reports in Annex 5).

Species/activity	Europe	North America East	North America West	Associated Countries
Algae/plants	1	0	0	1
Invertebrates[2]	10[1]	3	2	2
Fish[2]	0		0	0
Parasites[2]	8[3]	1[4]	2	0
Range expansion[5]	6	7	3	3
Eradication attempts	1 (successful)		2 (ongoing)	2 (successful)

[1]**Five of these species are Mnemiopsis which was reported for the first time in five different countries.**

[2]**Excludes freshwater invertebrates, fish, and associated parasites, but includes brackish water or anadromous/catadromous fish, invertebrates, and parasites.**

[3]**Five records from Poland**

[4]**Possibly native parasite infecting non-native species**

[5]**Reported species in reports only are recorded in this table, but it is likely more species are expanding ranges.**

1 Summary of WGITMO 2008 meeting

1.1 Terms of Reference

a) Consider the reports of the ad hoc groups on;

i) Hydrographic attributes

ii) Trend analyses and quantifying relationships

iii) Formulating hypotheses and predictions about mechanisms

iv) Selecting species for more intensive investigations

b) and use their recommendations concerning (1) recommended time series, (2) analytical methods and suitable software, (3) hypotheses and guidance for their use, and (4) a suggested list of species for intensive study, to complete 'the assessment of changes in the distribution and abundance of marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature;

c) to synthesize and evaluate national reports using the new format for reporting and contributions to the database that includes species, locations (latitude and longitude), status of invasion and other relevant information, and develop an annual summary table of new occurrences/introductions of aquatic invasive species in Member Countries and prepare a press release of highlights for distribution;

d) to finalize the five year summary of national reports (2003–2007) with the aim to prepare a 25-year summary based on earlier reports at a future meeting (intercessional editing of draft report after the meeting);

e) to conduct a half day workshop on risk assessment using the Canadian and/or U.S. and/or U.K. and/or other risk assessment approaches using a specific example (e.g. *Crassostrea gigas; Didemnum* sp.);

f) to prepare a draft Alien Species Alert report on *Crassostrea gigas* with the aim of editing and finalizing a report for next yea's meeting and develop an outline for an Alien Species Alert report for the Chinese mitten crab *Eriocheir sinensis*;

g) to develop joint projects (e.g. database management, taxonomic experts,) with PICES WG 21 during intersession that furthers cooperation and communication for resources sharing and information on introduced species;

h) to prepare a draft document on the impact of targeted fisheries on non-indigenous species (e.g. king crab, Chinese mitten crab, green crab, Manila clam).

1.2 Meeting attendance

Participants: Gordon Copp (UK); Jesus Cabal (Spain); Becky Cudmore (Canada); Fred Dobbs (USA; only until afternoon coffee break on Wednesday); Stephan Gollasch (Germany); Anders Jelmert (Norway); Francis Kerckhof (Belgium); Ian Laing (UK); Daniel Masson (France); Tracy McCollin (UK; only for joint session); Josip Mikus (Croatia); Fredrik Nordwall (Sweden); Francis O`Beirn (Ireland); Anna Occhipinti (Italy); Manfred Rolke (Germany); Inger Wallentinus (Sweden); and Cristina Morgado from ICES joint the OSPAR climate change discussions.

Apologies were received from WGITMO members Janet Beardall, Darlene Smith, and Amy Williams, Canada; Henn Ojaveer, Estonia; Lauri Urho, Finland; Laurence Miossec, France; Dan Minchin, Ireland; Bert Wetsteyn, the Netherlands; Joanna Hegele-Drywa and Anna Szaniawska, Poland; Roger Mann, Judith Pederson, and Greg Ruiz, USA; and Keith Hayes and Naomi Parker, Australia.

Stephan Gollasch served as interim chair for Judith Pederson, who had a family emergency. The agenda was adopted (Annex 2).

2 Progress with Terms of Reference at the WGITMO 2008 meeting

This section addresses the terms of reference discussed at the meeting and gives a brief overview of the National Report highlights. Each Term of Reference (ToR) is discussed below in more detail and appears in the order as discussed based on the Agenda (joint meeting and WGITMO meeting).

3 WGITMO and WGBOSV meeting summary

Because WGITMO and WGBOSV share one day of meetings, the following minutes cover the joint meeting first and the WGITMO meeting second reflecting the order of the meetings. The three issues for the 2008 meeting were (1) the joint effort with PICES WG 21 (the equivalent of both WGBOSV and WGIMTO), (2) issues related to hull and other hard surface vessel fouling where WGBOSV has taken the lead in drafting a Code of Practice, and (3) invitation to special topic workshop, Risk Assessment Approaches. The discussions focus on the terms of reference for 2007. In addition, future topics of interest to both Working Groups were discussed, specifically, collaboration with the World Organization for Animal Health (OIE).

ToR f to develop joint projects (e.g. database management, taxonomic experts,) with PICES WG 21 during intersession that furthers cooperation and communication for resources sharing and information on introduced species.

The WGITMO and WGBOSV joint effort with PICES WG21 proceeded with three meetings over the past year. The first occurred at the Fifth International Marine Bioinvasions Conference held in May 2007 at the Massachusetts Institute o Technology MIT, Cambridge, USA. This conference was sponsored by ICES, PICES and the National Sea Grant Office.

3.1 Fifth International Marine Bioinvasons Conference May 2007 meeting notes

The discussion about coordination and collaboration with PICES Working Group 21 (WG21) continues. At the May 2007 Fifth International Marine Bioinvasions Conference, the day and half meeting provided opportunity for roundtable exchange of the participant's interests and activities as well as identifying several potential joint areas of interest. The goals remain the same for both bodies of water, namely prevention of new introductions, management of those present, and a focus on sharing information to improve management. These topics are each briefly described below.

Shared Database: There were two areas where a shared database would be helpful. A list of experts from the North Atlantic and North Pacific would be of great value in species identification. A corollary to this would be a searchable database of species, information in journals that could be easily accessed.

Taxonomy: The identification of species remains clouded with dual names, reorganization of taxonomic units, and occasionally, a lack of consensus among experts. Opportunities to get experts together to work through some of the issues and research support for molecular studies would be o value to resolving these uncertainties.

Monitoring and Sampling: Relative to other areas of science, biological monitoring and introduced species monitoring in particular are short-term, incomplete, and poorly funded. As a result, it is difficult to statistically analyze impacts, correlate ties to global climate change, and demonstrate other relationships.

Ballast Water and Hull fouling: Ballast water treatment is a concern for all working groups, but WG21 has this issue as a lower priority (they are a new, relatively small group, and focused on other issues). Nonetheless, both groups will continue to share information on issues related to treatment, and detection. Among options for inspections and solutions were (1) in-water treatment, (2) cameras on a stick for in

tank inspections (difficult in turbid waters of ballast tanks), (3) antifouling paint, (4) dealing with sea chests, and (5) sampling labs on ships for detecting microalgae. Not all of these options are suitable for ballast monitoring (e.g. cameras on a stick) and possibly sampling labs on ships. One concern expressed was how organisms respond to some of these options as discussed briefly below.

Biological Concerns: Organisms respond to temperature, salinity, light, and other stimuli by spawning. More information about biological responses would be useful in developing treatment for ballast water and hull fouling.

Ornamental Fish Trade: The ornamental fish trade is an important issue for many countries, including thosee in Europe (e.g. Copp, G.H., Wesley, K.J. & Vilizzi, L. 2005d. Pathways of ornamental and aquarium fish introductions into urban ponds of Epping Forest (London, England): the human vector. Journal of Applied Ichthyology 21, 263–274), but in particular in Asian countries, with the release of species on Buddha's Birthday (Hubert, H., 1999. The Ceremony of Setting Live Creatures Free. *Journal of the Order of Buddhist Contemplatives.* http://www.obcon.org/journal/jobc5.html. Accessed: February 10, 2006; Severinghaus, L.L., and L. Chi., 1999. Prayer Animal Release in Taiwan. *Biological Conservation* 89: 301–304). These species often include fish, but may also include invertebrates. Many may be freshwater, such as the northern snakehead fish *Channa argus*, which has been released into ponds in several US states. Among issues to be explored are risk assessments of release of specific species and cumulative impacts. In addition, and along with aquaculture, introduced fish species may also introduce pathogens that cause disease to native fish. In same way, ornamental turtles species as *Trachemis scripta elegans* (Florida´s turtle) is common in ponds and river close to European cities, because these animal are released by the owners.

Encouraging student participation: Training of the next generation cuts across all the issues and is seen as an important component.

Economic and ecological impacts: Both ecological and economic impacts are poorly documented. There are several issues that should be addressed: (1) socioeconomic impacts of nonindigenous species, (2) need to document impacts quantitatively, (3) developing a case history database of what does and does not work, (4) animal disease response, and (5) inclusion of algae in the evaluations.

External Funding: The Japanese government has made available funding for the next five years to further collaborative efforts among PICES countries to address marine bioinvasions issues. At the meeting it was agreed to focus on two major areas; development of a shared database and rapid assessment surveys in each country that hosts PICES over the next five years. Henry Lee (Environmental Protection Agency, USA) and Debbie Reusser (US Geological Survey, USA) were contracted to develop a modification of their West Coast US database for benthic organisms that would focus on the North Pacific marine invaders.

Thomas Therriault (Department of Fisheries and Ocean, Canada) will develop a protocol for rapid assessment surveys to be adopted by PICES WG21.

3.2 PICES 2007 joint meeting notes, October 2007

A follow-up meeting occurred at the PICES meeting in October 2007, Victoria, British Columbia. Below is a short summary of the meeting. Attendees: Darlene Smith, Co-Chair, Canada; Graham E. Gillespie, Canada; Thomas W. Therriault, Canada; Hiroshi Kawai, Japan; Lijun Wang, China; Li Zheng, China; Yoon Lee, Korea,

Sam-Geon Lee, Korea; Evgenyi I. Barabanshchikov, Russia; Blake Edward Feist, USA; Henry Lee II, USA; Paul Heimowitz,USA; Mark D. Sytsma, USA and Guests: Debbie Reusser, USA; Gil Rilov, USA; Judith Pederson, USA; Hak G Yoon Kim, Korea; Greg Ruiz, USA.

Joint PICES-ICES further cooperation followed from a brief summary of the joint PICES WG 21 and ICES WGITMO and WGBWOSBV held May 24–25, 2007 provided by Judith Pederson. The priorities for further cooperation were (1) development of a North Pacific database; (2) sharing the ICES Code of Practice for the Introduction and Transfer of Marine Organisms; (3) risk assessments or analysis; (4) guidelines for sampling ballast water; and (5) hull fouling.

At the meeting in March 2008, it was decided that ICES WGBOSV and WGITMO should continue to develop joint projects. Although a ballast water sampling manual would be of value to the larger community, the WGSOBV committee decided that it would continue to provide input to IMO, when appropriate. A presentation on the PICES WG21 was prepared by Judith Pederson who attended a workshop in March 2008 at Busan, Korea on testing the database by member PICES countries. Stephan Gollasch presented highlights of the database to the WGBOSV and WGITMO committees. The goal of the database is to provide geospatial, biological, and ecological data for nonindigenous species (NIS) in the north Pacific (The data base is adaptable to any area). The database would (1) serve as an alert to neighboring countries/areas, (2) support mapping of nonindigenous species, (3) provide background information, (4) use as an opportunity to address taxonomic conflicts (names etc.); (5) integrate with others (e.g. become part of NISbase, a global, distributed, invasive species database). The database (1) stores information on species sequentially by number based on the ITIS or the Integrated Taxonomic Information System (ITIS, a joint effort by the US, Canada, and Mexico; http://www.itis.gov/)-no algae included-in access databases; (2) each PICES country enters their own data and the data will be merged but this is not yet tested; (3) data base allows data entry by each country who can add/edit species and add other information; (4) publications are required when entering data and most data cannot be accessed without a publication reference; (5) database holds over 8000 species from earlier work of Lee and Reusser (native and non-native); (6) database geared for large scale ecoregions, but has been modified to allow for point and place data (6) database deals with synonyms and many of the 8000 species have taxonomic data (phylum, class, order, family, etc.), which are automatically filled into the template once a species is selected, (7) the 'buttons' on the various pages lead to other templates and are self explanatory; and (8) integration of data has yet to be shown, but if it works this is a powerful, but perhaps cumbersome approach.

The focus of the database has been on the North Pacific with a place for data from the North Atlantic; however, these data are not currently listed. Several questions were posed to WGITMO and WGBOSV. Below are the questions and early responses.

Is this database the one we want to consider for ICES? The WGITMO thought that it was too early to commit fully to the WG21 database, for several reasons, but also because it does not include algae. They likened it to a super database which would require funding to maintain and update. There was concern about who would maintain such a database and whether local funding for local databases could form a family of distributed information that could be integrated. Again the funding issue remained unresolved for ICES, whereas funding from the Japanese Government will support this effort for five years. Other options discussed were to coordinate with the

Census of Marine Life or the Encyclopedia of Life efforts and to invite coperation. Similarly ICES or OSPARCOM or similar initiative in Europe should ensure that the minimum requirements for communication among databases and that the WG21 database is embedded in the structure. Because this database does not include algae as it is currently structured, it would not fully serve ICES expectations. This is a serious concern for the ICES Working Groups.

At the request of the PICES WG21, data on introduced species originating in ICES countries will be provided by several working group members. The data will include information on the biology, habitat and distribution of selected species and be added to the WG21 database.

How does this compare to DAISIE and other databases available? DAISIE is not a funded database and is currently maintained by individuals.

The second major focus of the WG21 is a proposed Rapid Assessment Survey protocol developed for a survey in Dalian, China, scheduled for October 23–November 3, in 2008. The goal is to identify non-native species in PICES member countries and other Pacific Rim countries. The approach is modified from Australian port surveys, the US Rapid Assessment Surveys, and deployment of sampling plates to be suspended in the water for four months prior to collection. The WG21 also referred to work done by several ICES countries in gathering nonindigenous data; e.g. the U.S. Rapid Assessment Surveys (J. Pederson et al. 2005 Marine Invaders in the Northeast: Rapid Assessment Survey of Non-Native Species of Floating Dock Communities, August 2003, MIT Sea Grant (http://massbay.mit.edu/publications/rapidassessment/RAS-report11.pdf); plate deployment (G. Ruiz, Smithsonian Environmental Research Center, pers. comm.), and others. This project is also funded from the Japanese funding to enhance collaborative research among PICES countries. Taxonomic experts would identify the species in laboratories.

Recommendation

Continue to develop joint projects with WG21 with a focus on the database as this is of interest to PICES. WGITMO will support this effort by providing information on species originating in ICES countries that are introduced in PICES countries to assist with information for their database.

3.3 Hull fouling

Fouling of hulls and other vessel surfaces is of interest to both WGBOSV and WGITMO. WGBOSV has taken the lead in developing Review of the Hull Fouling Report prepared by WGSOBV. The focus of the proposal is the Australia/New Zealand initiatives and reports on best practices on hull fouling management was well suited as a framework. These include: *The ANZECC Code of Practice for antifouling* (http://www.environment.gov.au/coasts/pollution/antifouling/code/pubs/code.pdf; Barker *et al*., 2006, *The Australian and New Zealand joint paper to IMO BLG subcommittee,* (BLG 12/11 2007); *and* the New Zealand report on "*Preliminary findings of a research programme to assess the risk of bio-fouling of ships arriving in New Zealand* (IMO BLG 12/INF.4, 2007). A draft annotated outline was developed by WGBOSV and further discussed at the joint meeting. Of particular concern was the need to include not just commercial vessels, but recreational and fishing (commercial or otherwise) as well. Definitions were developed and various members offered to address use of

anti-fouling materials for the various categories of vessels. This will continue to be an area of interest to both working groups.

Recommendation

WGITMO recommends that recreational and fishing (commercial and recreational) be included as well. WGIMTO will continue to work with WGBOSV.

3.4 Animal health

The World Organization for Animal Health (OIE) has expressed an interest in collaborating on issues of animal health. This is an opportunity for WGITMO and may also be a potential area of collaboration with WG21. Collaboration may lead to an opportunity to upgrade the current customs coding of seafood/live exports transformed to a more operative format.

The proposal got strong support from Becky Cudmore (Canada). Over the past several years, they have been working on a system for implementation for a species code. A note to Gerd Hubold from OIE has been sent informing him of our interest. ICES will have a meeting on cooperation with OIE soon, and focusing on a collaborative effort could be a concrete, practical task.

Recommendation

WGITMO will contact Greg Hubold and discuss how to proceed in developing opportunities for future collaboration.

3.5 Risk assessment workshop presentations

ToR d) to conduct a half day workshop on risk assessment using the Canadian and/or U. S. and/or U.K. and/or other risk assessment approaches using a specific example (e.g., *Crassostrea gigas, Didemnum* sp.).

Presentations on Risk Assessment were provided by Gordon Copp (Cefas-UK), with contributions from Laurence Miossec, on the protocols being developed in the EU programme 'IMPASSE' for the EU Regulation on the use of alien species in aquaculture. Becky Cudmore (DFO-Canada) presented an overview of the Canadian non-native aquatic species risk framework. Gordonn and Becky were asked to follow their presentations with a discussion of the strengths and weaknesses of the various approaches and to identify areas of uncertainties.

The presentations are summarized here below.

3.5.1 The IMPASSE Risk Assessment Scheme

Gordon Copp (UK) presented 'IMPASSE — Protocols for assessing the risks of using alien species in aquaculture', which is the scheme to be used in Europe for compliance with the new EU Regulation of the use of alien species in aquaculture. See Annex 3 for his report and references in this summary. Similar to the UK non-native risk assessment scheme (UK Defra 2005, Baker et al. 2008), the IMPASSE scheme is being adapted from the modular structure and protocols espoused by the European and Mediterranean Plant Protection Organisation (EPPO 2000). As such, the IMPASSE scheme will consist of four principal modules (pathway/delivery, facility, organism, ecosystem), with complementary modules for assessing invasive-ness potential, for quantifying economic impacts and for summarising risk and the uncertainties associated with the assessment process.

The invasiveness modules (Copp et al. 2005) are adapted versions of the Pheloung et al. (1999) weed risk assessment scoring sheet. The approach combines qualitative and semi-quantitative elements and represents an evidence-based approach to assess the potential invasiveness of a species based on information from its native and introduced ranges (e.g. biology, physiology, climate, and other environmental factors). The scoring kit produces a numerical value (ranging from -11 to 54) for each species assessed, providing managers with a way of ranking species by their relative risk of potential invasiveness and with certainty/uncertainty rankings for each question (1 = very uncertain, 2 = mostly uncertain, 3 = mostly certain, 4 = very certain) with which to aid interpretation of the invasiveness score. The freshwater fish invasiveness scoring kit (FISK) has been applied to 70 species and the risk thresholds calibrated, and the outcomes of this calibration process were presented.

Given the common EPPO-based approaches of the UK and IMPASSE schemes, the current UK scheme was used as an example to assess the Pacific oyster Crassostrea gigas, which was introduced to Europe in 16th century (Portugal), and then again in 1960s and 1970s. The species is now farmed in large part in France, and it is spreading along European coasts. The assessments were carried by Laurence Miossec (France) and by an anonymous researcher in the UK, with currently uninfested areas of the Normandy and UK coasts, respectively, as the risk assessment areas. For the initial, hazard identification, phase of these assessments, the marine invertebrate invasiveness scoring kit (MI-ISK) was used to assess invasive-ness potential (http://www.cefas.co.uk/4200.aspx). The outcome of these assessments were largely similar, with both resulting in 'high risk' MI-ISK scores, with medium-to-high impact ratings and medium uncertainty levels using the UK scheme.

3.5.2 Canada's approach to risk assessment for marine organisms

Becky Cumore, Department of Fisheries and Oceans, CEARA (Canada) presented the Canadian approach to risk assessment and discussed how values were obtained to indicate low, medium and high risk species. . The Canadian framework consists of three types of assessment (rapid response, pre-screening, detailed), though the pre-screening assessment protocols have yet to be decided on. See Annex 4 for her summary.

Fisheries and Oceans Canada's Centre of Expertise for Aquatic Risk Assessment (CEARA) looks at the biological risk of aquatic invasive species (AIS); the likelihood of the introduction of an AIS and the magnitude of the consequences of that introduction. Biological risk assessment is the first of three components of an overall risk analysis framework. Risk management (socio-economic impacts of AIS and mitigation options) and risk communication are the two other components making up a risk analysis framework.

RISK ANALYSIS = assessment + management + communication.

Canada's emerging biological risk assessment program, with the development of a Centre of Expertise for Aquatic Risk Assessment, is providing valuable science advice to the Government of Canada by assessing the risk of newly found, or potential AIS. CEARA is also providing valuable tools and risk assessment results for rapid response, monitoring and research. The rapid assessment protocol could be an important component for a rapid response protocol, while the risk assessment results can be used to identify geographic areas of concern for monitoring, as well as areas where further research is needed to better characterize the risk potential.

What are the strengths, weaknesses and uncertainties associated with the various approaches? Both schemes are modular, with assessment protocols applicable to different aspects of risk analysis and management. As noted by Gordon Copp, scarcity of data often represents a major constraints in the assessments. He has provide WGITMO members with the URL where electronic tool kits can be downloaded (http://www.cefas.co.uk/4200.aspx) for assessing the potential invasiveness of aquatic organisms and asked for their input to contribute to the development of a database of species assessments. The Canadian discussion noted that their approach also uses expert opinion in developing risk estimates and that the system can be revisited easily if new information is available.

Both the UK and Canadian approaches identify levels of uncertainty surrounding the assessments so as to provide policy and decision makers with a means of interpreting the level of confidence associated with the risk assessments.

3.5.3 The environmental impacts of alien species in aquaculture (IMPASSE)

Stephan Gollasch presented a brief overview of information provided in a report by Francesca Gheradi elaborated as part of IMPASSE, which is funded by the EC's Sixth Framework Programme for Research and Technological Development to provide a protocol for evaluating the potential impact f non-indigenous species in aquaculture. The overall goal is to develop guidelines that are environmentally sound. Several topics are addressed including: introductions and translocations in aquaculture, quarantine procedures and risk assessment protocols, and procedures for assessing the potential impacts of invasive alien species in aquaculture and related activities. An international conference, MALIAF, will be held November 5–7, 2008 in Florence, Italy for presenting IMPASSE, where discussion on sustainable and profitable aquaculture and fisheries will be encouraged. A broad group of stakeholders are expected to attend and share their knowledge and expertise.

Recommendation

Risk Assessment approaches continue to evolve. This will be a topic for continued updates for WGITMO.

4 WGITMO meeting summary

A review of the agenda included revision of the Rapid Response report and an addendum on risk assessment. Pederson has taken comments on the Rapid Response Report and edited the document. Although an informal risk assessment is discussed as part of the guidelines, risk assessment protocols are still under review in most countries. Thus, the decision by WGITMO is not to include an addendum on risk assessment at this time. The readers will be referred to the Risk Assessment in the Framework of the ICES Code of Practice on the Introductions and Transfers of Marine Organisms. Case studies of eradication efforts are included in the current version.

The Risk Assessment in the Framework of the ICES Code of Practice on the Introductions and Transfers of Marine Organisms was submitted to ICES in 2003, but only an earlier, two page draft document is on the ICES web page. A more comprehensive risk file has been presented, but it is unclear if this document has been approved by ACOM.

Recommendation

We request guidance from ICES on the publication of the risk assessment appendices. Although the Code of Practice provides well - thought out guidelines, they are not a tool or protocol. However, the generic risk assessment recommendations in the appendices submitted to ICES are sufficient to assist with management decisions.

4.1 Highlights of national reports

ToRb to synthesize and evaluate national reports using the new format for reporting and contributions to the database that includes species, locations (latitude and longitude), status of invasion and other relevant information, and develop an annual summary table of new occurrences/introductions of aquatic invasive species in Member Countries and prepare a press release of highlights for distribution.

The following highlights the new introductions and other important actions by ICES countries. WGITMO had planned to have a map of new introductions in 2007 to include with this report, but not all the data were available as of this writing. Instead, a map of new introductions reported in 2006. We are considering how best to illustrate changes over time for specific species.

Figure 3.1 Map of new species record from 2007 for European ICES countries and "guest status" countries.

We continue to strive to improve the national reports to make them relevant. We are adding a new section called, Species Not Yet Reported or Observed to better document dispersal. A few members have included this in the 2008 reports.

Recommenation

We request guidance on maintenance of a database and mapping efforts.

4.1.1 Legislation

Only one country, Spain identified new legislation, Spanish Law (Law 45/2007) of National heritage and Biodiversity calls for prevention and control of invasive alien species, leading to a commitment of studies and developing a catalogue of non-native species. Norway developed a report on ballast water that serves as decision support for the Ballast Water Convention. Australia continues to implement and improve its national security legislation.

4.1.2 New species reported

The following table provides a quick overview of the number of new reports, range expansions, and attempted eradications. Three ICES countries did not have new species introductions reported or range expansions; nor did Italy.

Table 4.1 New species reported by WGITMO countries along with range expansions and eradication efforts. For names of species see highlights, for more information see full reports in Annex 5).

Species/activity	Europe	North America East	North America West	Associated Countries
Algae/plants	1	0	0	1
Invertebrates[2]	10[1]	3	2	2
Fish[2]	0		0	0
Parasites[2]	8[3]	1[4]	2	0
Range expansion[5]	6	7	3	3
Eradication attempts	1 (successful)		2 (ongoing)	2 (successful)

[1]**Five of these species are Mnemiopsis which was reported for the first time in five different countries.**

[2]**Excludes freshwater invertebrates, fish, and associated parasites, but includes brackish water or anadromous/catadromous fish, invertebrates, and parasites.**

[3]**Five records from Poland.**

[4]**Possibly native parasite infecting non-native species.**

[5]**Reported species in reports only are recorded in this table, but it is likely more species are expanding ranges.**

Belgium

During 2007, one new invasive species, namely the comb jelly *Mnemiopsis leidyi* has been recorded. At the moment of its discovery in the harbour of Zeebrugge, the species was already very common.

All introduced species that were reported during previous years are still present and seem to be well-established and thriving.

Canada

Canada continues to import a range of organisms for aquaculture as described in this report.

Tunicates continue to affect the shellfish aquaculture industry in Prince Edward Island. In the affected region, the government and industry have introduced measures to contain the organisms. Other regions are monitoring for possible natural spread.

In Newfoundland, the European green crab, *Carcinus maenas* and the invasive colonial tunicates *Botrylloides violaceus (*violet tunicate) and *Botryllus schlosseri* (golden-star tunicate) were detected for the first time on the south coast of Newfoundland at single locations.

New Zealand mudsnails, *Potamopyrgus antipodarum*, were reported for the first time on Vancouver Island.

In British Columbia, catch rates of the European green crab (*Carcinus maenas*) catch rates in DFO surveys have increased since 2006 and populations exist from southwest to northwest Vancouver Island, British Columbia.

Live, wild-set Pacific oysters, *Crassostrea gigas*, were collected from a beach near a suspended culture operation in Long Inlet, Skidegate Inlet, Haida Gwaii (Queen Charlotte Islands).

Finland

Mnemiopsis leidyi was found in the open parts of the southern Gulf of Bothnia, Åland Sea and the Gulf of Finland and may be able to reproduce in the northern Baltic.

France

Two new European directives dealing with invasive species issues were adopted in 2007, the European Marine Strategy Directive and the directive on the use of alien species in aquaculture.

Bonamia exitiosa, an exotic pathogen of flat oysters, was detected for the first time in Europe (in Spain) in July 2007.

Germany

The invasive ctenophore *Mnemiopsis leidyi* was first recorded in the western Baltic Sea in summer 2006, continues to spread in the Baltic Sea, and currently may be found up to the Finnish coast.

The EU-funded project "Environmental impacts of alien species in aquaculture" (IMPASSE) is underway with the goal to review and assess the impact of alien species in aquaculture and also to provide recommendations n containment facilities for alien species in aquaculture use and other related topics.

For the first time *Hemigrapsus sanguineus and Hemigrapsus takanoi (penicillatus)* were found in German waters along the coast of the south-western Wadden Sea in 2007.

The free journal of applied research on biological invasions in aquatic ecosystems, *Aquatic Invasions*, is now issuing its 2nd volume (http://www.aquaticinvasions.ru/).

Ireland

Didemnum sp. continues to be observed at new locations around the east coast of Ireland.

Crassostrea gigas has been found in the bays in the north of Ireland, over large areas although with relatively low populations.

A change in inspections of imported mussels has been implemented to reduce the risk of *Crepidula fornicata* with higher rates of inspections from areas that have the slipper snail associated with seed.

Norway

The alien comb-jelly *Mnemiopsis leidyi* (first reported in the WGITMO 2007 report) has been present in the plankton throughout the year scattered along the coast from the Swedish Border to Bergen. It is occasionally found in substantial numbers, but no obvious bloom events.

The red king crab *Paralithodes camtschaticus* has extended its range soutwestward to the Balsfjord Area.

The snow crab *Chionocetes opilio* are sporadically found outside the coast of Finnmark County, but the main population is still concentrated in the eastern part of the Barents Sea.

Of a total of 8 suspects, 2 specimens of American lobster *Homarus americanus* were found in Norwegian waters in 2006, outside “Standefjord”.

A report on ballast water management (including exchange zones) was finalised and serves as decision support for by-laws on the BW convention (http://www.dirnat.no/content.ap?thisId=500028164).

A risk assessment will later be implemented in management plans for nonindigenous species. A revised list of introduced species with risk assessment has been finalised (Gederås *et al*., 2007 for reference see full report, Annex 5). A report on mapping and management of introduced marine species has been commissioned and will be finalised march 2007.

Poland

In the summer of 2006, unusual amphipod specimens, *Dyopedos monacanthus,* were noticed at five deep-water stations over the Słupsk Furrow, currently the easternmost limit of the species' range in the Baltic Sea.

First record of *Mnemiopsis leidyi* (A. Agassiz, 1865) (surface to 42m) in the Gulf of Gdańsk (southern Baltic Sea, Poland) in October 2007.

Paratenuisentis ambiguus (Van Cleave, 1921) first record from October 2007, from Vistula Lagoon, found on eel *Anguilla anguilla.*

Pseudodactylogyrus anguillae (Yin et Sproston, 1948) and *Pseudodactylogyrus bini* (Kikuchi, 1929) are widespread in Polish coastal waters and often present on adult eels and fry.

Uradiophora ramosa (Balcescu-Codreanu, 1974), *Cephaloidophora mucronata* (Codreanu-Balcescu, 1995) and *Nosema pontogammari* (Ovcharenko and Kurandina, 1987) are microparasites which were very recently found on *Pontogammarus robustoides* from the Vistula deltaic system.

Spain

A new Spanish Law (Law 45/2007) of National heritage and Biodiversity calls for prevention and control of invasive alien species, leading to a commitment of studies and developing a catalogue of non-native species.

The Ministry of Environmental have supported the "European Conference on Invasive Alien Species" in January 2008, so research based in alien species will be promoted from the National Science Foundation programmed by the Government.

Sweden

The saltmarsh grass *Spartina anglica* was detected as an isolated population in the northern archipelago of Göteborg in summer 207, probably having been there for some years.

The first finding of European perch rabdo virus was isolated from farmed fish in Southeastern Sweden (the Baltic Sea) in spring 2007.

The Japanese oyster *Crassostrea gigas*, <1 year old, was reported from the Swedish west coast, from close to the Norwegian border and down to the city of Falkenberg, province of Halland. Although some specimens from Wales had been introduced during 1973–76, it is believed these originate from newly introduced spat from populations in Denmark or Germany.

The American comb jelly, *Mnemiopsis leidyi*, first identified on the Swedish west coast in autumn 2006, was extremely abundant during summer and autumn 2007 along almost all of the Swedish west coast. It was also found in the Baltic Sea, in the Landsort Deep, in the Åland Sea, in the Gulf of Finland, and as far in as the northern Bothnian Sea, but not in the Bothnian Bay.

United Kingdom

No records of species new to the UK have been reported.

There is increasing concern about the spread of Pacific oysters, *Crassostrea gigas,* in the wild and also of seed mussel consignments acting as vectors for introductions of associated species.

Monitoring and other studies continue with a range of previously-introduced species, including freshwater fishes (pumpkinseed Lepomis gibbosus, sunbleak Leucapiu delineatus, topmouth gudgeon Pseudorasbora parva) and marine species (Caprella, Styela, Sargassum).

There are several legislative changes under consideration affecting introductions of alien species.

United States

Two haplotypes of the Indo-Pacific lion fish (*Pterois miles/volitans* complex) were first observed in the Northwest Atlantic in 1992 in Biscayne Bay, Florida and have subsequently been observed from Bermuda to Rhode Island (with juveniles in Massachusetts and Long Island Sound), in the Gulf of Mexico (Tampa Bay), and regularly off the coast of North Carolina.

Several species, identified in earlier reports, continue to spread. These include the *Phyllorhiza punctata* (Australian Spotted Jellyfish), *Megabalanus coccopoma* (Titan Acorn Barnacle), *Stramonita haemostoma floridana* (Southern Oyster Drill, Florida Rock Shell), *Penaeus monodon*, (Asian Tiger Shrimp), *Didemnum* sp A. (an invasive colonial tunicate, previously called *D. vexillum*, *D. vestum*, *D. lahillei*), and the *Eriocheir sinensis* (Chinese mitten crab).

On the Pacific coast, the *Rhinogobius brunneus* (species complex, Amur Goby) was reported expanding in the Columbia River watershed, Washington; and *Assiminea parasitologica* (a brackish water snail), was found in Coos Bay, Oregon estuary; and *Littoridinops monroensis* (a brackish-water snail) was found in San Francisco Bay, California.

A second attempt has been made to eradicate *Avicennia marina* (Gray Mangrove) and ongoing efforts to eradicate *Spartina japonica* (Japanese eelgrass) continue from the West Coast of the US.

Bonamia sp. (Protozoan oyster parasite) appears to infect *Crassostrea ariakensis* cultures and the native *Ostreola equestris* oyster in high salinity waters.

Italy

A potentially toxic algae has been algae has been isolated.

Studies on the biology and ecology of species that had been introduced previously have been continued especially on invading algae (*Caulerpa* spp.) and fish (*Siganus luridus* and *Fistularia commersonii*).

A section is added on information obtained from neighbouring seas (Slovenia, Croatia, France, Malta and Tunisia), including a new introduction of fish species in the Mediterranean.

Australia

Development and implementation of the Australian National System for the Prevention and Management of Marine Pest Incursions (National System) continues and is comprised of three elements (prevention, emergency management, and ongoing management and control) aimed at providing a holistic approach to marine pest management.

The Black Striped, *Mytilopsis sallei*, and Asian Green mussels, *Perna viridis* (species exotic to Australia), were both detected on vessels within Northern Australian waters during 2007. These species cause significant environmental and economic impacts on Australia and apparently were eradicated by treating or removing mussels from vessels.

Recommendation

WGITMO should continue to revise National Reports to streamline reporting on changes over time. This may include developing maps of new reported species and exploring a database that allows one to follow changes of species over time. Equally important are species not yet identified in countries and this will be included in the revised National Reports.

4.2 ToR a Consider the reports of the *ad hoc* Groups on

1) Hydrographic Attributes.

2) Trend Analyses & Quantifying Relationships.

3) Formulating Hypotheses and Predictions about Mechanisms.

4) Selecting Species for More Intensive Investigations.

and use their recommendations concerning (1) recommended time series, (2) analytical methods and suitable software, (3) hypotheses and guidance for their use, and (4) a suggested list of species for intensive study, to complete 'the assessment of changes in the distribution and abundance of marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature.

4.2.1 Synopsis of a report to OSPAR

A 2008 Report to OSPAR was prepared and edited by WGITMO (See Annex 5). Three non-native species were identified as species with range expansions and/or changes in reproduction that are likely to be related to global climate change. These three species are the invasive *tomentosoides* form of the green alga, *Codium fragile*; the barnacle *Elminius modestus;* and the Pacific oyster, *Crassostrea gigas.* The report identifies several caveats regarding literature reports of species associated with climate change. The Working Group identified the need for a consensus among biologists of the definition of vagrants, which WGITMO considers native species. Similarly, Lusitanian and West African species are considered native, but may be reported as range expansions or non-native species in regions that were only recently monitored, i.e., there is no record of what was or was not there in the past. Other species, e.g., *Bugula neritina* (possibly part of a complex of species that is as yet unresolved) and *Balanus amphitrite* are cosmopolitan. Although there is evidence of sea surface temperatures rising and changes in salinity, pH, currents, and other variables associated with global climate change, many of these parameters are measured offshore whereas non-native species are monitored nearshore.

Recommendation

WGITMO will continue to consider these parameters and scientifically validated approaches to linking observations about change in distribution of non-native species to climate change.

4.3 Status of five year report

ToRc to finalize the five year summary of national reports (2003–2007) with the aim to prepare a 25-year summary based on earlier reports at a future meeting (intercessional editing of draft report after the meeting)

WGITMO reviewed the status of 5-year report and previous summary reports to follow a few specific organisms over a long time. To the extent that they are available, the earlier reports will be placed on the Sharepoint web pages for review ongoing review during intersession. Although the records are incomplete, given the resources of WGITMO, the 5-year-summary will be based on National Reports only. If known, other information may be added, but comprehensive gathering of details from other sources is not feasible. Miossec and Laing prepared the 5-year report on parasites and diseases. Gollasch prepared the 5-year report for invertebrates. Pederson has volunteered to complete the 5-year report on algae (macroalgae and phytoplankton) and Wallentinus has agreed to edit the document. Fredrik Nordwall will prepare a draft of the 5-year summary for fish but will not be able to do so until September 2008. The inconsistency in developing materials is a result, in part, of losing some members who has previously worked on various sections.

Recommendation

WGITMO will prepare a draft report intersessionally for review and adopt a final document at the 2009 meeting. In addition, suggestions for integrating data from the last 25 years will be discussed and serve as the basis for preparing a future report Note: the issues are not trivial. WGITMO needs to identify those definitions that constitute introductions, established populations, range expansions, vagrants, Lusitanian expansions and more. We have begun this process.

4.4 Status of Crassostrea gigas report

ToR e to prepare a draft Alien Species Alert report on *Crassostrea gigas* with the aim of editing and finalizing a report for next year's meeting and develop an outline for an Alien Species Alert report for the Chinese mitten crab *Eriocheir sinensis*.

There was a lively discussion of the planned Species Alert Report on *Crassostrea gigas* because of the spread of wild population to several European countries. Daniel Masson provided an overview of the input to the UK risk assessment (see Annex 3). A brief summary of the spread and impact of *C. gigas* in ICES countries will be integrated into the draft report. WGITMO recommends that wild and aquaculture *C. gigas* populations be discussed in the report, including issues of climate change as it relates to spread, controversial views (e.g., *C. gigas* is a pest in the Wadden Sea, but at the same time a great fishery in France). In France eradication programmes are implemented to destroy wild oysters, (i.e. reefs outside hatcheries are destroyed with caterpillars).

4.4.1 Status of Crassostrea. gigas report

There was a lively discussion of the planned Species Alert Report on *Crassostrea gigas* because of the spread of wild population to several European countries. Daniel

Masson provided an overview of the input to the UK risk assessment (see Annex 3). A brief summary of the spread and impact of *C. gigas* in ICES countries will be integrated into the draft report. WGITMO recommends that wild and aquaculture *C. gigas* populations be discussed in the report, including issues of climate change as it relates to spread, controversial views (e.g. *C. gigas* is a pest in the Wadden Sea, but at the same time a great fishery in France). In France eradication programmes are implemented to destroy oysters, (i.e. reefs outside hatcheries are destroyed with caterpillars).

4.4.2 On the climate aspects relevant to C. *gigas* the following was reported as indicated by country

Ireland: A combination of factors promotes *C. gigas* spread; one of those is climate change. Its recruitment is known only from northern part of the country, leading to one assumption this demonstrates natural selection of oysters to tolerate current climate regimes. (Cardoso Jona FMF, Langlet Denis, Loff José F, Marti Ana R. 2007. Spatial variability in growth and reproduction of the Pacific oyster *Crassostrea gigas* (Thunberg, 1793) along the west European coast. Journal of Sea Research 57: 303–315).

Belgium: Oysters spawn earlier after warm winters, i.e. spread is clearly climate related.

Germany: The observed trend of oyster spread appears to be climate related. Because there is no salinity change in the Wadden Sea and no food limitation, the correlation of change and temperature appear to be climate related.

(Nehls, Georg and Büttger, Heike. 2007. Spread of the Pacific Oyster *Crassostrea gigas* in the Wadden Sea Causes and consequences of a successful invasion. The Common Wadden Sea Secretariat, Wilhelmshaven April 2007).

Norway: There are only one or two locations in southern Norway where *C. gigas* in known in the wild.

Sweden: In summer 2007, less than a year old specimens of *C. gigas* appeared in Sweden along almost 300 km of the west coast, which may be considered as an indication for a climate change related spread in the oyster distribution from Denmark or German, since the previous winter and spring was mild. (See Swedish National Report).

UK: *C. gigas* is spreading.

Croatia: No *C. gigas* is reported, but culturing with native oysters is prevalent.

France: There is a natural spread of *C. gigas* outside farms, and great concern about ecological impacts (e.g. food limitations, maintain integrity of mudflats, and impact on mussel industry. Drastic eradication efforts are underway for escaped populations.

Netherlands: (as reported by Belgium): *C. gigas* is spreading. There are plans to destroy oyster reefs to keep mudflats.

Italy: No recent difference in *C. gigas* occurrence.

Spain: *C. gigas* is found in farms and the wild, but it is unknown if temperature impacts the populations.

Laurence Miossec, France will have a draft report for WGITMO to review during intersession.

It was decided that a report on the blue crab *Callinectes sapidus,* which has been reported by many European countries would be a preferred next Alien Species Alert Report. Jesus Cabal, Spain has offered to lead this effort. If ICES approves that this is recommendation, he will prepare an annotated outline for the next meeting.

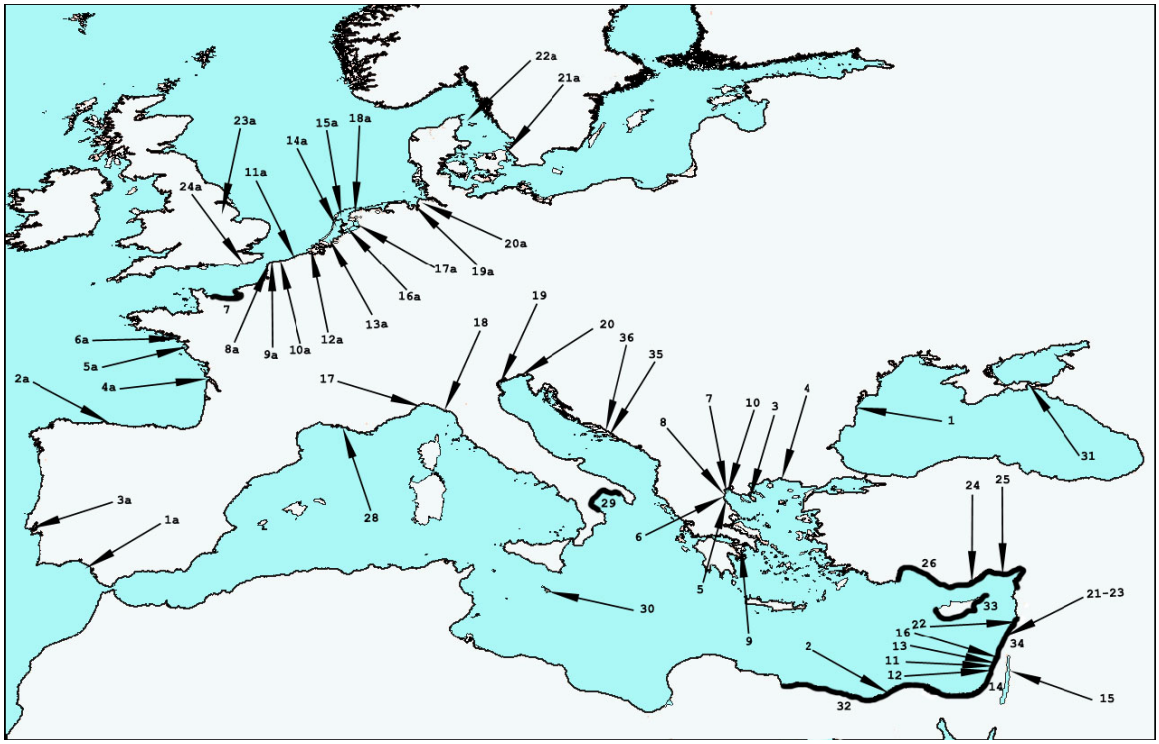

Figure 4.2 Map of *Callinectes* findings in Europe as provided by J. Cabal, see terms of reference.

Recommendation

WGITMO proposes to develop the next Alien Species Alert Report on the blue crab (Callinectes sapidus) which is found throughout Europe (see Figure 4.2) and is a relevant topic for targeted species.

4.5 Status of impact of targeted fisheries on nonindigenous species

ToR g to prepare a draft document on the impact of targeted fisheries on non-indigenous species (e.g. king crab, Chinese mitten crab, green crab, Manila clam).

There was confusion about the request for looking at targeted fish species in relation to the Code of Practice. Thus, there was not a draft report prepared. The issue was discussed and we are referring this ToR back to ICES to get further clarification.

The confusion about how to respond arises from the choice of species identified. For example, the King crab (*Paralithodes camtschaticus*) was intentionally introduced long before the Code was approved, the Chinese mitten crab (*Eriocheir sinensis*) came unintentionally with ballast water, and the European green crab (*Carcinus maenas*) was also an unintentional introduction to the Northwest Atlantic and eventually the Pacific Coast of the US and Canada. The Manila clam (*Venerupis philippinarum*) was introduced intentionally before the Code was approved. Below are some comments:

Bivalves

Manila clam (*V. philippinarum*) was intentionally introduced in Europe for aquaculture, specifically into Italy in 1970s; UK & Ireland 1982; France 1972; Portugal

(year unknown); Spain, early 1980s. It spread and became established. The key natural reproduction sites in Europe include Italy, France and Ireland.

Norway, culture of *V. philippinarum* was attempted, but few individuals were found in the wild whereas in Ireland, no targeted fisheries in the wild. In the UK, fisheries for Manila clam in the wild may affect native species as Manila clam and native bivalves are not easy to tell apart and native species may also be taken. Native mussels only reproduce when they are larger, but they are taken from the wild before they reach a size where they can reproduce, i.e. no chance for natural reproduction. The native species at risk is *Venerupis decussata*.

Although the Manila clam was in aquaculture in France, efforts were terminated due to drop on market value, it spreads in wild, and it depresses native mussels. In Belgium, there is no wild population, even though there was one unsuccessful attempt. Italy is the country with the greatest number of Manila clams in production in EU aquaculture. Wild populations are known; and wild collections of *V. philippinarum* threaten native species.

Spain is farming and examining wild fisheries of *V. philippinarum* impact on *Venerupis decassata*.

Crustaceans

King Crab (*Paralithodes camtschaticus*) is appreciated as a highly valued fishing item.

The European green crab (*Carcinus maenas*) arrived in the US probably from shipping vessels. It is the primary predator in the intertidal in the Northeastern portion of North America.

Chinese mitten crab (*Eriocheir sinensis*) has invaded several European countries and the U.S. Below are some reports by country.

Germany: One fisherman in the port of Hamburg catches crabs more or less as selective effort. Crabs are also caught as bycatch in eel fisheries where they are sold to Asian markets. Exports of juveniles to China were also attempted to restock the depleted population.

Ireland: There are a few crabs recorded, but no fisheries.

UK: The UK is looking at the feasibility of establishing a fishery.

France: No information on the Chinese mitten crab.

Belgium, Italy, Spain: There is no fishing for the mitten crab in these countries.

The question of interest is whether the Code of Practice was used in the past for targeted fisheries.

Countries that used the Code of Practice for targeted fisheries are as follows:

UK (*C. gigas*, Manila clam, other oysters)

Ireland (Manila clam, abalone, *Pecten yezoensis*)

Sweden (it is prohibited to import alien species by Swedish law)

USA (*C. ariakensis*)

Not used in Norway, Spain, Italy, Germany, Belgium, France, Croatia.

Recommendations and actions for 2009

During intersession, WGITMO will prepare a summary of important introduced species for ICES publication.

5 WGITMO Terms of Reference

The **ICES Working Group on Introduction and Transfers of Marine Organisms (WGITMO)** (Chair: Judith Pederson, USA) requests approval to meet in Washington, DC, USA, 11–13 March 2009 (back-to-back with WGBOSV with a common meeting on 11 March 2009) to:

a) Synthesize and evaluate national reports using the new format for reporting and contributions to the database that includes species, locations (latitude and longitude), status of invasion and other relevant information (also including information of relevant species from other ICES member countries as appropriate), and develop an annual summary table of new occurrences/introductions of aquatic invasive species in Member Countries. And also to prepare an information bulletin of highlights for the ICES Internet site;

b) Finalize the five year summary of national reports (2003–2007) and begin to prepare for a draft 25-year summary based on earlier reports (this requires intercessional editing of draft reports prior the meeting);

c) Finalize the draft Alien Species Alert report on *Crassostrea gigas* and requests that we develop a report on the blue crab *Callinectes sapidus* as the next Alien Species Alert report (see map under the targeted species discussion) rather than the Chinese mitten crab *Eriocheir sinensis.*

We request ACOM agree to the *Callinectes sapidus* as the next Alien Species Alert Report.

d) Continue to develop joint projects (e.g. management of database and taxonomic expertise) with PICES WG21 during intersession that furthers cooperation and communication for resource sharing and information on introduced species. This would be of mutual benefit for PICES and ICES;

There are other areas were we can cooperate, but the database management is a significant commitment for all Working Groups. We will continue other collaborative efforts, e.g. provide information on species native to ICES countries that are introduced in PICES countries.

e) Finalize the preparation of a draft report on the impact of targeted fisheries on non-indigenous species with an emphasis on ICES Member Countries; this will require intersession discussion to select species that were considered with the Code of Practice;

We propose to develop an outline and a set of criteria for preparing a document to respond to this ToR.

f) Review the Internet-based Appendices of the ICES Code of Practice on the Introduction and Transfer of Marine Organisms. These Appendices were prepared in 2002 and may need some editing to ensure up-to-date requirements;

This will also be useful to TOR e and contribute to consideration of targeted species and the Code of Practice.

g) Discuss the need of harmonizing selection criteria to develop lists of high risk, moderate risk and low risk lists for intentional introductions and for mitigating new unintentional introductions (see e.g. the Norwegian 2008 National Report);

This issue is related to the discussion of risk assessment and rapid response and should use information from IMPASSE and other approaches. It also is related to TOR b, e, and f.

h) Continue to encourage all ICES Member Countries to submit WGITMO National Reports.

We request that all countries have a designee for the WGITMO who is responsible for the National Report. Much of the data that is relevant to our TORs, e.g., early detection of an introduced species is not yet published or in gray literature. Thus, to have an individual in each country fill out the report will provide some continuity from year to year and provide an alert o neighboring countries. Specifically, we lack representatives from Denmark, the Netherlands, Iceland, Latvia, Lithuania, Portugal, and Russia. ICES assistance in identifying individuals who will provide National Reports, review publications, and attend meetings would be appreciated. We have appreciated the attendance, reports, and cooperative efforts of Croatia, Italy, and Australia for the current effort.

We will also continue to meet with WGBOSV on areas of interest to both of Working groups. These will include hull fouling, monitoring (e.g. Port Sampling Protocol (a TOR of BOSV of interest to ITMO as some aquaculture facilities are in close proximity to ports, .e.g ballast water discharge zones).

WGITMO will report by 21 April 2009 to the attention of the ACOM.

Annex 1: List of participants

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Annex 2: Agenda of the March 2008 WGITMO Meeting

ICES Working Group on Introductions and Transfers of Marine Organisms

Agenda

March 12–14, 2008

Copenhagen, Denmark

Wednesday March 12, 2008

Joint session with Working Group on Ballast and Other Shipping Vectors

9:00–9:30 AM Brief round of introductions of both committees

9:30–10:30 AM Hull Fouling

- Review of Hull Fouling Report prepared by WGSOBV

10:30–11:00 AM Break

11:00AM–12:30PM Discussion of collaborative efforts with PICES WG 21

- Summary of discussions to date-Gollasch, Jelmert. Future actions relating to ToRs
- Barcoding-Jelmert

12:30–2:00 PM Lunch

2:00–6:00 PM Presentations on risk assessment approaches

- IMPASSE UK risk assessment scheme - Gordon H. Copp
- Canadian risk assessment approach-Becky Cudmore
- Brief reference to EU Programme IMPASSE-Gollasch
- What are the strengths and weaknesses of the various approaches
- What are the uncertainties

Thursday March 13, 2008

9:00–10:00 AM Welcome, Introductions, Meeting Logistics (wireless, printing, food, etc.)

- Possible addendum on risk assessment for the Rapid Response report
- Risk assessment in the framework of the ICES Code of Practice on the Introductions and Transfers of Marine Species.

9:30–10:30 AM ToRb: Nation Report Session

- Brief presentations of National Reports

10:30–11:00 AM Break

11:00 AM–12:30 PM Nation Report Session continued

- Brief presentations and discussion

12:30–2:00 PM Lunch

2:00 AM–4:00 PM Synthesize and evaluate national reports for sending summary to related committees and ICES ACOM

- ToRa Review other reports on hydrographic attributes, trend analysis, quantifying relationships, formulating hypotheses and predictions about mechanisms and selecting species for more intensive recommendations. We need to complete the assessment of changes in the distribution and abundance of marine species in OSPAR maritime area in relation to hydrodynamics and sea temperatures.

4:00–4:30 PM Break

4:30–6:00 PM Continued discussion on ToRa and b

- Review of status of 5 year report and previous summary reports to follow a few specific organisms over a long time. To the extent that they are available, the earlier reports will be placed on the Sharepoint web pages for review prior to the meeting.

Friday March 15, 2008

9:00–10:30 AM ToRe *Crassostrea gigas* report

- Discussion and comments of planned Species Alert Report on Crassostrea gigas-Daniel Masson
- Review options for targeted fisheries on non-indigenous species and make decision

10:30–11:00 AM Break

11:00 AM–1:00 PM **Final session**

- Prepare recommendations and actions for 2009
- Meeting adjourned

Annex 3: Gordon Copp's presentation on the IMPASSE risk assessment scheme

IMPASSE — Protocols for assessing the risks of using alien species in aquaculture

Gordon H. Copp[1], with contributions from Lorenzo Vilizzi[2] and Laurence Miossec[4]

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Introduction

The non-native species risk assessment scheme being developed as part of the EC project '*IMPASSE*' will provide a framework for evaluating the potential for non-native aquatic plants and animals with which to inform the EU Regulation on the use of Alien Species in Aquaculture. Similar to the UK non-native risk assessment scheme (UK Defra, 2005; Baker *et al*., 2008), the *IMPASSE* scheme is being adapted from the modular structure and protocols espoused by the European and Mediterranean Plant Protection Organisation (EPPO, 2000). As such, the *IMPASSE* scheme will consist of four principal modules (pathway/delivery, facility, organism, receptor ecosystem), with plug-in modules for assessing invasive-ness potential, for quantifying economic impacts and for summarising risk and the uncertainties associated with the assessment process. For identifying potentially invasive species, the *IMPASSE* 'organism' module will make use of five taxon-specific Invasive-ness Scoring Kit (ISK), which are adapted versions of the Pheloung *et al*., 1999 *Weed Risk Assessment* (see Copp *et al*., 2005; http://www.cefas.co.uk/4200.aspx). The five invasive-ness modules currently concern: freshwater fish (FISK), marine fish (MFISK) amphibia (AmphISK), freshwater invertebrates (FI-ISK) and marine invertebrates (MI-ISK). These screening kits have a scoring range of -11 to 54, with an uncertainty-to-certainty ranking range of 1 to 4.

This presentation outlined the *IMPASSE* scheme and then described the calibration of the FISK scoring thresholds (between low, medium and high risk) as well as recent improvements to the original FISK screening tool (Copp *et al*., 2005), which now requires the assessor to rank the level of certainty of their responses. As a trial of the potential use of the EPPO-based approach, the Pacific oyster *Crassostrea gigas* was assessed using the current version of the U.K. risk scheme by researchers in the UK and France, with currently un-infested areas of the Normandy and UK coasts, respectively, as the risk assessment areas. The Pacific oyster was introduced to Europe in 16th century (Portugal), and then again in 1960s and 1970s. The species is now farmed in large part in France, and it is spreading along European coasts. The initial, hazard identification, phases of these assessments employed MI-ISK to assess invasive-ness potential. The outcome of these assessments was presented.

Calibration of FISK scores

The 70 non-native species in total assessed with the FISK tool were classified *a priori* as invasive and non-invasive based on information available at: www.fishbase.org. Assessments were carried out independently by five scientists (G.H. Copp, G. Fenwick, M.J. Godard, R.E. Gozlan, L. Vilizzi) each of whom screened a different number of species, but with each species assessed by two scientists. This resulted in two scores per species. Outcome thresholds were set by default (see Copp *et al*., 2005) as 'low risk' (score <1), 'medium risk' (1≤ score ≤ 6), and 'high risk' (score > 6), which

correspond to the categories of 'Accept', 'Evaluate' and 'Reject', respectively, described by Pheloung *et al*., 1999.

Following the statistical guidelines of Gordon *et al.*, 2008, mean FISK scores for assessors did not differ significantly (permutational ANOVA, Anderson, 2001), although between-assessor score differences for the individual species (Δ scores) showed a great degree of variation (0–26). However, there was no significant correlation between mean score and Δ score, indicating that the extent of between-assessor differences was not related to the score assigned to a certain species. Receiver operating characteristic (ROC) curves (Bewick *et al*., 2004) being generated to assess the predictive ability of the FISK scores and thus identify the appropriate 'cut-off' threshold value for discriminating species of medium and high invasiveness risk. The areas under the three ROC curves were always significantly greater than 0.5, indicating that FISK accurately distinguished between invasive and non-invasive species to a greater degree than would be expected by chance alone. Also, pair-wise tests were not significant, indicating that the areas under the three curves were comparable. Based on these results, mean scores (from the assessment set) were used to calibrate the FISK thresholds. The maximum Youden's index (Bewick *et al*., 2004) indicated a cut-off score of 18.8, with ROC curve minima and maximum being 18.3 and 23.8, respectively. Therefore, the recommended cut-off between medium and high risk is 18. Within the group of species classed by FISK as high risk using the threshold level of 18, a 'higher risk' category could be identified, visually and by analysis of a lag plot (S-Plus 2000 Professional Release 3 for Windows), consisting of two species, namely topmouth gudgeon *Pseudorasbora parva* and gibel carp *Carassius gibelio*. This was supported by the corresponding lag plot, which evidenced separation of the latter from the other species.

Example risk assessment of Pacific oyster

In the assessments of the Pacific oyster, a MI-ISK score of 42 was obtained for the UK (but the level of uncertainty was not reported) and a score of 36.0 was obtained for Normandy, with the mean uncertainty being 3.6. The summarized risks obtained using the UK risk assessment scheme differed according to the score calculation method used. By simple summation of the risk scores, the total risk was 'medium' for both the risk areas, but the risk of impacts was ranked as low for Normandy and medium for the U.K. Whereas, using conditional probabilities (Holt, 2006), the impact risk was again classed as low for Normandy and medium for the U.K., but the total risk was classed as 'high'. These mathematical summaries of impact and total risk differed from the author's subjective assessment of the total risk, which was 'high' for Normandy but 'medium' for the U.K., with the authors ranking the risks of impact to be moderate in both risk areas. The levels of certainty (by summation) also differed between the U.K. and Normandy assessments, with those for Normandy being 'low' for all assessment topics (Entry, Establishment, Spread, Impacts, Total) in contrast to 'medium' in the U.K. for all topics except Entry and Establishment (which were 'low'). The author's judgments of certainty were similar to those by summation, except for the Total for Normandy, which was 'medium'.

In summary, the modular structure of the proposed *IMPASSE* scheme for assessing the potential risks of the use of alien species in aquaculture was outlined. FISK is able to distinguish accurately between invasive and non-invasive species. The original threshold for low-to-medium risk remains set at <1, and species with scores 1–18 are of medium risk and those of >18 are high invasive-ness risk. The modular approach

to risk assessment appears to show great promise for use in evaluating the use of aliens in aquaculture, with further testing of the scoring kits required.

References

Anderson, M.J. 2001. Permutation tests for univariate or multivariate analysis of variance and regression. *Can J. Fish. Aquat. Sci.* 58, 626–639.

Baker, R.H.A., Black, R., Copp, G.H., Haysom, K.A., Hulme, P.E., Thomas, M.B., Brown, A., Brown, M., Cannon, R.J.C., Ellis, J., Ellis, M., Ferris, R., Glaves, P., Gozlan, R.E., Holt, J., Howe, L., Knight, J.D., MacLeod, A., Moore, N.P., Mumford, J.D., Murphy, S.T., Parrott, D., Sansford, C.E., Smith, G.C., St-Hilaire, S. and Ward, N.L. 2008. The UK risk assessment scheme for all non-native species. *Neobiota Series* (in press).

Bewick, V., Cheek, L. and Ball J. 2004. Statistics review 13: Receiver operating characteristic curves. *Critical Care* 8, 508–512.

Copp, G.H., Garthwaite, R. and Gozlan, R.E. 2005. Risk identification and assessment of non-native freshwater fishes: concepts and perspectives on protocols for the UK. Cefas Science Technical Report (http://www.cefas.co.uk/publications/techrep/tech129.pdf).

EPPO, 2000: EPPO Standards: Pest Risk Analysis. European and Mediterranean Plant Protection Organization, PM 5/1–4 English.

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Holt, J. 2006. Score averaging for alien species risk assessment: a probabilistic alternative. *J. Environ. Manag.* 81, 58–62.

Pheloung, P. C.; Williams, P. A.; Halloy, S. R., 1999: A weed risk assessment model for use as a biosecurity tool evaluating plant introductions. *J. Environ. Manag*. 57, 239–251.

UK Defra, 2005. Standard methodology to assess the risks from non-native species considered possible problems to the environment. (www.defra.gov.uk/wildlife-countryside/resprog/findings/non-native-risks/index.htm).

Annex 4: Canada's Approach to Risk Assessment

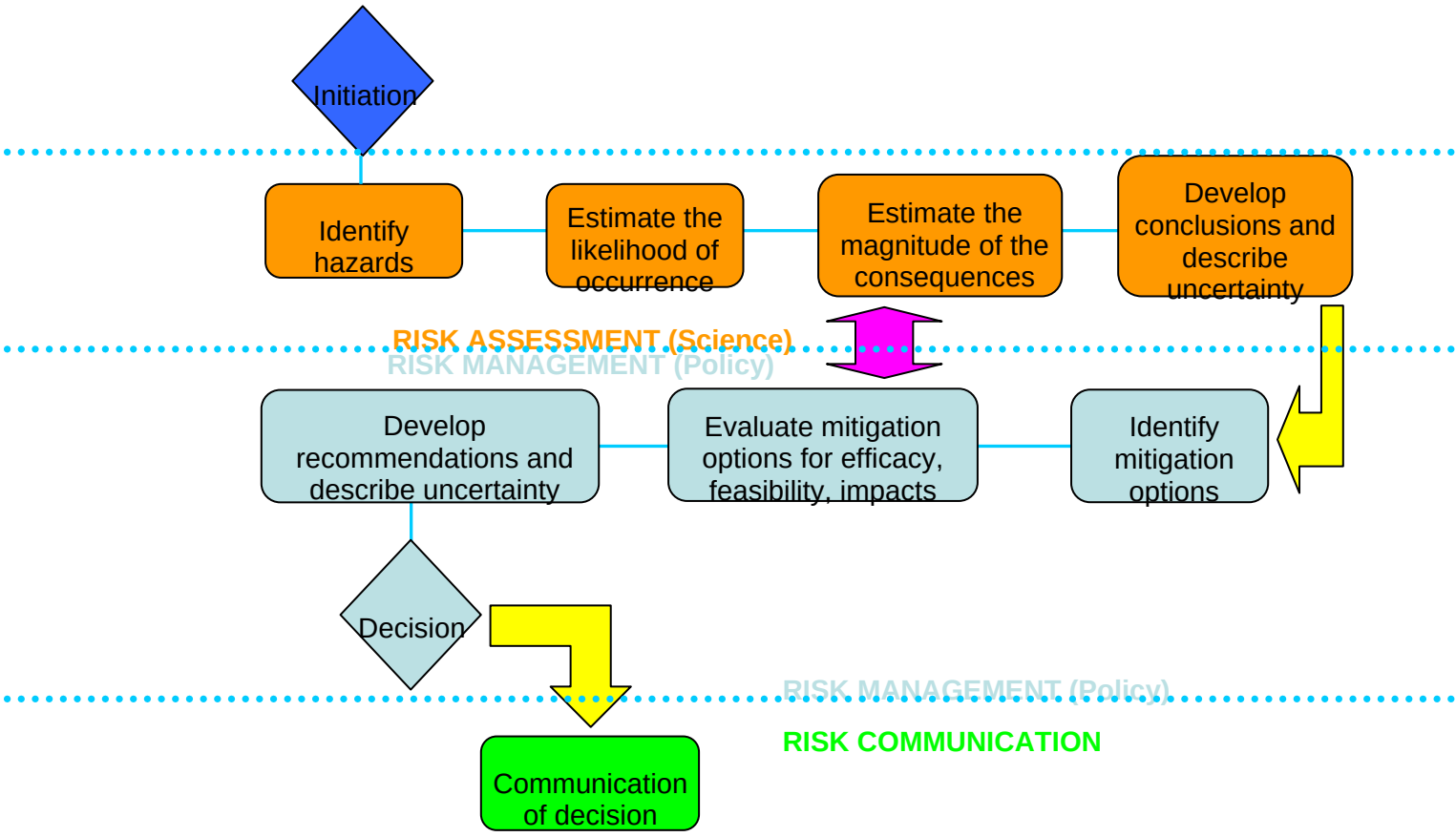
Canada's Approach to Risk Assessment for Marine Organisms

Becky Cumore, Department of Fisheries and Oceans, CEARA, Canada

Centre of Expertise for Aquatic Risk Assessment

Fisheries and Oceans Canada's Centre of Expertise for Aquatic Risk Assessment (CEARA) looks at the biological risk of aquatic invasive species (AIS); the likelihood of the introduction of an AIS and the magnitude of the consequences of that introduction. Biological risk assessment is the first of three components of an overall risk analysis framework. Risk management (socio-economic impacts of AIS and mitigation options) and risk communication are the two other components making up a risk analysis framework.

RISK ANALYSIS = assessment + management + communication

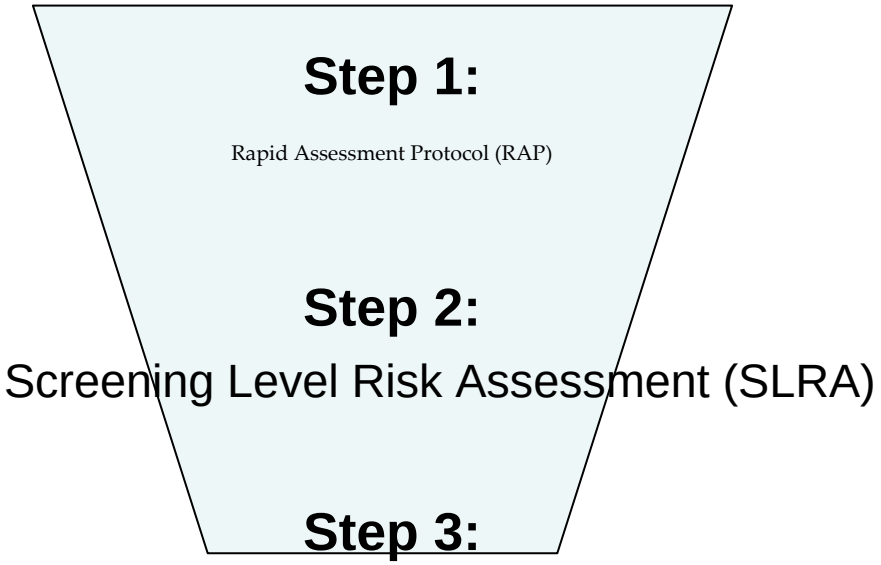


CEARA's Directorate (Nick Mandrak, Executive Director and Becky Cudmore, Manager) ensure that the objectives of CEARA are met. These objectives are to: develop a national standard for conducting biological risk assessments of AIS; educate practitioners on the risk assessment process; develop a process for prioritizing risk assessment needs and extend this advice to Fisheries and Oceans headquarters; and, coordinate and track progress of national risk assessments to ensure deliverables are met.

To date, several risk assessments have been completed and include five species of Asian carps, northern snakehead and five species of tunicates. Risk assessment projects that are nearing completion are European green and Chinese mitten crabs, six freshwater invasive fishes on the Pacific coast and bloody red shrimp (*Hemimysis anomala*). Ongoing data collection to be used for a relative assessment of freshwater fish pathways is being done for live food, aquarium, water garden and bait trades. Data is also being collected for an assessment of the risk of Ponto-Caspian fishes to the Great Lakes.

Biological risk assessment program

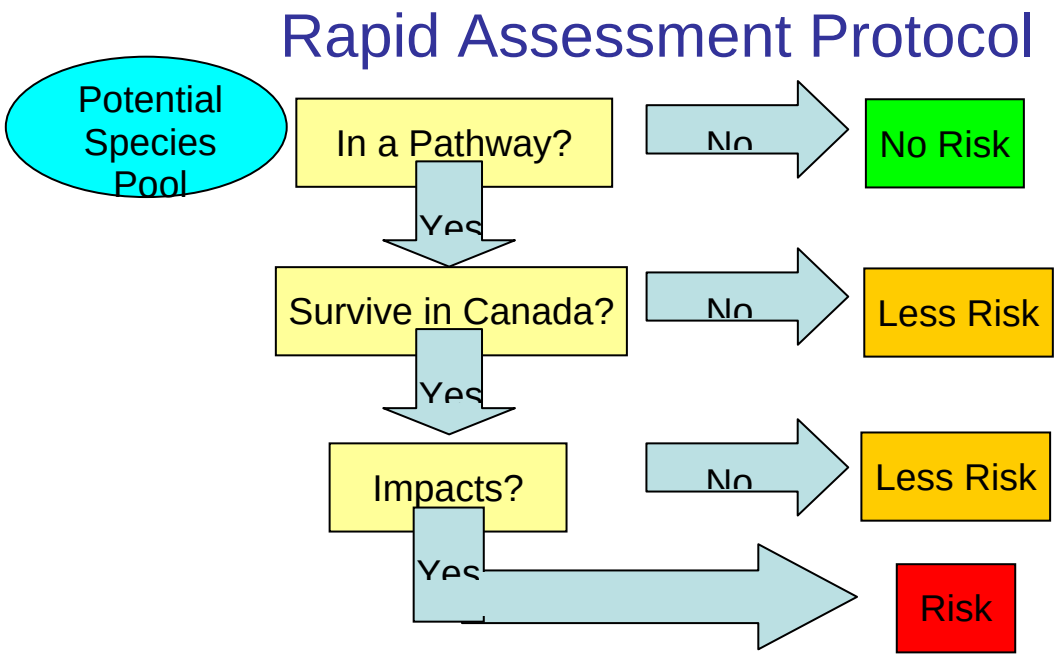
Fisheries and Oceans Canada's biological risk assessment program (developed and coordinated through CEARA) is relatively new and continues to develop over time. CEARA currently envisions a three step biological risk assessment process for AIS:



As the program is still under development, the process and steps are not currently finalized.

Step1: Rapid Assessment Protocol (RAP)

The draft rapid assessment protocol being developed by CEARA allows for rapid assessment of a newly arrived AIS in order to provide guidance on potential risk (feeds into a rapid response framework), or allows for screening large volumes of species, such as those in live trade. The RAP asks three questions: 1. is the species in a pathways (or has arrived)?; 2. is the species able to survive in Canada?; and, 3. are there known impacts elsewhere, or predicted impacts? Tools are currently under development by CEARA to quickly assess survival in Canada (GlobalFish) and to predict impacts based on a limited knowledge of a species life history.



Step 2: Screening Level Risk Assessment (SLRA)

This step is important for species coming out in the RAP as 'less risk' or 'risk', but may not require a detailed level risk assessment (Step 3: DLRA). Information to be gathered about the species would be needed in more detail than required for the RAP, but less detail than required for a DLRA. CEARA will be looking at UK's CEFRA's Fish Invasiveness Screening Kit (FISK) adapted by Dr. Gordon Copp from Australia's Weed Invasiveness Screening (by Pheulong).

Step 3: Detailed Level Risk Assessment (DLRA)

Step 3 requires the greatest amount of information available on the species of interest. The information on the species description, taxonomy, distribution, biology, uses by humans and ecological impacts are compiled into a detailed biological synopsis. This biological synopsis is then used as the basis for a DLRA following guidelines drafted by CEARA.

CEARA's national guidelines for conducting biological risk assessments for AIS

The methodology for conducting biological risk assessments for AIS is meant for species that are introduced through unintentional or unauthorized means. CEARA attempts to remain proactive by conducting biological risk assessments for species that have yet to be introduced to Canada, or have been newly discovered in Canadian waters. The methodology used is similar to most international risk assessment guidelines where risk and uncertainty rankings are presented separately, rather than combined.

The guidelines present a two part process ranking the likelihood of introduction (assess likelihood for arrival, survival, reproduction and spread) and the consequences (ecological and genetic) of this introduction for the species itself, as well as for its fellow travellers (pathogens, parasites or other organisms).

The results of the DLRA are considered formal science advice for the Government of Canada and, therefore, all risk assessment results are to be peer reviewed in a

meeting of experts following the Canadian Science Advisory Secretariat (CSAS) advisory process (http://www.dfo-mpo.gc.ca/csas/).

CEARA's draft national guidelines provide an organized framework for conducting biological risk assessments for AIS, are transparent, flexible and are not prescriptive. However, it is recognized that the draft still requires some work before finalization such as how overall components involved in the likelihood of introduction section are combined and how elements of the consequences may be better reflective of true risk. Similar to most ecological risk assessment guidelines and frameworks, there is also a bias towards medium risk. These shortcomings are to be addressed in the coming months.

As the national guidelines are not prescriptive, but are to be considered a guiding framework ('toolbox'), the development of specific risk assessment tools have also occurred. One such tool, the Quantitative Biological Risk Assessment Tool (QBRAT), has been developed by Marten Koops and Becky Cudmore (Fisheries and Oceans Canada, Burlington ON).

Assessing the biological risk of Chinese Mitten Crab (*Eriocheir sinensis*) in Canada

To show how the national guidelines have been used to assess risk of AIS in Canada, an example was presented for Chinese mitten crab. This species was identified as a species of concern by CEARA based on its global invasion history. As Chinese mitten crab has been reported from Atlantic Canada and the Great Lakes, it was determined that a formal risk assessment was needed to characterize the potential risk posed to Canadian waters. A DLRA began in the spring of 2007 with the completion of a biological synopsis (Veilleux and DeLafontaine, 2007).

To estimate the probability of introduction of this species, information was gathered to characterize the likelihood of arrival, survival, establishment and spread. This included information on known and potential pathways of introduction, coarse scale analysis of physiological tolerances, analyses of suitable environmental conditions at port locations, river suitability analysis, larval drift modeling from source populations, and identification of other methods for secondary spread. The overall likelihood of introduction for Atlantic Canada was determined to be moderate, with high uncertainty.

To estimate the ecological consequences information was collected on potential impacts on the food web, impacts on the integrity of aquatic habitats and impacts seen in other areas where the species was introduced. Ecological consequences to specific components were assessed, which included consequences to marine, freshwater and estuarine biodiversity, habitat and genetic consequences, etc. The overall magnitude of ecological (genetic was incorporated) consequences was determined to be high, with very high uncertainty.

Combining probability of introduction with consequences, the overall risk rating for Atlantic Canada was Moderate Risk, with Very High uncertainty.

For assessing the risk of fellow travelers, it was noted that the risk varies with life stage and that two issues should be assessed: the Oriental lung fluke (*Paragonimus westermani*) and for epibionts (such as nematodes, bivalves and crustaceans) found on the hairy claws of the Chinese mitten crab. The lung fluke's secondary host has been recently discovered on the west coast of North America, while data on epibionts is just emerging. Therefore, the probability of introduction (assessing arrival, survival,

reproduction and spread) for these fellow travellers was determined to be moderate with very high uncertainty. The magnitude of consequences for the fluke was determined to be low with moderate uncertainty, while for the epibionts the consequences were determined to be low with very high uncertainty.

Combining probability of introduction with consequences for the fellow travellers, the overall risk rating for Atlantic Canada was Moderate Risk, with Very High uncertainty.

Summary

Canada's emerging biological risk assessment program, with the development of a Centre of Expertise for Aquatic Risk Assessment, is providing valuable science advice to the Government of Canada by assessing the risk of newly found, or potential AIS. CEARA is also providing valuable tools and risk assessment results for rapid response, monitoring and research. The RAP could be an important component for a rapid response protocol, while the risk assessment results can be used to identify geographic areas of concern for monitoring, as well as areas where further research is needed to better characterize the risk potential.

Literature cited

Veilleux, E. and Y. DeLafontaine. 2007. Biological synopsis of the Chinese mitten crab (Eriocheir sinensis) Canadian Manuscript Report Fisheries and Aquatic Sciences #2812, 60pp.

Further Information

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http://www.dfo-mpo.gc.ca/science

The Environmental Impacts of Alien Species in Aquaculture (IMPASSE)

Annex 5: ICES WGITMO Report 2008

ICES WGITMO Report 2008

WGITMO Report to OSPAR report

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In addition to the above, the following WGITMO members also contributed comments and references: Adi Kellerman (ICES, Denmark), Dan Minchin, (Ireland), Anna Occhipinti-Ambrogi (Italy); Henn Ojaveer (Estonia), Susanna Pakkasmaa (Sweden), and Lauri Urho (Finland) WGITMO.

This document responds to a Term of Reference request to the Working Group on Introductions and Transfers of Marine Organisms (WGITMO) by the Protection and Conservation of Marine Biodiversity and Ecosystems Convention (OSPAR). The request by OSPAR was to identify and report on changes in the distribution, population abundance, and condition of introduced marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature.

Summary

Currently, papers that identify range expansion change in reproductive periods, alterations in other life history traits, or other non-native related changes due to global climate change are rare in the published literature. The Working Group on Introductions and Transfers of Marine Organisms (WGITMO) has chosen three species based on collective best judgment and selected publications. Perhaps the best example is the Japanese oyster *Crassostrea gigas*, which was introduced for aquacultural purposes, but has since become established in the wild and is spreading throughout Western Europe. *Crassostrea gigas* will be the featured Alien Species Alert Report and more information will be available in 2009. A barnacle, *Elminius modestus* and the green alga, invasive *tomentosoides* strain of *Codium fragile,* are two other introduced species for which observational data on range expansion and extended reproductive periods are available from long-term monitoring (e.g. for the UK).

Other published reports and sampling data on non-native species suggest that ranges are expanding due to climate change, but often long-term records or other supporting data are lacking. We have organized the rest of this report according to the following categories: nonindigenous species with highly probable response to global climate change, potential nonindigenous exhibiting range expansion, vagrant species, Lusitanian species (considered native in this report), cosmopolitan species, and others.

We also note the difficulty in developing this report with statistical data and with conflicting information in the literature about sea surface temperature.

Introduction

ToR to Working Group on Introductions and Transfers of Marine Organisms

a) Consider the reports of the Ad Hoc Groups on;
   i) Hydrographic Attributes
   ii) Trend Analyses & Quantifying Relationships
   iii) Formulating Hypotheses and Predictions about Mechanisms
   iv) Selecting Species for More Intensive Investigations

and use their recommendations concerning (1) recommended time series, (2) analytical methods and suitable software, (3) hypotheses and guidance for their use, and (4) a suggested list of species for intensive study, to complete 'the assessment of changes in the distribution and abundance of marine species in the OSPAR maritime area in relation to changes in hydrodynamics and sea temperature.

We have received a document entitled "Advice for the consideration of changes in biota caused by hydrographic and sea temperatures changes by ICES in 2007" prepared by the Working Group on Ecosystem Effects of Fishing Activities (WGECO). The document identifies not only temperature and hydrodynamics, but other climate-related factors that may influence distribution and abundance. In another correspondence from ICES, it was noted that statistical techniques were not available to provide consistency across all ICES Working Groups. Thus, we briefly define our approach on how we made decisions in our response to OSPAR's request.

Approach

This document provides a list of some of the many nonindigenous species that are deemed to be established (i.e., they are reproducing in the new location), appear to show range expansion, and/or show changes in reproductive periods over the last several years (Gollasch *et al*., 2007; Wallentinus, 2007; draft Five Year Summary). The list of highly probable and potential non-native species responding to global climate change are compiled from the literature and best professional judgment of the Working Group on Introductions and Transfers of Marine Organisms (WGITMO) attendees at the March 2007 meeting and updated at the 2008 meeting and others by correspondence. As the OSPAR request is limited to nonindigenous species, this document only briefly mentions vagrant, Lusitanian, and West African species which are considered extending their range, or those classified as others (e.g. freshwater).

In the literature, several other nonindigenous species appear to be expanding their range, but the data currently do not support the cause as global climate change. These species are identified as potential nonindigenous species with climate-change range expansion and should be watched and monitored.

Vagrants are defined as species that for a variety of reasons (physiological, physical changes in the environment) expand to an area, remain for a time then disappear; i.e. transitory but not migratory. As we reviewed the literature for this effort, we realized that there are many definitions of vagrants that the larger biological community should address. We have used the collective judgment of WGITMO for defining vagrant species.

For this report we define Lusitanian species as native, even though many are apparently expanding their range eastwards and northwards e.g. into the North Sea. The range changes of Lusitanian species are not always recognized due to the absences of long term monitoring data, and is sometimes interpreted differently by

different investigators (Franke and Gutow, 2004; Hiscock *et al*., 2004; Kerckhof *et al*., 2007). Simultaneously, several North African species are expanding their range into European waters. We have a brief statement about cosmopolitan species.

The other category, which generally is not within our mandate (Introductions and Transfers of Marine Organisms), includes some freshwater species. However, because many ICES countries are surrounded by fresh or brackish water and have observed climate-related expansions, we have included a few examples.

The published literature is sparse on documented climate change impacts on non-native species. The data on species spread are incomplete because of limited spatial and long-term sampling of non-native species throughout the ICES countries. Of all the species considered three were chosen as likely examples of range expansions that appear to be related to warming temperatures associated with global climate change. The three are (1) an escaped aquaculture species, the Japanese oyster (*Crassostrea gigas*), (2) a barnacle species (*Elminius modestus*) and (3) invasive *tomentosoides* strain of the *Codium fragile* (hereafter *Codium*) for which range expansions appear to be related to warming temperatures associated with global climate change. One of these three, the barnacle *E. modestus* was mentioned in three reports as responding positively to temperature increases and has shown the greatest impact on a native species for which we have data.

For this report, there are several caveats regarding the list of introduced species' that are expanding ranges due to climate change. The selected species are based, in part, on records provided in our national reports. However, the long term records are incomplete, as some countries may not have reported each year and others have not reported at all. Thus, some species are overlooked in this process, and other species may have been present in the past but were not recorded, but now may be reported as range expansions.

A second caveat is the lack of information on many of the species' native range and potential range, i.e. their physiological tolerance that often is greater than their distribution in their native range. The native range for a species is usually limited by physical and biological interactions, but many introduced species face fewer predators, diseases/parasites, and competitors. Thus, the potential range (i.e., the temperature and salinity tolerances) of a species may be greater than the observed native range. This makes it challenging to evaluate a range expansion of a non-native species relative to global climate change.

A third issue that we addressed is to separate out those species found at the edge of their tolerance range (vagrants) that expand and contract with climate fluctuations. Where known, some of these factors have been taken into account. Where additional sources may be helpful to OSPAR countries, we have included links to other programs.

Some additional issues that we considered relate to an ICES report (Astthorsson *et al*., 2006) that suggests range expansion of several species of fish into Icelandic waters. Only three of these fish were considered introduced in previous WGITMO reports. Until further information is available, we list these as possible introduced species range expansions. In the same way, Bañon (http://www.siam-cma.org/cligal/novedades/50.pdf) recorded that some tropical species of fishes are more frequently in the Galicia area in the last years. These species are *Balistes capriscus, Caranx crysos Pseudocaranx dentex*, *Gaidropsarus granti*, *Physiculus dalwigki*, *Pisodonophis semicinctus*, *Lepidotrigla dieuzeidei*, *Kyphosus sectator*, *Seriola rivoliana*, *Fistularia petimba*, *Pomatomus saltator***.** This northward spread of the usual distribution of some species of

fishes was firstly reported by Quero *et al*., 1996, 1998 in *Cyttopsis roseus* and *Zenopsis conchifer* and was probably due to changes in the temperatures of the oceans.

Two UK projects developed models of global climate change and predicted sea surface temperature (SST) increases under different scenarios and related these to potential range expansion of three introduced species, *Codium, Sargassum muticum, and Elminius modestus*. These are the Marine Climate Change Impacts Partnership (www.mccip.org.uk) and the MarClim Project (http://www.mba.ac.uk/marclim/index.php?sec=pub). The MCCIP has developed an annual 'scorecard' mechanism to present data collated by the group, which includes climate change in the marine environment. For the 2006 scorecard, impacts of climate change on non-natives were specifically investigated. The scorecard reported a paucity of evidence demonstrating that climate change has affected invasive species is rare (Elliot, 2006). Consequently, the project evaluates the literature to postulate which marine non-native species already present in the UK may be further spread and/or affected by changing water temperatures. Furthermore, the report suggested that, with rising seawater temperatures, introductions of potentially damaging warm-water species may occur. The MarClim project modeled the predicted range extensions of certain marine species resident in the UK, some of which were non-natives, as are noted above. We have not included *S. muticum* because the northernmost range in the UK is comparable to the temperature experienced at locations in Western Norway where it was established much earlier. This was deemed to negate its potential range expansion in the UK as solely based on global climate change. For a broad discussion on non-native species and climate change, see Occhipinti-Ambrogi, 2007.

Non-native species with expanding ranges and changes in reproduction

The following nonindigenous species are observed to have expanded their range and/or shown changes in their reproductive cycles that may be related to climate change.

Plants: Green alga

Codium fragile

Origin: Japan

> *Codium fragile* the invasive *tomentosoides* strain (Provan *et al*., 2008) shows range expansions around the UK under three different projected climate change scenarios (increase in surface sea temperature SST between 0.41 to 0.80 °C by 2020, 1.01 to 1.98 °C increase by 2080 and 1.67 to 3.28 °C by 2080), with the most significant expansion under the highest increase scenario. There appears a general northern expansion with increasing severity of scenario. This species grows in a variety of habitats (hard bottom and sandy areas with hard substrates e.g., *Crepidula*, rocks, shells,) and competes with kelp and seaweeds (http://www.algaebase.org/; Provan *et al*., 2008).

Arthropods: Barnacles

Elminius modestus

Origin: Australia

> This species has demonstrated extended reproductive periods due to warmer sea temperatures. Warm winter temperatures appear to favour *E. modestus*, whereas severe weather favours the native *Semibalanus balanoides*. See notes

under *Codium* on model-derived SST increases under different scenarios (Kerckhof and Cattrijsse, 2001; Kerckhof, 2002; JNCC, 2007; and Kerckhof *et al.*, 2007).

Molluscs: Bivalves

Crassostrea gigas

Origin: Japan

This oyster species reproduces in the wild and is exhibiting an extended reproductive period as observed along the Belgium and British coasts, in Dutch and German waters after a series of mild winters in the 1990's and early 2000's (Spencer *et al.*, 1994; Reise *et al.*, 2005; Gollasch *et al.*, 2007; Kerckhof *et al.*, 2007) and specimens less than a year old appeared along the Swedish west coast after the mild winter 2006/2007 (see Swedish National Report). Figure 1 shows the location and years of first settlement in the Wadden Sea. *Crassostrea gigas* was massively introduced in the beginning of the 1970s in France for aquaculture purpose. Environmental conditions were appropriate to obtain yearly regular spat recruitment. As recent as 1975, natural spat from Arcachon Bay and Bay of Marennes-Oleron was sufficient to sustain the French oyster production. This spat production was initially limited to the South Atlantic coast. But since the 1990's, natural recruitment is also observed along the Brittany coasts up North to Normandy coast. The same observations were made elsewhere in Europe where the species was introduced for aquaculture purposes and initially thought not to reproduce. In recent decades settlements of small numbers of oysters have been found on the south and west Irish coasts (Boelens *et al.*, 2005). Currently, an Alien Species Alert report is being prepared.

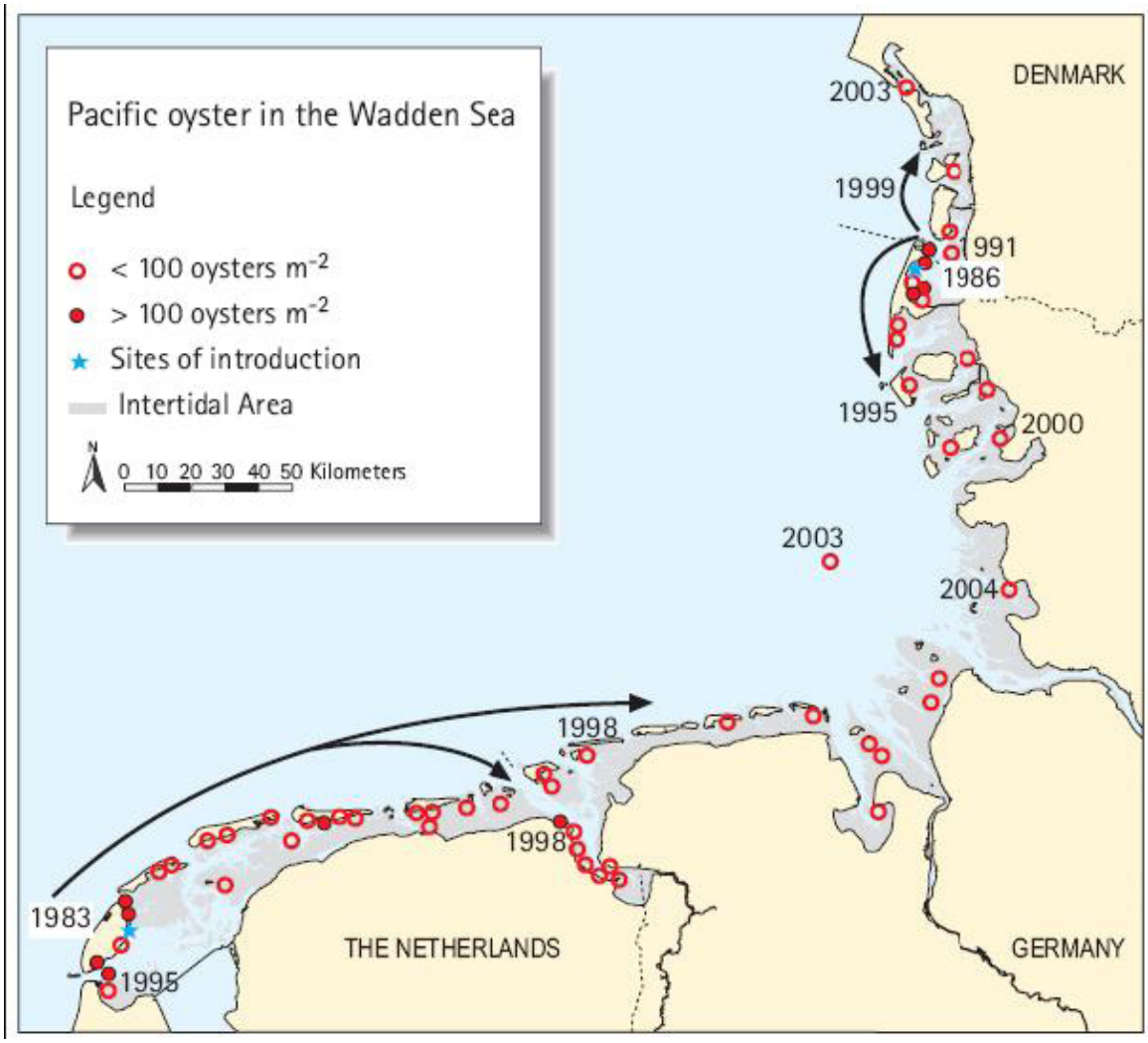

Figure 1 ***Crassostrea gigas*** **in the Wadden Sea. Asterisks indicate introduction sites (Texel, The Netherlands and Sylt, Germany). Years indicate first records of settlement. Circles refer to mean Pacific oyster abundance in 2003 (from Reise** ***et al.*****, 2005).**

Non-native species range expansion potentially associated with warming trends

Ctenophores

Mnemiopsis leidyi

Origin: North America

Several authors have related the mass occurrences of the jellies to elevated surface water temperature (Faasse and Bayha, 2006; Javidpour *et al.*, 2006). For example, in the Baltic, a strong increasing trend of temperature has been observed during the summer for the last 20 years. This climatic change favours the reproduction of the population of *M. leidyi* (Janas and Zgrundo, 2007).

Molluscs: Gastropods

Crepidula fornicate

Origin: NW Atlantic

In the 1870s, the American slipper limpet was accidentally introduced to Europe; it is common in low numbers around Helgoland with its northern limit apparently limited by low winter temperatures. The numbers are also quite low on the Swedish west coast.

Molluscs: Bivalves

Venerupis philippinarum

Origin: Pacific

This species with reproducing populations is found in Poole Harbour, South Coast of Britain (Naylor, 1965; Jensen *et al*., 2005). Naturally recruited Manila clams have also recently been found about 35 miles to the east of this, site in Southampton Water. As this site is only semi-enclosed further dispersal is possible under prevailing conditions of higher seawater temperatures. This species is one that may be a candidate for global climate change expansion. Along the French Brittany coast, populations of this species are thriving in the wild and they have gradually replaced the indigenous *Venerupis decussata.*

The Japanese clam was introduced into France in 1973 from Puget Sound area (Canada) for aquaculture purposes. Aquaculture production started from spat introduced from Canadian hatcheries, then produced in French hatchery (Flassch and Leborgne, 1992). It was performed in intertidal areas and in oyster ponds. The species found good environmental conditions and started to reproduce naturally in the field. First experiments were developed in Arcahon Bay in 1980 then first natural beds were observed in 1988 (Robert and Deltreil, 1990). The introduced species competed with the native species *Venerupis decussata,* which was outcompeted rapidly. Bertignac *et al*., 2001 demonstrated that *V. philippinarum* represented 94% of clam species and 97% of clam biomass in the natural bed of Arcachon Bay in 2000. The same situation was observed along the Atlantic coast, especially in the Golf of Morbihan. Moreover the alien species is now present along the French coasts of the English Channel. Limited aquaculture of Japanese clams was performed in Mediterranean lagoons; consequently the native clam species is still dominant.

Arthropods: Barnacles

Megabalanus tintinnabulum

Origin: Cosmopolitan

This species was often transported to Europe as fouling species on ships hulls survives now and is reproducing in the southern North Sea (Kerckhof and Cattrijsse, 2001; Kerckhof *et al*., 2007).

Arthropods:Decapods

Eriocheir sinensis

Origin: Pacific

The Chinese mitten crabs are increasing in the Baltic Sea influenced by warming temperatures (Lundin *et al*., 2007).

Bryozoans

Bugula nertina

Origin: Cosmopolitan

> This species, which may be a complex, has a wide spread distribution in warmer European waters; its European range may be expanding with warmer temperatures. The species has recently been recorded form Belgium and the Netherlands. The widespread occurrence of *Bugula neritina* in U. K waters appears significant, where it was previously known predominantly from artificially heated docks (compare with *Balanus amphitrite*) (Arenas *et al*., 2007; Faasse, 2007; Kerckhof *et al*., 2007). Molecular studies needed to clarify taxonomy.

Vagrant, Lusitanian, West African, Cosmopolitan and other species

Vagrant species

Arthropods: Barnacles

Balanus amphitrite

Origin: Unknown

> This cosmopolitan warmwater barnacle species extended its range from southern European waters to the North Sea with a transition phase in its occurrence in artificially warmed waters (Kerckhof and Cattrijsse, 2001; Kerckhof *et al*., 2007).

Solidobalanus fallax

Origin: West Africa

> This warm water West African barnacle species that could be regarded as a vagrant has spread into Europe (viz Lusitanian species are spreading through the English Channel and expanded into the North Sea) (Southward *et al*., 2004).

Arthropods: Decapods

Pachygrapsus marmoratus

Origin: Atlantic Coast

> This crab species has been found in the south of England; (Ingle and Clarke, 2008).

Lusitanian Species

Lusitanian species

Several Lusitanian species are often considered indicators of warming, which we note here as species expanding their range and considered vagrant. These include the crustaceans: *Liocarcinus depurator*, *L. vernalis*, and *Diogenes pugilator*.

Cosmopolitan species

Besides the examples already given above, a great many of other alien species are cosmopolitan in warmer waters and eurythermal. They are now able, not only to settle and to survive, but also to reproduce in formerly colder waters such as the North Sea.

Other Category

Other species that are identified for this report as possibly expanding their ranges, but not clearly related to climate change include four species of red algae *Asparagopsis armata*, *Antithamnionella ternifolia*, *Bonnemaisonia hamifera*, and *Neosiphonia* (=*Polysiphonia*) *harveyi.* In addition, three species of polychaetes *Hydroides dianthus, Hydroides ezoensis,* and *Ficopomatus enigmaticus;* and two species of tunicates *Styela clava* and *Botrylloides violaceus* show expansion in some areas. Two planktonic species, the scyphozoan *Pelagia noctiluca* and the siphonophore *Apolemia uvariae* have been observed more frequently in Atlantic coastal waters. Other species of barnacles in Europe that may survive and eventually spread include: *Balanus reticulatu*s and *Balanus trigonus* both of which are cosmopolitan, warm-water species, while other barnacle species could be expected (Kerckhof, 2002; Kerckhof *et al*., 2007).

Over 20 southern species of fish were identified in Icelandic waters (Astthorsson and Palsson, 2006); however of these only three species, the *Chaunax suttkusi*, *Petromyzon marinus*, and *Platichthys flesus* have been recorded as introduced in Northeast Atlantic (Gollasch *et al*., 2007).

A brackish/freshwater mussel, Conrad's false mussel *Mytilopsis leucophaeata* was first found in the cooling water area of the nuclear power plant in Loviisa, Central Gulf of Finland and has now also been recorded near Olkiluoto nuclear power plant, Gulf of Bothnia. Based on intensive monitoring of the area it is known that the species has not been present there prior to 2006. An empty shell of *M. leucophaeata* was also found in a new location near Kotka, Eastern Gulf of Finland. All these observations indicate that *M. leucophaeata* may colonize the northern Baltic Sea but so far all records have been associated to areas affected by warm cooling waters from power plants.

The freshwater Prussian carp, Carassius gibelio was observed in the Gulf of Finland as reported in previous Finnish and Estonian National Reports and other literature. It is suggested that warm summers favored its appearance and warm water bodies connected to the sea for its effective reproduction (Copp *et al*., 2005; Vetemaa *et al*., 2005; Berg *et al*., 2007; Urho and Lehtonen, 2008; http://www.rktl.fi/en/julkaisut/j/420.html).

Higher water temperatures in the OSPAR region may also increase the likelihood for the establishment of warm-temperate or tropical species. In some circumstances, or e.g. phytoplanktonic species producing toxins, which could have worrying consequences, especially regarding human health risk.

Concluding thoughts and concerns

Although we have noted several caveats about the data presented on non-native species range expansions that are related or presumed to be related to global climate change, we want to underscore two key issues. One, the data from our ICES WGITMO data set is not a complete record and two, we have not surveyed all the literature and/or evaluated the level of certainty associated with claims of expansion and climate change. Thus, one investigator's non-native species may be another's vagrant. The definition of marine vagrants needs to be reviewed and defined by biologists. We appreciate the ICES WGECO comments on the need for statistical approaches that are consistent across all committees.

We have not attempted to correlate the data from the range expansions to global climate change parameters, because we do not have guidance on how to do this. Most of the species that we record are nearshore and much of the climate change data is based on large oceanographic water bodies (as with the subregional map (Figure 2) provided by ICES Working Group on Oceanic Hydrography (2008). This may explain some of the discrepancies noted by members of the WGITMO in terms of sea surface temperature. One recent paper finds no heating in the upper surface (i.e. upper 700 m) of the world's oceans since 2004 (Willis *et al*., in press), although it is important to note that the above refers to global conditions. The NE Atlantic (mainly the OSPARCOM area) has likely had a temperature increase (strongly influenced by the superimposed phases of NAO and AMO), but may also face a temperature decrease due to the simultaneous shifts in the two indices. It is difficult for us to sort out these data.

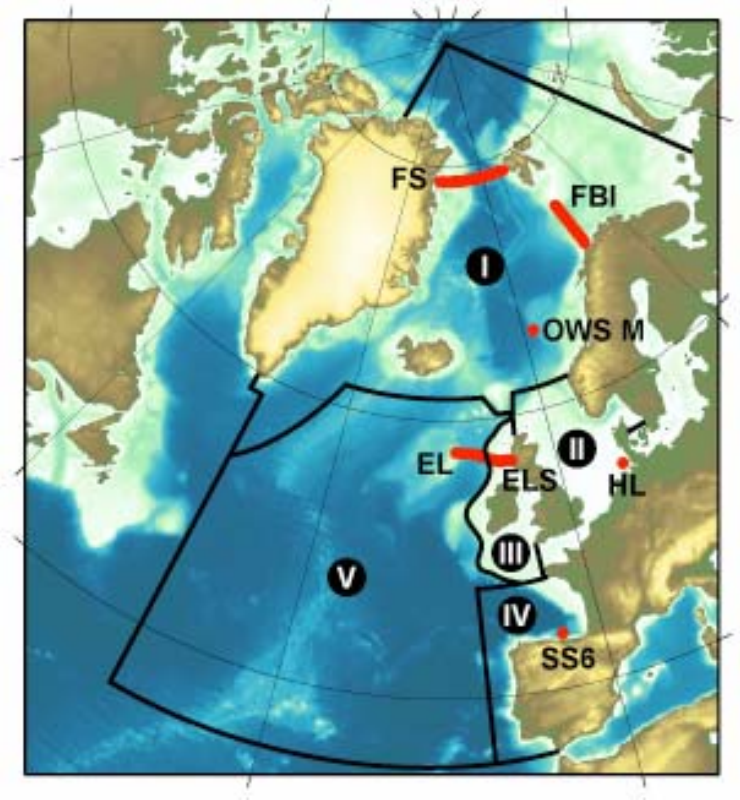

Figure 2 Location of selected hydrographic time series within the OSPAR sub-regions (stations in red, boundaries of sub-regions in black). In Region I (Arctic Waters) are time series at Fram Strait (FS), Fugløya-Bear Island (FBI) and Ocean Weather Station Mike (OWS M). Region II (Greater North Sea) is represented by Helgoland Roads (HL). EL=Ellett Line is representative of the deep the wider Atlantic or Region V; ELS = Ellett Line Shelf is representative of region III (Celtic Seas); SS6 = Station 6 of the Santander Section 6 is representative of the Bay of Biscay and Iberian Coast.

Region III (Celtic Seas) is represented by Ellett Line Shelf stations (ELS). Region IV (Bay of Biscay and Iberian Coast) is represented by station 6 of the Santander Section (SS6). Region V (Wider Atlantic) is represented by the deep Ellett Line stations (EL). Appears as Figure 5 in Report of the Study Group on Working Hypothesis Regarding Effects of Climate Change, ICES SGWRECC Report 2008, ICES CM 2008 ACOM: 40.

The map for *Crassostrea gigas* shows expansion along the North Sea coast which appears to be experiencing temperature increases as plotted in the WGECO Annual Report 2007 (see Figure 3) showing annual mean SST calculated for ICES fishing areas. The WGECO report suggests hypothesis driven science serve to identify and support understanding the mechanisms observed in changes in the biota of all regions. This is particularly relevant when trying to identify range expansions, reproductive output, etc. in the face of relatively short-term events (10–20 years) that influence not only SST (sea surface temperature), but also freshwater input (largely localized impacts), nutrient loading, changes in food resources, etc. We do not think that correlations alone represent cause and effect.

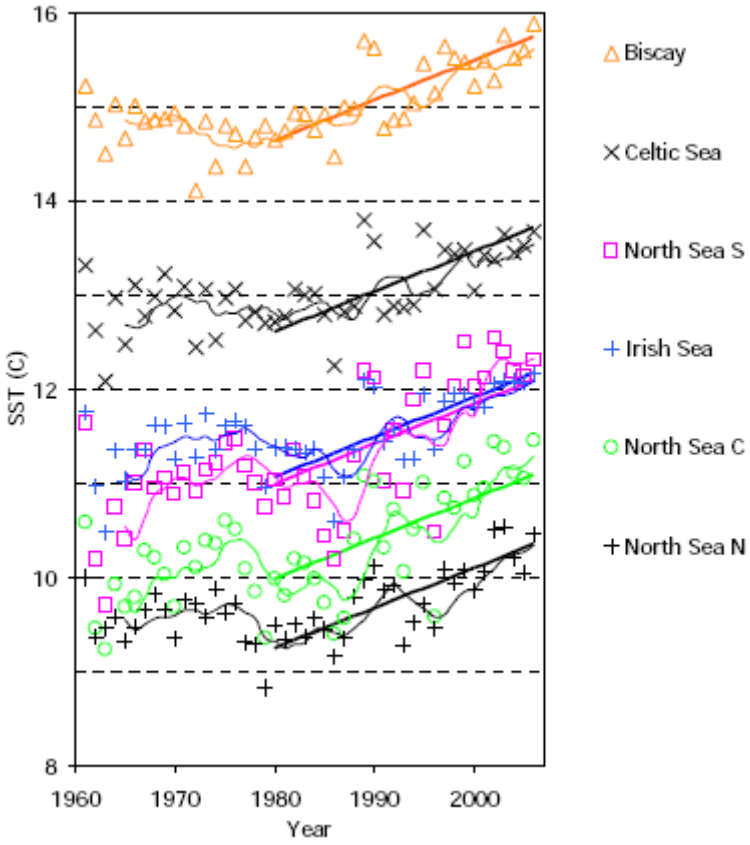

Figure 3 Annual mean SST (sea surface temperature) calculated from Hadley1 SST monthly 1 degree grid values for ICES fishing areas. The trends are indicated by a running 5 year mean and a linear fit (common slope, separate intercepts for the period 1980–2006). The constraining of the fitted trend lines to a common slope allows the estimated intercepts be used to estimate the difference in rates of warming in the different areas, therefore the lines of best fit for the data which they overlay. Figure 9.2.1.3.1 from WGECO, 2007.

We did not discuss the proposed hypotheses in the Study Group on Working Hypotheses Regarding Effects of Climate Change (SGWRECC) during the WGITMO 2008 meeting. The section related to introduced species was given as:

> **2. Rising temperature could enable more human introduced species to invade and become established, replacing current native species.**

Patterns in data or expected in the future (Elliot *et al*., 2008)

- The number of species of non-indigenous flora, fauna and algae is increasing in marine habitats and some are causing major ecological changes.
- Distributions of some non-native species are currently limited by water temperature.
- Warmer waters over the last three decades are facilitating the establishment of some of these species.

"Discussion of processes responsible" was not completed in SGWRECC report and not a comment from the WGITMO.

Thus, we have no formal response from WGITMO at this time, but will consider expanding our comments on selected species during the intersession and next year.

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Annex 6: National reports

National report, Belgium, 2007

F. Kerckhof MUMM/BMM

Highlights

During 2007, one new invasive species, namely the comb jelly *Mnemiopsis leidyi* has been recorded. At the moment of its discovery in the harbour of Zeebrugge, the species was already very common.

All introduced species that were reported during previous years are still present and seem to be well-established and thriving.

Laws and regulations

There is no new legislation to report.

Intentional introductions

There is no information available on intentional introductions if any.

Unintentional introductions

Mnemiopsis leidyi: this species was discovered in August 2007 in the harbour of Zeebrugge. At the moment of its discovery, it was already very common (Dumoulin, 2007). After its first detection, the species was also present in the harbour of Oostende and there were also several findings of stranded specimens on the beach, indicating that *Mnemiopsis* was present in the coastal waters. There were sightings until November.

Rangia cuneata: A vast population of this estuarine bivalve is present in the port of Antwerpen. This species is new to the European brackish water fauna.

After the first notice of the presence of a few small individuals in August 2005, *R. cuneata* was encountered frequently in the pipes of the cooling water system of an industrial plant from February 2006 onwards. However the species must have been introduced several years prior to its first discovery, since a population *Rangia cuneata* proved to be present the Verrebroekdok, a large container dock with a Ro-Ro terminal in the harbour of Antwerpen. During a survey in May 2007, living *Rangia* specimens from several year classes were found (Kerckhof, unpublished). The adult individuals present, being at least six years old, indicate that the species almost immediately colonised the dock after its opening in 2000. Only when it became a nuisance in a certain industrial plants did we become aware of its presence.

The species has also been found in the Netherlands in the Noordzee Kanaal and the Kanaal Gent-Terneuzen. These findings will be published soon.

All introduced species that were reported during previous years are still present and seem to be well-established thriving. An overview of the current status of alien species in Belgian marine waters can be found in Kerckhof *et al*., 2007.

Species not yet reported or observed

Gracilaria vermiculophylla. This species was looked for in the Spuikom of Oostende, a saline pond in connection with the harbour were some aquaculture (including

relaying of oysters) takes place, but all Gracilaria specimen found, proved to be *Gracilaria gracilis* (Heytens *et al*., 2007).

Urosalpinx cinerea A few specimens and egg capsules of the American oyster drill, *Urosalpinx cinerea*, have been found in October and November at Gorishoek in the Oosterschelde, an area of shellfish culture in The Netherlands. Probably *U. cinerea* was introduced with imported shellfish from south-east England.

Pathogens

No information

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Prepared by

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First records for Belgium, March 2007

SPECIES	LOCALITY	LATITUDE	LONGTITUDE	COMMENTS	DATE
Mnemiopsis leidyi	Zeebrugge, harbour	51°18'55.79"N	3°13'22.94"E	Established	2007

National Report 2007/2008 Canada

Prepared by Amy Williams

Audience: ICES, Member Countries and Observers, and Scientists

Highlights

While a number of activities and introductions are described in this report, these are primarily updates on issues reported in past years. Canada continues to import a range of organisms for aquaculture as described in this report. The pattern of these imports is much the same as in past years and no new activities were reported in 2007 that would raise particular concerns with respect to risks to aquatic resources.

Tunicates continue to affect the shellfish aquaculture industry in PEI. The affected region has introduced measures to contain the organisms, and other regions are monitoring for possible, natural spread.

In Newfoundland, Green crab (*Carcinus maenas*) was detected for the first time. The origin is unknown but it is suspected to be related to commercial shipping activity. The invasive colonial tunicates *Botrylloides violaceus (*violet tunicate) and *Botryllus schlosseri* (golden-star tunicate) were also detected for the first time on the south coast at single locations.

New Zealand mudsnails, *Potamopyrgus antipodarum*, were reported for the first time from British Columbia in 2007. The snails are currently confirmed from a single location at the head of west coast of Vancouver Island.

Catch rates of the Green crab (*Carcinus maenas*) in DFO surveys have increased from 2006 and populations exist from the southwest to northwest Vancouver Island, British Columbia.

Live, wild-set Pacific oysters, *Crassostrea gigas*, were collected from a beach near a suspended culture operation in Long Inlet, Skidegate Inlet, Haida Gwaii (Queen Charlotte Islands). This represents the first record of natural reproduction of this species north of Vancouver Island.

1 Laws and regulations

The Canadian Food Inspection Agency (CFIA) has initiated the process of amending Regulations under the Health of Animals Act to support implementation of a National Aquatic Animal Health Program (NAAHP). The proposed amendments will align Canada's national aquatic animal health management more closely with international standards for animal health attestation.

New Brunswick began the development of a Governance document regarding breaches of containment in the salmon aquaculture industry. When finalized this document will provide consistent procedures for the aquaculture industry to aid in the prevention of breaches of containment, the reporting of breaches when they occur and the protocol for the recapture of aquaculture salmon from the environment.

In Nova Scotia, a draft policy on the introduction and transfer of Gaspé strain Atlantic salmon is being developed.

2 Deliberate releases and planned introductions

2.1 Finfish

Province	Species	Number	Reason
New Brunswick	Atlantic Salmon (*Salmo salar)*	47 883 500	Aquaculture/Enhancement
	Atlantic Cod *(Gadus morhua)*	1 079 400	Aquaculture/Research
	Haddock *(Melanogrammus aeglefinus)*	300	Research
	Halibut *(Hippoglossus hippoglossus)*	35 000	Aquaculture/Research
	Trout (Brook, Speckled & rainbow) *(Salvelinus fontinalis & Oncorhynchus mykiss)*	227 630	Aquaculture/Research
Newfoundland	Brook Trout *(Salvelinus fontinalis)*	100 000	Component of an ongoing habitat compensation program related to a hydroelectricity project.
Prince Edward Island	Atlantic Salmon (*Salmos salar)*	5000	Enhancement
	Rainbow trout *(Oncorhynchus mykiss)*	1020	Youth Fishing
Nova Scotia	Brook trout *(Salvelinus fontinalis)*	1.14 million	Re-stocking program
	Rainbow trout *(Oncorhynchus mykiss)*	60 000	Re-stocking program
	Landlocked Atlantic Salmon (*Salmos salar)*	40 000	Re-stocking program
	Brown Trout *(Salmo trutta trutta)*	125 000	Re-stocking program
	Atlantic whitefish *(Coregonus huntsmani)*	4000+/-	Re-stocking Program
British Columbia	Chinook salmon (*Oncorhynchus tshawytsha)*	400 000	Enhancement
	Chum salmon (*O. keta)*	500 000	Enhancement
	Coho salmon (*O. kisutch)*	306 000	Enhancement
	Sockeye salmon (*O. nerka)*	609 000	Enhancement
	Steelhead trout (*O. mykiss)*	60 000	Enhancement

2.2 Invertebrates

Province	Species	Number	Reason
Newfoundland	Blue mussel seed (*Mytilus* sp.)	49 kg	Environmental monitoring program
	Blue mussel (*Mytilus* sp.)	700	Environmental monitoring program
Quebec	Scallop (*Plactopecten magellanicus*)	5600	Research
	Oysters	1200	Enhancement
	Blue Mussel (*Mytilus* sp.)	35 000 lbs	Production
Nova Scotia	Soft-shelled clams *(Mya arenaria)*	3000+	Enhancement project in Chezzetcook and Clam Harbour areas
	American oysters	5000+	Enhancement project Halls Pond, Main-a-dieu

3 Live imports

3.1 Finfish

Province	Species	Country of Origin	End Use
New Brunswick	Atlantic Cod *(Gadus morhua)*	USA	Research/Aquaculture (600,000 eggs & 21,000 juveniles)
	Atlantic Salmon (*Salmo salar)*	USA	Aquaculture (800 broodstock & 8,000,000 eggs)
Newfoundland	*Tautoga onitis*	USA	Research (closed containment facility only)
Prince Edward Island	Rainbow trout *(Oncorhynchus mykiss)*	USA	Aquaculture
	Atlantic Salmon (*Salmo salar)*	USA	Aquaculture
Nova Scotia	Rainbow trout *(Oncorhynchus mykiss)*	USA	Aquaculture
	Zebra Fish *(Percina caprodes)*	USA	Research
British Columbia	Atlantic salmon (*Salmo salar)*	Iceland	Aquaculture

3.2 Invertebrates

Province	Species	Country of Origin	End Use
New Brunswick	American oysters	USA	Research (500 diploid, 1500 triploid)
British Columbia	Manila clam (*Venerupis philippinarum)*	USA	Aquaculture
	Eastern oyster (*Crassostrea virginica)*	USA	Aquaculture
	Pacific oyster (*C. gigas)*	USA	Aquaculture
	Kumamoto oyster *(C.sikamea*)	USA	Aquaculture
	Blue mussels (*Mytilus edulis)*	USA	Aquaculture

4 Unintentional releases

An excel spreadsheet with detailed information is attached, however below are some important highlights.

Green crab, *Carcinus maenas*, was detected in Placentia Bay, NL in August 2007. The origin is unknown but it is suspected to be related to commercial shipping activity. Biological characteristics of sampled animals indicate colonization, reproduction, and establishment of populations. Control/Mitigation planning is scheduled for March 2008.

The invasive colonial tunicates *Botrylloides violaceus (*violet tunicate) and *Botryllus schlosseri* (golden-star tunicate) were detected in October 2007 on the south coast of Newfoundland and Labrador at single locations, respectively. The origin is unknown. Eradication of violet tunicate will be attempted in March 2008.

In PEI, no new species were detected in 2007, however all four tunicate species continue to spread within Island waters.

In Nova Scotia, Malpeque Disease was found in the fall of 2007, within the Bras d'Or Lakes (Boom Island area).

New Zealand mudsnails, *Potamopyrgus antipodarum*, were reported for the first time from British Columbia in 2007. The snails are currently confirmed from a single location at the head of west coast of Vancouver Island. The discovery has been confirmed by DFO biologists.

European green crabs, *Carcinus maenas*, were collected at high densities in three west coast of Vancouver Island, British Columbia. Green crab catch rates in DFO surveys have increasedsince2006 and populations exist from southwest to northwest Vancouver Island. There are no known populations found on the east coast of Vancouver Island or the mainland coast of British Columbia.

Live, wild-set Pacific oysters, *Crassostrea gigas*, were collected from a beach near a suspended culture operation in Long Inlet, Skidegate Inlet, Haida Gwaii (Queen Charlotte Islands). This represents the first record of the natural reproduction of this species north of Vancouver Island.

Beach surveys in Queen Charlotte Strait resulted in the collection of varnish clams, *Nuttallia obscurata*; this represents the northern most population found on the north tip of Vancouver Island.

5 Meetings, conferences, symposia or workshop on Introductions and transfers

DFO sponsored workshop/meeting in Toronto, March 2007 on biological risk assessment.

A regional workshop was held in the Magdalen Islands from 23 to 26 October 2007 to define a regional policy on invasive aquatic species. A sectoral action plan and an intervention strategy were developed at this workshop.

A regional workshop on introductions and transfers was held on 6 September 2007 at Grande-Rivière. This workshop was part of an ACRDP project on transfers and brought together sea farm operators, researchers and other people active in the aquaculture sector. It developed a profile of the status of invasive species in Quebec and neighbouring provinces, identified sites targeted by the industry for their transfer (source and destination), studied the potential constraints related to these transfers and examined whether any mitigation measures were possible.

The Fifth International Symposium on Marine Bioinvasions, Cambridge, Mass, May 2007.

The second meeting of PICES Working Group 21 on Marine Non-indigenous Species, Victoria, BC, October, 2007.

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National Report for Finland 2007

1.0 Laws and regulations

2.0 Deliberate releases and p;anned introductions

2.1 Fish

Deliberate releases into the Baltic Sea were (including rivers draining into the Baltic) for fisheries and fish stock enhancement purposes in 2007 (whitefish numbers not available, thus roughly estimated) as follows

- 0.3 million newly hatched and 2.6 million older salmon (*Salmo salar*), and
- 0.4 million newly hatched and 1.3 million older sea trout (*Salmo trutta* m. *trutta*),
- something around 40 million newly hatched and 10 million older whitefish (*Coregonus lavaretus*).

2.2 Invertebrates

2.3 Algae and higher plants

3.0 Accidental introductions and transfers

3.1 Fish

No new species was caught. Gibel carp, *Carassius auratus* m. *gibelio* was caught in some new places along the south coast of Finland, and it extended its range further to the north, as far as the Archipelago Sea. One individual was found in fish ladders entering into fresh water in the River Aurajoki. In 2007, at least three specimens of Russian sturgeon, *Acipenser gueldenstaedtii* were caught in the coast of Finland. They were considered as escapers from Russian fish farms.

3.2 Invertebrates

The American comb jelly (*Mnemiopsis leidyi*) was found for the first time in the northern Baltic Sea and in Finnish waters in autumn 2007. The species has been recorded only in deep and relatively cold waters in the open parts of the southern Gulf of Bothnia, Åland Sea and the Gulf of Finland. Only small individuals have found so far but there are indications that the species can reproduce even in the northern Baltic Sea.

The invasive amphipod *Gammarus tigrinus* was found widely distributed in the shallow littoral zone in Helsinki sea area. The species was first observed in Finnish waters in 2003 and has been reported only from two port areas in the Archipelago Sea and eastern Gulf of Finland before the present records.

3.3 Algae and higher plants

3.4 Parasites, pathogens, and other disease agents

4.0 Live imports

4.1 Fish

Siperian sturgeons (*Acipenser baeri*) were imported from Italy for cultivation in inland farms. Rainbow trout and its golden form were imported from Germany, Denmark and Sweden to inland areas. Eels imported from Sweden (in quarantine) originated from Great Britain.

4.2 Invertebrates

4.3 Algae and higher plants

5.0 Live exports

5.1 Fish

Rainbow trout, whitefish (*Coregonus lavaretus*) and grayling (*Thymallus thymallus*) were exported and the target countries were Austria, Estonia and Sweden. Rainbow trout was also exported to Russia and Iran.

5.2 Invertebrates

5.3 Algae and higher plants

6.0 Meetings, conferences, symposia or workshops on Introductions and Transfers

7.0 Bibliography

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National Report 2007/2008 France

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Audience: ICES, Member Countries and Observers, and Scientists

Highlights

Two new European directives dealing with invasive species issues were adopted in 2007, the European Marine Strategy Directive and the directive on the use of alien species in aquaculture. *Bonamia exitiosa*, an exotic pathogen of flat oysters, was detected for the first time in Europe (in Spain) in July 2007.

Content

1 Regulations

Council regulation (EC) n° 708/2007, 11 June 2007, concerning use of alien and locally absent species in aquaculture: This regulation establishes a framework governing aquaculture practices related to exotic and locally absent species in order to assess and minimize the possible impact of these and any "hitchhiker" species on aquatic environment.

The European Parliament adopted on December the 11th 2007, a new directive called Marine Strategy Directive (SEC (2005) 1290) setting out guidelines for the protection of the marine environment during its plenary session in Strasbourg. The Thematic Strategy on the Protection and Conservation of the Marine Environment aims to achieve good environmental status of the European Union's marine waters by 2021 and to protect the resource base upon which marine-related economic and social activities depend. The Marine Strategy Directive is consistent with the water framework directive from 2000 which requires that surface freshwater and ground water bodies (lakes, streams, rivers, estuaries, coastal waters…) achieve a good ecological status by 2015 and that the first review of the River Basin Management Plan should take place in 2021. Characteristics and environmental status of eco-regions will include, among the listed variables, biological elements as introduction of alien species and biological disturbance as pathogens and non-native species.

2 Intentional

European Union project IMPASSE, (2006–2008) is in progress (www.hull.ac.uk/hifi/IMPASSE/). The overall objective of the IMPASSE project is to develop guidelines for environmentally sound practices for introductions and translocations in aquaculture, guidelines on quarantine procedures and risk assessment protocols, and procedures for assessing the potential impacts of invasive alien species in aquaculture. The verifiable scientific and technological objectives of IMPASSE are:

1) Review of introductions and translocations in aquaculture and for aquaculture-based restocking and assess the economic importance of introductions and translocations resulting from aquaculture and aquaculture-based restocking in the Community;
2) audit the state of knowledge of the results of operations concerning introductions and translocations of aquatic organisms for aquaculture purposes, particularly concerning environmental and economic

impacts and genetic interactions with wild populations; to analyse the economic importance of restocking, particularly for community aquaculture enterprises;

3) develop risk assessment protocols for future aquatic species introductions and aquaculture, with specific models and sub-routine assessments to consider economic issues, the potential environmental and economic impacts of diseases in wild aquatic organisms and ecosystems, as well as genetic interactions with wild populations, and the disruption of ecosystem structure and function. Special attention will be paid to assessing whether modern land-based closed aquaculture facilities can be considered bio secure and to what extent movements into these facilities can be differentiated from movement into open aquaculture facilities under community rules;

4) provide guidelines for quarantine procedures to account for phylum-specific peculiarities, developmental stages and risk levels, including procedures for containment and control where invasive species are identified as a problem; and

5) provide guidelines for environmentally sound practices for introductions and translocations in aquaculture and stock enhancement operations.

3 Unintentional

Protists

Quinqueloculina carinatastriata in Marennes-Oleron bay and Ile de Re

Large populations of the living benthic foraminifera *Quinqueloculina carinatastriata* (Wiesner, 1923) were reported for the first time from intertidal mudflats of the French Atlantic coast (Marennes-Oléron Bay and Ile de Ré) in 2 June 2004 (Bouchet *et al*., 2007). The species was previously described from the Adriatic and Tyrrhenian Seas (Central Mediterranean Sea) and reported from the Eastern Mediterranean and Red Seas, as well as tropical and subtropical regions. Sampling sites were located at Bellevue (45°56′32.14″ N; 1°12′20.72″ O), Les Traires (45°52′41.75″ N; 1°10′36.44″ O) and Daire (45°51′57.14″ N; 1°09′11.18″ O) from the Marennes-Oléron Bay and Rivedoux (46°09′52.79″ N; 1°16′22.55″ O) from Ile de Ré. Living specimens were found in fourteen of a total of thirty-two samples. The large population of *Q. carinatastriata* (2500 living individuals in 50 cm^3 of sediment at Les Traires) shows that this species has found favorable conditions for its growth and reproduction along the French Atlantic coast. Maximum abundance of living individuals in September suggests a massive reproduction during summer, when water and superficial sediments at low tide are the warmest, reflecting the origin of the species from warmer climates, which seems to corroborate Mediterranean and/or tropical-subtropical origin. A survey of available literature to trace records of the species in muddy shallow habitats along the western coasts of Europe and Africa reveals that the species is unrecorded from Western Mediterranean Sea and is unknown in the Eastern Atlantic Ocean from Ivory Coast to Denmark, including the British Islands. The Marennes-Oléron Bay is Europe's largest production area for the Pacific oyster, which was introduced during the 1970s. The nearest major seaport handling international cargo is the Port de La Rochelle-Pallice, which is located north of the Marennes-Oléron Bay and east of the Ile de Ré. Shellfish industries and ballast water discharged from ships have both led to numerous human-mediated dispersals of

non-indigenous species. This supports the hypothesis that the species has been accidentally introduced outside its natural range as a probable result of mariculture trade and/or shipping activities. This is the first report of a successful introduction of non-indigenous benthic foraminifera to the Atlantic coast of Europe.

Crustaceans

Several individuals of the oriental shrimp *Palaemon macrodactylus*, have been reported from two estuaries along the French Atlantic coast, the Gironde estuary (45°20′ ; 0°45′) and the Adour estuary (43°53′; 1°53′), respectively, in August 2006 and September 2006 (Beguer *et al*., 2007). Examinations of previous samples collected in the Gironde estuary revealed one specimen in 1998 and several in 1999 and 2000. These species should have been present since 1998. Authors suspected ballast water as probable vector. Several ovigerous females were identified indicating that the population of *P. macrodactylus* might be established. This species could compete with local shrimp populations and consequently reduce the native species abundance. In spring 2007, *Palaemon macrodactylus* specimens have been collected in Charente estuary (45°55'47''N; 1°0'18''W–WGS 84, Google Earth–Modéran, thesis in progress, P.-G. Sauriau Pers. Comm.).

Molluscs

PROGIG, a French program on Pacific oyster's (*Crassostrea gigas*) proliferation on the French Atlantic and Channel coasts: statement, dynamics, ecological and socio-economic consequences (contact : Christian Hily, University of West Brittany, European Institute of Marine Studies, Brest, Christian.Hily@univbrest.fr).

Introduced in the early seventies in the main shellfish production areas, *Crassostrea gigas* established successfully and produced rapidly spatfall which settled outside the farms and constituted "natural populations" in many sites south of the Loire estuary. In the nineties, this phenomenon extended to the north, along the Brittany and the Channel coasts. The objective of the PROGIG program is to evaluate the consequences of this expansion in the natural ecosystems. In eighteen months the following results have been obtained:

1) The assessment of the sites concerned by proliferation in the natural environment on the French Atlantic coast of Brittany is partially done and integrated in a GIS. The entire coast of Brittany was visited. Most of the sites showed the presence of oysters even if the most opened and exposed sites showed low densities. The proliferation remains localized in sheltered bays and estuaries.

2) Twenty eight sites with permanent quadrats are currently monitored from Normandy to the Basque coasts to study dynamic of colonization. Spatfall settlement, growth, mortality of oysters and competition with other species are recorded.

3) Global warming appears to be facilitator of the reproduction of oysters. An adaptation of the species can also occur and natural selection of individuals is demonstrated at the local scale.

4) *C. gigas* settles preferentially on the intertidal areas. In subtidal areas this species occurs only in estuaries. The presence of oyster reefs, on rocky shores and on mud flats, increases the diversity of macrofaunal invertebrates at the local level.

5) The study of impacts of the biological activities of *C. gigas* (filtration, biocalcification and biodeposition) on ecosystem functioning is on the way. First results demonstrated that the role of biodeposits on the biogenic silicium cycle and the primary production of diatoms is important at the scale of the Bay of Brest ecosystem.

6) Socio-economic studies underline the negative impact of this proliferation on the shellfish farming industry. Farmers spend time and money to clean their gears. The presence of lots of oysters induces injuries for beach users. On the other hand, this situation allows large oyster gathering for recreational purposes.

7) Management options to limit the negative effect of this proliferation are understudied. Some local options will be tested in order to maintain some reference areas without wild oysters in some Special Areas of Conservation.

4 Pathogens

Bonamia exitiosa was detected for the first time in July 2007 in Europe following mortality in a Spanish hatchery. This first occurrence was notified to the OIE in October 2007 after diagnostic confirmation (http://www.oie.int/wahid-prod/public.php?page=event_summary&reportid=6368). Infected flat oyster *Ostrea edulis* were cultured in hatchery troughs with imported seed. No increase in mortality has been observed. No other susceptible species are cultured in this area. The origin of the infection is unknown and the epidemiological investigation was inconclusive. *Bonamia exitiosa* is currently reported in flat oysters from New Zealand and Chile. Similar parasites were also reported from *Ostrea angasi* in Australia; *Ostrea puelchana* in San Antonio Bay, Argentina; *Ostrea equestris* in North Carolina, USA; and *Cassostrea ariakensis* experimentally introduced into North Carolina, USA. For additional information see http://www.pac.dfo-mpo.gc.ca/sci/shelldis/title_e.htm.

5 Meetings

Deuxièmes rencontres francophones Invasions Biologiques et Traits d'Histoire de Vie Variabilité, plasticité et adaptation. Rennes, du 14 au 16 novembre 2007, http://www.inra.fr/colloque_invasions.

Three presentations and one poster were related to marine species:

Le Cam S and Viard F. Relations entre dynamique de population et changement de sexe chez le gastéropode protandre invasif, *Crepidula fornicata*. 2ème rencontres francophones « Invasions biologiques et traits d'histoire de vie Variabilité, plasticité et adaptation ». Rennes, 14–16 novembre 2007.

Voisin M and Viard F. Influence de l'habitat et des pressions anthropiques sur la structure génétique de l'algue Undaria pinnatifida, cultivée et introduite en Bretagne. 2ème rencontres francophones « Invasions biologiques et traits d'histoire de vie Variabilité, plasticité et adaptation ». Rennes, 14–16 novembre 2007.

Stiger-Pouvreau V, Rohfristch A, Zubia M et Payri C. Comparaison des traits d'histoire de vie de deux algues brunes Sargassaceae proliférant sur les récifs de Polynésie française. 2ème rencontres francophones « Invasions biologiques et traits d'histoire de vie Variabilité, plasticité et adaptation ». Rennes, 14–16 novembre 2007.

Rigal F, Comtet T, and Viard F. Impact de la température sur la variabilité ede la durée de vie larvaire: implication dand la dynamique de l'espèce invasive C.

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The proceedings of this conference are available at the following address: http://www.inra.fr/colloque_invasions/actes_et_presentations/documents

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Report prepared by Laurence Miossec, Ifremer La Tremblade; Philippe Goulletquer, Ifremer Nantes Pierre-Guy Sauriau CNRS-Ifremer La Rochelle Vincent Boucher Ifremer-La Rochelle.

National Report 2007/2008 Germany

Prepared by S. Gollasch, H. Rosenthal, V. Hilge and M. Rolke, GoConsult, Grosse Brunnenstr.61, 22763 Hamburg, Germany

Audience: ICES, Member Countries and Observers, and Scientists

Highlights

As reported in the last years´ National Report, the invasive ctenophore *Mnemiopsis leidyi* was first recorded in the western Baltic Sea in summer 2006. This comb jelly is still spreading in the Baltic Sea and may now be found up to the Finish coast.

The EU-funded project "Environmental impacts of alien species in aquaculture" (IMPASSE) is underway and the first intermediate report was prepared. Two German partners are involved. The key objectives include to review and assess the impact of alien species in aquaculture and also to provide recommendations on e.g. containment facilities for alien species in aquaculture use.

For the first time *Hemigrapsus sanguineus* and *Hemigrapsus takanoi*, both know to be native in Asian waters were found in German waters along the coast of the south-western Wadden Sea in 2007.

The free journal of applied research on biological invasions in aquatic ecosystems, *Aquatic Invasions*, is now issuing its 2nd volume (http://www.aquaticinvasions.ru/). Contributions to the journal from WGITMO members are more than welcome. Please submit inland waters manuscripts to Vadim Panov at vpanov@aquaticinvasions.ru and accounts on coastal invaders to Stephan Gollasch, SGollasch@aol.com.

1 Regulations

EU Council regulation on aliens in aquaculture

The new EU Council Regulation (EC) No 708/2007 of 11 June 2007 Concerning the Use of Alien and Locally Absent Species[i] in Aquaculture was finalized and will enter into force January 1, 2009. This instrument deals "only" with species imports from outside the Europe Union member states. A PowerPoint presentation on highlights of this instrument is available.

Meetings of the Convention on the conservation of European wildlife and natural habitats (Bern Convention)

Currently a comprehensive EU Strategy to address alien species is lacking. However, in the framework of the Bern Convention alien species are addressed and the Standing Committee is working toward overcoming this situation.

In early May a meeting in Strasbourg at the 27th Standing Committee Meeting of the Bern Convention was held and a draft document of interest to WGITMO was circulated, i.e. *Draft Assessment of Existing Lists of Invasive Alien Species for Europe, with Particular Focus on Species Entering Europe Through Trade, and Proposed Responses*. This document includes detailed species lists, refers to introduction vectors and briefly mentions policies and trade regulations.

In late May 2007 the Bern Convention Group of Experts on Invasive Alien Species met in Reykjavik, Iceland. One of the documents addressed at the meeting included a reference to the 2004 WGITMO Report where we documented the number of new invaders and/or secondary introductions over time, i.e. considering new findings of

alien species since 2000, every 9 weeks an invasion event occurs in Europe. This is regionally very different. Further, there are indications that a new species was found every 3 weeks in the time period 1998–2000.

In November the Standing Committee met again and a document entitled *Towards a Black List of Invasive Alien Species Entering Europe through Trade, and Proposed Responses* was considered. This is a further development of the documents mentioned in 2 a and b. Once agreed upon, the black list will contain species prohibited to be imported into the European Community.

European Marine Strategy

European Parliament legislative resolution of 11 December 2007 on the Council´s common position for adopting a directive of the European Parliament and of the Council establishing a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Framework Directive) (9388/2/2007–C6–0261/2007–2005/0211(COD) is in the process of the second reading. This was initiated by the Directive of the European Parliament and of the Council to establish a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Directive) first proposed in October 2005.

The EU's 6th Environment Action Programme (6th EAP) requested the development of a Thematic Strategy for the protection and conservation of the European marine environment (hereafter the Strategy) with the overall aim to "promote sustainable use of the seas and conserve marine ecosystems".

As a first step in the development of the Strategy, the Commission in 2002 produced the Communication entitled "Towards a strategy to protect and conserve the marine environment".

Broad consensus was reached on the magnitude of threats facing the marine environment, generating potentially irreversible or nonlinear changes to marine ecosystems, with wide ranging economic and social consequences. The principal threats to the marine environment that were identified include effects of climate change; impacts of commercial fishing; oil spills and discharges; **introduction of non-native species**; eutrophication and the related growth of harmful algal blooms; litter pollution; contamination by dangerous substances and microbiological pollution; radionuclide discharges; and noise pollution.

Ballast water exchange in Europe

The Contracting Parties of HELCOM and OSPAR are considering the requirment of a voluntary interim application of the D-1 Ballast Water Exchange Standard in the Northeast Atlantic and the Baltic Sea. The D-1 Standard requires at least 95% volumetric ballast exchange (empty/refill) or when using the pump though method-pumping through three times the volume of each tank. All ballast tanks should be exchanged at least 200 nautical miles from the nearest land in water at least 200 metres deep. If this is impossible the exchange should be undertaken as far from the nearest land as possible, and in all cases in waters at least 50 nautical miles from the nearest land and at water depths of at least 200 metres. Provided this approach is agreed upon, the target application date for this requirement is within the next 12 months.

EU survey on alien species

"Europe is committed to halting the loss of biodiversity by 2010," Commissioner Dimas said. "We know that invasive species are one of the major threats to biodiversity, and that economies often suffer as a result, but we lack a harmonised system for tackling the problem and assessing its impact. A strong public response to this survey will help Europe define the problem more clearly, and ultimately help us develop a suitable mechanism to halt it altogether."

The European Commission is tackling this problem by launching an internet consultation on the issue on 3 March, to remain open until 5 May 2008. Interested parties, including individual citizens, industry and consumer representatives, interest groups, the NGO community and other organisations are all invited to contribute information and opinions. The results of this consultation will be used to inform the development of EU policy in the field of invasive alien species, the options for which will be presented in a Communication from the Commission at the end of 2008. The results of the survey will inform a Commission communication on an EU framework for Invasive Alien Species to be adopted by the end of the year. The survey is available at: http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=Invasive.

2 Intentional

No major changes to last years National Report are known.

Fish

Aquaculture

Sturgeons are still imported for stocking and in the aquarium trade. As already reported in last years National Report it is extremely difficult to trace the routings and quantities of life fish trade as there is no or very limited mechanisms to collect these data. As in previous years, salmonid species, rainbow trout, eels, and carps were imported from various countries.

Rainbow trout, *Oncorhynchus mykiss*, was exported to Finland and Carp to Sweden.

Invertebrates

Crassostrea gigas was imported from France and *Mytilus* sp. from Sweden and Denmark.

Live crustaceans (*Homarus americanus* and *Callinectes sapidus*) have been imported for direct human consumption from various countries in an unknown quantity.

Blue Mussels (*Mytilus edulis*) were exported to Belgium and The Netherlands.

Plants

Macroalgae for human consumption become an increasing business and test cultures continue with the brown alga, *Laminaria saccharina,* and red alga, *Palmaria palmata*. The use of these algae for new products for human consumption (e.g. bread!) was tested and showed good customer interest and response.

3 Unintentional

New sightings

The first record of *Hemigrapsus takanoi (penicillatus)* in Europe was in 1993 during the German Shipping Study in hull fouling samples of a commercial vessel in

Bremerhaven (Gollasch, 1999). In 1994 it was found in the Bay of Biscay (France) and since 1996 also in Spain. The species spread further and was in 1997 found in Le Havre (France). Dutch records are reported since 2000 in the Oosterschelde estuary and later also from the Westerschelde (D´Udekem d´Acoz and Faasse, 2002). *Hemigrapsus takanoi* was found in 2007 for the first time in German waters along the coast of the southwestern Wadden Sea (Gehrmann *et al*., 2007, Markert and Wehrmann, in prep.). Other studies in 2007 also documented the presence of *H. takanoi and H. sanguineus* from the area (Obert *et al*., 2007) (Figure 1). *H. takanoi* is supposed to be a sibling form of *H. penicillatus* who is also known to compete with larger decapods (D´Udekem d´Acoz and Faasse, 2002).

A new German record for *Hemigrapsus* cf. *penicillatus*, not shown on the map below, was made later in 2007 for Büsum (north of the Elbe river estuary) and the German Wadden Sea island Amrum (Borcherding pers. com). Flyers were released to inform the public of this newly arrived invader also asking to report findings (Figure 2).

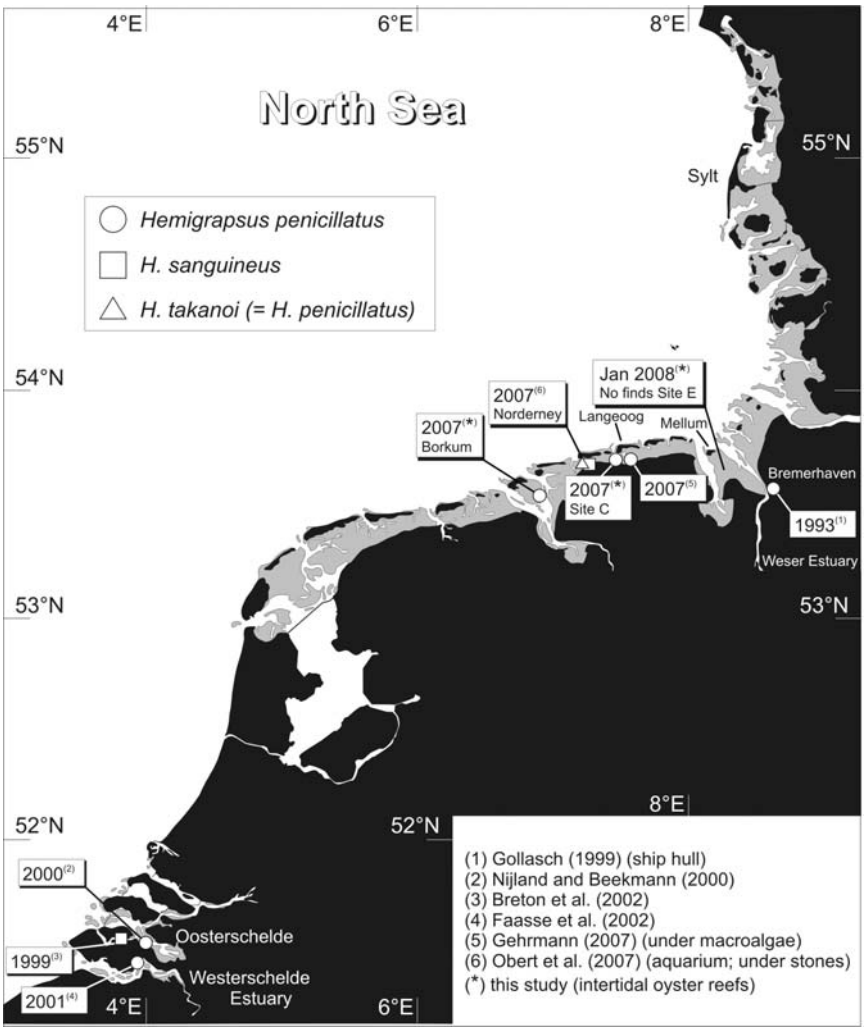


Figure 1 Distribution map of *Hemigrapsus* spp. along the southern Nort Sea coasts (with permission from A. Wehrmann, Research Institute Senckenberg, Wilhelmshaven, Germany).

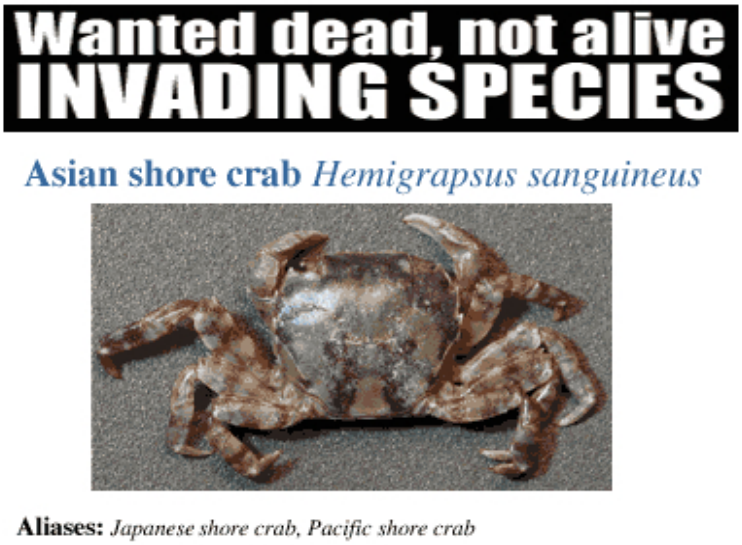


Figure 2 Flyer on *Hemigrapsus* released in Germany (Schutzstation Wattenmeer e.V.).

Previous sightings

As reported before, in October 2006 the invasive ctenophore *Mnemiopsis leidyi* was first recorded in the Kiel Bight (Western Baltic Sea, sampling station located at (54°19.7' N, 10°09.5' E) and is today found in all Baltic countries (Figure 3). *M. leidyi* may also have invaded the North Sea already in the 1990s with records from The Netherlands. However, this invasion may have been overlooked as the species was misidentified as a native comb jelly (Faasse and Bayha, 2006). In October 2006, *M. leidyi* was found near the German North Sea island Helgoland. This species is included in the list of the 100 most invasive species in Europe prepared by the EU Programme Delivering Alien Invasive Species Inventories for Europe (DAISIE). Questionnaires were sent to German diving clubs asking for details of com jelly sightings (Figure 4).

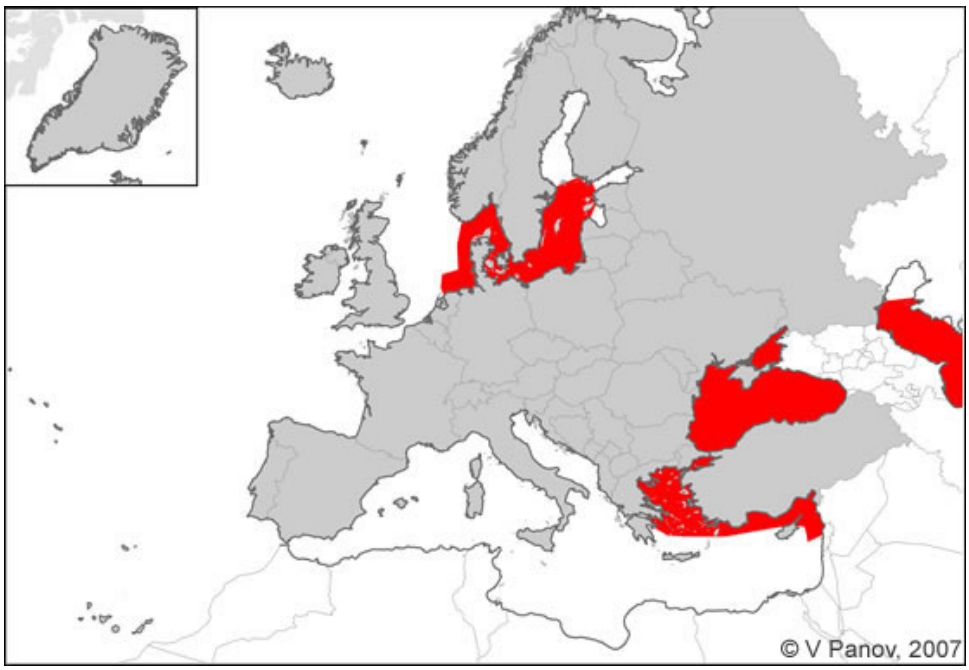
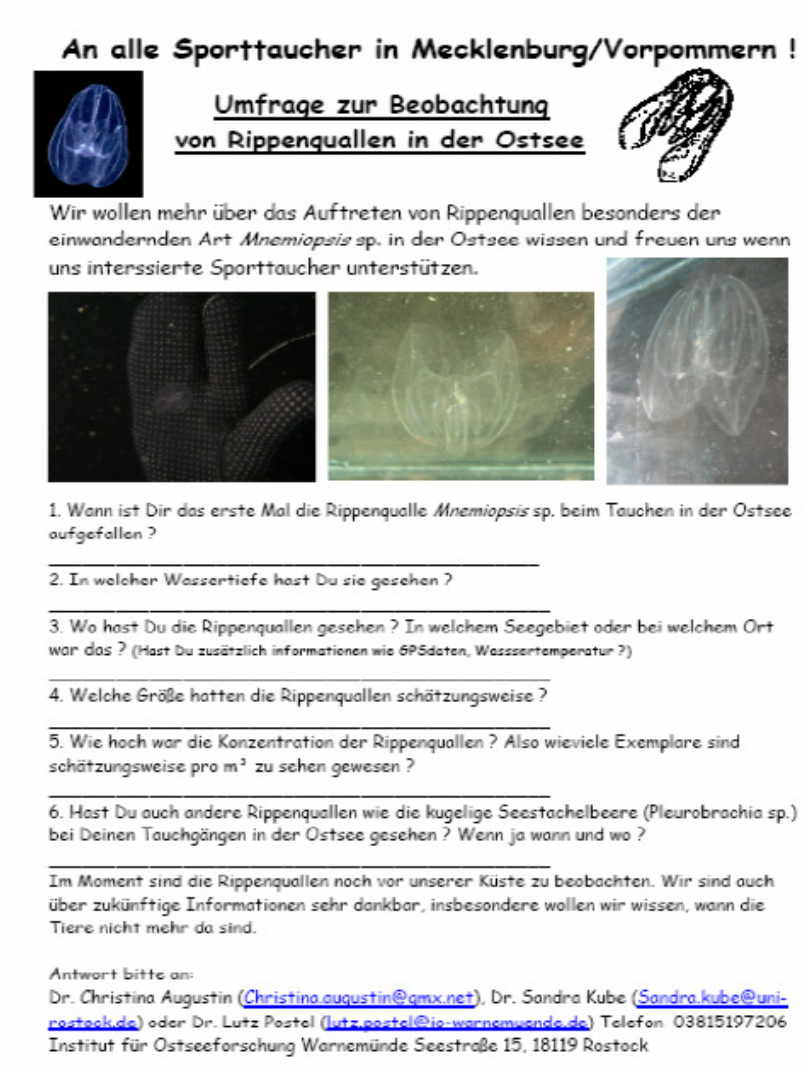


Figure 3 Distribution map of *Mnemiopsis leidyi*. This map is a result of the EU Programme Delivering Alien Invasive Species Inventories for Europe (DAISIE). Courtesy of Vadim Panov.



An alle Sporttaucher in Mecklenburg/Vorpommern !

Umfrage zur Beobachtung von Rippenquallen in der Ostsee

Wir wollen mehr über das Auftreten von Rippenquallen besonders der einwandernden Art *Mnemiopsis* sp. in der Ostsee wissen und freuen uns wenn uns interssierte Sporttaucher unterstützen.

1. Wann ist Dir das erste Mal die Rippenqualle *Mnemiopsis* sp. beim Tauchen in der Ostsee aufgefallen ?

2. In welcher Wassertiefe hast Du sie gesehen ?

3. Wo hast Du die Rippenquallen gesehen ? In welchem Seegebiet oder bei welchem Ort war das ? (Hast Du zusätzlich informationen wie GPSdaten, Wassertemperatur ?)

4. Welche Größe hatten die Rippenquallen schätzungsweise ?

5. Wie hoch war die Konzentration der Rippenquallen ? Also wieviele Exemplare sind schätzungsweise pro m³ zu sehen gewesen ?

6. Hast Du auch andere Rippenquallen wie die kugelige Seestachelbeere (Pleurobrachia sp.) bei Deinen Tauchgängen in der Ostsee gesehen ? Wenn ja wann und wo ?

Im Moment sind die Rippenquallen noch vor unserer Küste zu beobachten. Wir sind auch über zukünftige Informationen sehr dankbar, insbesondere wollen wir wissen, wann die Tiere nicht mehr da sind.

Antwort bitte an:
Dr. Christina Augustin (Christina.augustin@gmx.net), Dr. Sandra Kube (Sandra.kube@uni-rostock.de) oder Dr. Lutz Postel (lutz.postel@io-warnemuende.de) Telefon 03815197206
Institut für Ostseeforschung Warnemünde Seestraße 15, 18119 Rostock

Figure 4 Questionnaire sent to diving clubs in the Baltic asking for details of *Mnemiopsis leidyi* sightings.

Gracilaria vermiculophylla, first recorded along the German North Sea coast in 2002 and along the German Baltic coast in 2005, continues to spread. In the Baltic a recent survey between Flensburg and Warnemünde showed that its key distribution area in the Kiel Bight. Along the western part of the Kiel Fjord, south of the Kiel Canal entrance, *G. vermiculophylla* reaches 50 to 100% coverage. The easternmost finding was near Wismar (southeastern Lübeck Bight) with coverage less than 1%. Experiments have shown that the alga grows in salinities down to 5.5 psu thereby indicating its potential to spread and establish in a wide area of the western Baltic. Preliminary results show that *G. vermiculophylla* may have a potential to compete with the native *Fucus vesiculosus* in shallower and less exposed areas. The authors conclude that this alga has a very high potential to spread and that it may especially colonize shallower areas (Weinberger *et al.*, submitted).

4 Pathogens and parasites

No new records on pathogens are known. One of the most impacting parasites is the eel nematode *Anguillicola crassus*.

5 Meetings

Past

The First Preparatory Conference to the Sixteenth Organization for Security and Co-operation in Europe (OSCE) Economic and Environmental Forum "Maritime and Inland Waterways Co-operation in the OSCE Area: Increasing Security and Protecting the Environment" was held in Helsinki, Finland 10–11 September 2007. In "Session IV-Protecting the environment and enhancing co-operation" the ballast water issue was raised as of high concern.

The final conference if the EU Programme Delivering Alien Invasive Species Inventories for Europe (DAISIE) was held in the end of January 2008 in Portoroz, Slovenia. The conference was attended by more than 90 participants from various EU member states and representatives from national and international authorities. The conference was considered very successful endpoint for the DAISIE programme.

Future

The project *IMPASSE "Environmental impacts of alien species in aquaculture"* was funded within the EU's Sixth Framework Program for Research and Technological Development in order to address the EC's need for a thorough evaluation of the potential impacts of non-indigenous species in aquaculture. Its overall goal is to develop guidelines for environmentally sound practices for the introductions and translocations in aquaculture, guidelines on quarantine procedures and risk assessment protocols, and procedures for assessing the potential impacts of invasive alien species in aquaculture and related activities. The IMPASSE consortium delivered its first intermediate report and it was shown that more than 100 alien species are either in use in aquaculture in Germany or were unintentionally introduced associated with target species movements.

IMPASSE-International conference MALIAF

As a dissemination event of the 2-year project IMPASSE, a final project international conference "Managing Alien Species for Sustainable Development of Aquaculture and Fisheries" (MALIAF) is to be hosted by the University of Florence (Italy) between 5 and 7 November 2008. Its main objective is to present IMPASSE's results to the scientific community, administrators, and stakeholders, but also to extend the discussion on the strategies needed to develop sustainable and profitable aquaculture and fisheries across the world. The conference will be followed by the production of a proceedings volume gathering the main talks and contributions given.

MALIAF will provide a unique opportunity for many leading scientists engaged in research on invasive alien species to meet and share their knowledge with practitioners, stakeholders, and regulatory agencies. This will have a positive impact on the ongoing process, at the EU level, of developing regulations governing the use of alien species in human activities, including aquaculture. Specifically, *MALIAF* will contribute to strengthen cooperation at international, regional, transboundary, and local levels and to develop integrated actions to standardize guidelines or protocols for species movement, risk assessment, and quarantining. By suggesting strategies for an effective management of aquatic ecosystems and for a mitigation of the risks posed to organisms, communities, and ecosystems by alien invasive species, *MALIAF* will pinpoint means and opportunities that might ultimately improve the quality of life, assuring both human well-being and economic development of the society in general.

For more information, please contact the IMPASSE Partner Francesca Gherardi at francesca.gherardi@unifi.it.

The frequently referred to Neobiota group continues to be active and its next meeting will be held in Prague (Czech Republic), October 23–26 (http://www.ibot.cas.cz/neobiota/).

The next meeting of the EU funded Project "Sustainable Ballast Water Management Plant" (BaWaPla) will be held in mid May 2008.

The IMO Marine Environment Protection Committee will hold its 57th meeting from March 31 to April 4th at the International Maritime Organization (IMO) headquarters in London. At this meeting, the findings of the recent sub-committee meeting of the Bulk Liquid and Gases (BLG) group will also be discussed. Of key interest to ICES may be the current development of the Ballast Water Sampling Guideline (G2) for compliance control with the standards as set forth in the IMO Ballast Water Management Convention.

As reported last year Germany continues to be active in the relevant working group of the IMO. Onboard tests of ballast water treatment systems developed by German vendors are ongoing. The tests are carried out according to IMO guidelines. One vendor completed the ship-board tests; another is planning those tests to start soon. Several other vendors are in a preparational stage. The Federal Maritime and Hydrographic Agency is responsible for the type approval of ballast water treatment systems in Germany and is currently carrying out several approval procedures. The first German system to receive Final Approval from IMO, a prerequisite for issuance of a certification, is likely the system developed by the Hamann AG. The treatment system includes a mechanical separation (hydrocyclone and 50 μm filtration) to be followed by the injection of a chemical (Peraclean Ocean).

On a biannual basis Singapore runs a meeting on ballast water treatment systems. This year the 4th International Conference and Exhibition on Ballast Water Management (ICBWM) meeting is to be held Oktober 16–17.

The 14th International Congress on Marine Corrosion and Fouling will be held July 27–31, 2008 Kobe, Japan (www.icmcf-14th-kobe.jp).

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National Report Ireland

Submitted by Francis O`Beirn

Highlights

Didemnum sp. continues to be observed at new locations around the east coast of Ireland.

Crassostrea gigas has been found in the bays in the north of Ireland, over large areas although with relatively low populations.

A change in inspections of imported mussels has been implemented to reduce the risk of Crepidula fornicata with higher rates of inspections from areas that have the slipper snail associated with seed.

1 Regulations

No reports.

2 Intentional introductions

None reported.

3.0 Accidental introductions

A colonial tunicate, *Didemnum* sp., was first described from Malahide marina on the east coast of Ireland in October, 2005. A similar form, displaying pendulous growth, was described from another marina in the north-east of the country (Carlingford Lough) in June 2006. These occurrences were described in Minchin and Sides (2005). Since then, similar forms have been observed on the west coast of Ireland (Galway Bay and Clew Bay), at aquaculture installations in both bays. The growth was observed on oyster culture bags but was not extensive in either case. In the case of Clew Bay it was removed, with the cooperation of the aquaculture operator, by replacing the oysters into clean bags and air-drying the affected bags. As yet, the exact species has not been confirmed, but the forms observed are very similar to the invasive forms described elsewhere.

Settlement of *C. gigas* has been confirmed in two bays in the north of Ireland (Lough Foyle and Strangford Lough) and anecdotal accounts of settlement have been described in 5 other areas. The settlement in Strangford Lough is considered low but extensive within the western part of the lough and appears to be confined to the intertidal region (D. Roberts, Queens University Belfast, personal communication). In Lough Foyle, settlement has been recorded both subtidally and intertidally. The oysters have been found primarily on mussels and native oysters (C. McGonigle, Loughs Agency, personal communication).

4 Species Not Yet Reported or Observed

The risk of introducing *Crepidula fornicata* in mussel seed shipments from the UK continues to be an issue. Over the last two years the demands for mussel seed has increased in Ireland. Applications to import seed from a number of areas in the UK have been received by the Department of Agriculture Fisheries and Food (DAFF). Following the transport of a shipment of seed from the south coast of England, a risk-based management plan was implemented conducted in consultation with the National Parks and Wildlife Service. With the cooperation of the UK Agencies,

CEFAS, CCW, and the EA, the DAFF were able to identify locations within UK from where seed should not be introduced, due to the high risk of introducing *C. fornicata* with shipments. Seed originating from areas of low or moderate risk were subject to sporadic inspections, the frequency of which was based upon the level of risk combined with the quantity to be transported.

Publications

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Meetings

Risk Assessment of Bottom Culture of the Pacific Oyster, *Crassostrea Gigas* in Ireland. Francis X. O'Beirn, Terry McMahon, Micheal O'Cinnéide.

Presentation, 10th International Conference on Shellfish Restauration (ICSR) 2007 November 12–16, Vlissingen, The Netherlands.

National report Norway

Prepared by Anders Jelmert, Institute of Marine Research

Highlights of the report.

The alien comb-jelly **Mnemiopsis leidyi** (Reported in the WGITMO 2007 report) has been present in the plankton throughout the year scattered along the coast from the Swedish Border to Bergen 60 22N, 05 04E. Occasionally found in substantial numbers, but no obvious bloom events.

The red king crab **Paralithodes camtschaticus** has extended its range soutwestward to the Balsfjord Area 69 14 N 19 23 E.

The snow crab **Chionoecetes opilio** are sporadically found outside the coast of Finnmark County, but the main population is still concentrated in the eastern part of the Barents Sea.

Of a total of 8 suspects, 2 specimen of American lobster **Homarus americanus** were found in Norwegian waters in 2006,outside "Standefjord 54 04 N, 10 15 E.

A report on ballast water management (including exchange zones) was finalised and is decision support for by-laws on the BW convention (Dragsund *et al*., 2007).

The risk assessment will later be implemented in managemental plans for nonindigenous species. A revised list of introduced species w/ risk assessment have been finalised (Gederås *et al*., 2007). A report on mapping and management of introduced marine species has been commissioned and will be finalised March 2007.

1) Laws and By-laws.

A new law for Biodiversity planned to be enacted in 2007 has been postponed to 2008.

2) Deliberate releases.

Nothing to report (but illegal release of American lobster and red king crab cannot be ruled out.)

3) Accidental introductions and transfers.

(i) Invertebrates

Specimen suspected to be the comb-jellyfish *Mnemiopsis leidyi* were spotted in the Oslofjord dec. 2006. The identity was later confirmed by US taxonomists. The combjelly have later been found in the "Coastal Current" as far north as outside Bergen (60 22N, 05 04E). The species will now be targeted by the zooplankton surveys at IMR. A North European initiative to monitor *Mnemiopsis* is established (Uli Sommer, Germany) and have had a number of meetings during 2007.

The Pacific oyster *Crassostrea gigas* have previously been cultured in enclosed ponds in Norway (But is now illegal). Scientists from IMR did a survey in the vicinity of one facility and cleared young specimen at "Espevik (N: 59 54, E 05 40.) in 2006. Another two specimen were found (and collected) outside Kragero (N: 58 52, E 09.). Hopefully some more fieldwork to eradicate eventual other specimen will be carried out in 2008.

The red king crab (*Paralithodes camtschaticus*) (personal communication, Jan Sundet, IMR).

The red king crab (*Paralithodes camtschaticus*) is now fully dispersed in all coastal areas in the Norwegian zone from the Russian border to North Cape. West of North Cape substantial amounts of crabs are caught in the open access fishery west of 26 o E.

Catches of single specimens of the red king crab are made sporadically several places in the coastal areas of Troms County. In 2007, such recordings was done both in the Kvenangen fjord (69 58 N 22 01 E), the Reisafjord (69 49 N 20 58 E) and Balsfjorden (69 14 N 19 23 E). These recordings indicate that the crab is still spreading to new habitats along the coast of north Norway west of its core distribution area, but the open access fishery west of 26° E seem to reduce the dispersal rate noticeably.

The snow crab (*Chionoecetes opilio*) (personal communication, Jan Sundet, IMR).

Snow crabs (*Chionoecetes opilio*) of both sexes were caught both during regular scientific surveys and by fishing vessels in all eastern and northern areas of the Norwegian part of the Barents Sea and in the Svalbard Conservation zone. In addition, one male snow crab were caught close to North Cape (71 11N 25 40 E), and one north of Nordkyn (71 27N 27 48 E), in 2007.

All Norwegian recordings of the snow crabs in 2007 strengthen the hypothesis that the dispersal of this introduced crab will have a more northern pattern than the red king crab.

Ballast water has been suggested as a vector for snow crab into the Barents Sea (V. Kuzmin, PINRO, Russia). Samples collected from Barents Sea has been analyzed, but does not seem to match samples from the NW Atlantic closely (K. Jørstad, IMR, pers. comm.). The B.S. samples will later be compared to samples from the Beering Sea. If the Barents Sea populations are genetically close to (or identical) to the Beering Sea populations, the possibility that the Snow Crab has entered the Barents Sea as a natural range extension North of Siberia need to be addressed.

American lobster (*Homarus americanus*). A total of eight specimens with suspect habitus characters were collected and DNA analysed. Two individuals caught outside "Sandefjord "54 04 N, 10 15 E were confirmed to be *H. americanus*. (A.L. Agnalt and K. Jørstad, IMR, Pers. Comm.) One of these individuals was an egg-carrying female. Since 2000: a total of 75 lobsters with atypical morphology have been collected and tested by microsatelite DNA analysis. Of these, 18 have been confirmed to be *H. americanus.*

The gammarid *Caprella mutica* is now found from Hidra 58 09N, 06 39E scattered along the W Norwegian Coast to Around Tromsø 69 42N, 19 01 E. (Vim Vader, University of Tromsø, pers. comm.)

(ii) Nothing to report

(iii) Algae and higher plants

The algae previously described as *Chattonella_verruculosa*, an introduced HAB alga (http://www.nobanis.org/files/factsheets/Chattonella_verruculosa.pdf) has been reanalyzed and was found to be different from tested Japanese strains. It is now considered to be a species belonging to the North Sea, and has been taxonomically reviewed. It is now transferred to a new genus (*Verrucophora*) and given the name *Verrucophora farcimen* (Edvardsen *et al*., 2007).

Anecdotal information about northward expansion, but no scientifically confirmed sightings of the Japanese drift kelp *Sargassum muticum* north of the "Sognefjorden" area (N:61 10 E: 04 58) Where established, the species seems to expand in density.

The rhodophycean *Gracillara vermicullophylla* has apparently not managed to cross the border from Swedish water.

Heterosiphonia japonica (*-ceramiales, Rhodophyta*) continues to spread north and south and continues to grow aggressively in the sub-tidal habitats. It is now established in the Oslofjorden area (N: 59 05, E: 10 37), and grows north to outside Trondheim (N: 63 40, E 09 34).

Antithamnion nipponicum (*Ceramiaceae, Rhodophyta*), was found at Austevoll SW of Bergen 60 06 N, 05 03 E, (Rueness *et al*., 2007).

4) Live imports

A request has been made to the Norwegian Food and Animal Health Inspection Service (Dyrehelsetilsynet). The EU-"TRACES" database appears to attain some functionality. But the custom tariff codes are still poorly designed to track the international movement of live animal and/or

Data to be processed

Food products

Live exports

5) Meeting conferences, symposia, workshops, etc.

A Conference on Introduced species was held in Trondheim when the "Black List was presented) in May 2, 2007.

6) Bibliography and links.

"Artsdatabanken": The Norwegian Biodiversity Information Centre. http://www.biodiversity.no/default.aspx?m=23.

A species map database for red listed species distribution has been made available at Artdatatbanken (Norwegian only) at http://artskart.artsdatabanken.no/.

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National Report 2007/2008 Poland

Prepared by A. Szaniawska and J. Hegele-Drywa, Department of Experimental, Ecology of Marine Organisms, Institute of Oceanograph, University of Gdansk, Al. Marszalka Pilsudskiego 46, 81–378 Gdynia, Poland

Audience: ICES, Member Countries and Observers, and Scientists.

Highlights

In the summer of 2006, unusual amphipod specimens were noticed at five deep-water stations over the Słupsk Furrow. This was the first time that *Dyopedos monacanthus* was observed in that area, which is currently the easternmost limit of the species' range in the Baltic Sea.

First record of *Mnemiopsis leidyi* (A. Agassiz, 1865) in the Gulf of Gdańsk (southern Baltic Sea, Poland) in October 2007. During the first month of observations the species was found in many areas of the Gulf of Gdańsk, from the surface to a depth of 42 m.

Paratenuisentis ambiguus (Van Cleave, 1921) first record from October 2007, from Vistula Lagoon. Specimens were found on eel *Anguilla anguilla.*

Pseudodactylogyrus anguillae (Yin et Sproston, 1948) and *Pseudodactylogyrus bini* (Kikuchi, 1929) are widespread in Polish coastal waters and often present on adult eels and fry.

Uradiophora ramosa (Balcescu-Codreanu, 1974), *Cephaloidophora mucronata* (Codreanu-Balcescu, 1995) and *Nosema pontogammari* (Ovcharenko and Kurandina, 1987) are microparasites which were very recently found on *Pontogammarus robustoides* from the Vistula deltaic system.

1 Regulations

Nothing new recorded, still in force: CBD Convention (05 June 1992) and Nature Conservation Act (16 April 2004).

2 Intentional

Fish

Data from 2007 are not yet available.

3 Unintentional

Invertebrates

Dyopedos monacanthus (Metzger, 1875) (Amphipoda)-is a common amphipod on estuarine soft-bottoms along North Atlantic sea coasts (Thiel, 1998). It inhabits flexible mud whips that it constructs from filamentous algae, detritus and sediment particles. A new amphipod species was noted in the material from deepwater stations over the Słupsk Furrow. The size of these species ranged from 2 to 5 mm, with females being the most abundant in the 2 mm length class and males in the 3 mm length class. It is probable that this species entered the southern Baltic with water flowing in from the Kattegat-Oresund area. It is not clear whether *D. monacanthus* has settled in the Słupsk Furrow but the latest records of the species' appearance confirm its tendency to expand its Baltic Sea range in an easterly direction (Dziaduch, 2007).

*Mnemiopsis leidyi (*A. Agassiz, 1865) (Ctenophora)-the native habitats of the ctenophore are temperate to subtropical estuaries along the Atlantic coast of North and South America, where it is found in an extremely wide range of environmental conditions (winter low and summer high temperatures of 2 and 32 ◦C, respectively, and salinities of <2–38) (Purcell *et al.*, 2001). On 3rd October 2007, the first individuals of *M. leidyi* (about 10) were observed and collected by a diver in the coastal zone of the Gulf of Gdańsk at a depth of 1.5 m (water temperature 14°C, salinity 7 psu). Subsequently, *M. leidyi* individuals were observed by divers in Gulf waters from the surface to a depth of 42 m. The total lengths of specimens varied from 1.8 to 8.0 cm (Janas and Zgrundo, 2007).

Parasites, pathogens and other disease agents

Pseudodactylogyrus anguillae (Yin et Sproston, 1948) and *Pseudodactylogyrus bini* (Kikuchi, 1929) (Monogenea*)* are gill flukes of the eel *Anguilla anguilla.* In Europe, the genus Pseudodactylogyrus is represented by these two species. These parasites are restricted to host fish of the genus *Anguilla* and are geographically widespread worldwide (Matejusová *et al*., 2003). The first Polish record of the parasites dates back to 1995 (Dzika *et al*., 1995) when they were found on 23 specimens of wild eels. Nowadays these parasites are widespread in Polish coastal waters and often present on adult eels and fry which is imported from western countries (Bystrzyńska *et al*., 2005; Rolbiecki, personal communication).

Paratenuisentis ambiguus (Van Cleave, 1921) (Acanthocephala)-intestinal acanthocephalan is known as an endemic eel parasite of brackish waters along the east coast of the USA (Bullock and Samuel, 1975). Along with *Gammarus tigrinus*, the parasite *P. ambiguus* has been introduced into Europe (Gollasch and Zander, 1995). In October 2007, the first individuals of *P. ambiguus* were recorded on one specimen of *Anguilla anguilla* from Vistula Lagoon (Rolbiecki, personal communication).

Uradiophora ramosa (Balcescu-Codreanu, 1974), *Cephaloidophora mucronata* (Codreanu-Balcescu, 1995) two parasitic gregarines of Ponto- Caspian origin, were recorded in digestive tracks of invasive *Pontogammarus robustoides* from the Vistula deltaic system (Ovcharenko *et al*., 2006, 2007a, b, c).

Nosema pontogammari (Ovcharenko and Kurandina, 1987) very recently Ovcharenko *et al.*, 2006 found one species of parasitic microsporidia also on *P. robustoides.*

Microparasites above are new to Poland. At the moment, there are no reports on possible transfer of these pathogens to native species (Grabowski *et al*., 2007).

Table of all non-native marine species in Polish Baltic coastal environment.

	Alien species name	Taxon
1	*Mnemiopsis leidyi*	Ctenophora
2	*Acartia tonsa*	Crustacea
3	*Atyaephyra desmarestii*	Crustacea
4	*Balanus imrovisus*	Crustacea
5	*Cercopagis pengoi*	Crustacea
6	*Chaetogammarus ischnus*	Crustacea
7	*Chelicorophium curvispinum*	Crustacea
8	*Dikerogammarus haemobaphes*	Crustacea
9	*Dikerogammarus villosus*	Crustacea
10	*Dyopedos monacanthus*	Crustacea
11	*Eriocheir sinensis*	Crustacea
12	*Gammarus tigrinus*	Crustacea
13	*Hemimysis anomala*	Crustacea
14	*Obesogammarus crassus*	Crustacea
15	*Orconectes limosus*	Crustacea
16	*Palaemon elegans*	Crustacea
17	*Platorchestia platensis*	Crustacea
18	*Pontogammarus robustoides*	Crustacea
19	*Rhithropanopeus harrisii tridentatus*	Crustacea
20	*Cordylophora caspia*	Hydrozoa
21	*Dreissena polymorpha*	Mollusca
22	*Mya arenaria*	Mollusca
23	*Potamopyrgus antipodarum*	Mollusca
24	*Branchiura sowerbyi*	Oligochaeta
25	*Anguillicola crassus*	Nematoda
26	*Acipenser baerii*	Pisces
27	*Acipenser gueldenstaedti*	Pisces
28	*Acipenser ruthenus*	Pisces
29	*Aristichthys nobilis*	Pisces
30	*Coregonus peled*	Pisces
31	*Ctenopharyngodon idella*	Pisces
32	*Cyprinus carpio*	Pisces
33	*Hypophtalmichthys molitrix*	Pisces
34	*Lepomis gibbosus*	Pisces
35	*Neogobius gymnotrachelus*	Pisces
36	*Neogobius melanostomus*	Pisces
37	*Oncorhynchus mykiss*	Pisces
38	*Percottus glehni*	Pisces
39	*Marenzelleria* cf. *viridis*[1]	Polychaeta
40	*Pseudodactylogyrus anguillae*	Monogenea
41	*Pseudodactylogyrus bini*	Monogenea
42	*Paratenuisentis ambiguus*	Acanthocephala

[1] **Most of the *Marenzelleria* from the Baltic Sea are not the "true" *viridis*. Thus, according to experts one should use molecular techniques to identify the species and we have included a "cf." before the species name.**

Live imports and transfers

Eggs of sturgeon *Acipenser baerii* were imported from Russia, eggs of rainbow trout *Oncorhynchus mykiss* were imported from France, Spain, Denmark and eggs of Atlantic sturgeon from Canada.

Live exports to ICES member countries

Rainbow trout and Common carp were exported to Germany.

Planned introductions and transfers

No major changes to last year's National Report.

4 Pathogens

See above section.

5 Meetings

No data.

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National Report 2007/2008 Spain

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Audience: ICES, Member Countries and Observers and Scientists.

Highlights

Studies of Invasive Alien species in Spain will be development in the next years because there were important issues involved in this matter with the Law 45/2007 of Natural Heritage and Biodiversity. Furthermore, Ministry of Environmental have been supported the "European Conference on Invasive Alien Species" in January 2008, so research based in alien species will be promoted from the National Science Foundation programmed by the Government.

1 Regulations

In 2007 there was a new national Law related to Invasive Alien Species, the Law 45/2007 of Natural Heritage and Biodiversity, on the 13 of December. In this Law, the Title III is related to Conservation of Biodiversity, and his Chapter III has mentioned the prevention and control of invasive alien species. The Article 61 indicated that it is necessary the creation of a catalogue the Invasive Alien Species.

2 Intentional

Live imports

Large quantities or marine and freshwater organism were imported from different areas of the world to serve the aquarium and hobby industry. The quantities of ornamental fish trade are in kilos.

	2006	2007(1–10)
Ornamental fishes	6 067 469,77	4 728 666,54

Live crustaceans (*Homarus* spp., and crabs) and molluscs have been imported for human consumption from various countries. Data have been obtained in the web page of Ministry of Industry, Tourist and Commerce. Data of total live animals import are shown in kilos. The products were catalogued according to TARIC codes, and frequently these codes mixed the quantities of live animals (fresh or refrigerated) with dead animals. In this way, much of the information obtained from this data base is not useful in order to know the quantities of live animals that are imported. Data were obtained from http://datacomex.comercio.es/princip.

	2006	2007(1–10)
Homarus spp.	4 643 783,97	3 864 477,44
Scallops	5 398 621,13	4 996 576,35
Perna spp.	138 329,00	43 831,00
Oysters	455 690,30	296 976,06
Mytilus spp.	5 874 178,71	5 231 398,19
Ommastrephes spp.	887 348,61	705 597,24

3 Unintentional

In the last years more alien species were recollected. Some information is from 2005, but until now we do not have any information about them. The list of new alien marine species is the Table I.

Table I. First records from Spain (2007)

Genus	Species	Common na	Locality	Latitude	longtitude	comments	date	Reference
Rapana	*venosa*	mollusca	Cambados	42º31´433"	8º50´524"	present	2007	Rolan and Bañon, 2007
Crepipatella	dilatata	mollusca	Muelle Aldán (Ponte	42º27´26´´	8º55´06´´	frequent	2005	Rolán and Horro 2005
Branchiomm	Luctuosum	Polychaeta	Valencia Port	39º25´58"	0º18´53"	present	2007	El Haddad et al. , 2007
Branchiomm	Luctuosum	Polychaeta	Cullera	39º19´11"	0º14´06"	present	2005	El Haddad et al. , 2007
Branchiomm	Luctuosum	Polychaeta	Vinaroz	40º28´15"	0º28´28"	present	2006	El Haddad et al. , 2007
Branchiomm	Luctuosum	Polychaeta	Portitxol port (Balea	39º 33´34"	2º40´07"	present	2006	El Haddad et al. , 2007

Previous data of non native marine species were included in the 2007 National Report to WGITMO and WGBOSV ICES groups. At the moment, one hundred thirty four species of marine organisms have been identified as non-native. The majority of these 134 species are crustaceans (27 species), molluscs (20) and seaweed (52). The data are from the Atlantic and Mediterranean Spanish coast, and data from the Canary Islands region was not included. In the Atlantic coast the number of alien species reached 73 species, mainly seaweed, crustaceans and molluscs. There is a complete list in the WGOBSV 2007 report.

During this past year we tried to complete the list including data of geographical localization and spreading area. We also checked all recorded data, in order to obtain a complete list of Alien marine species. We observed some disagreement about some alien species among different authors, so we are trying to have a specialist from each group of species correct them in the original list.

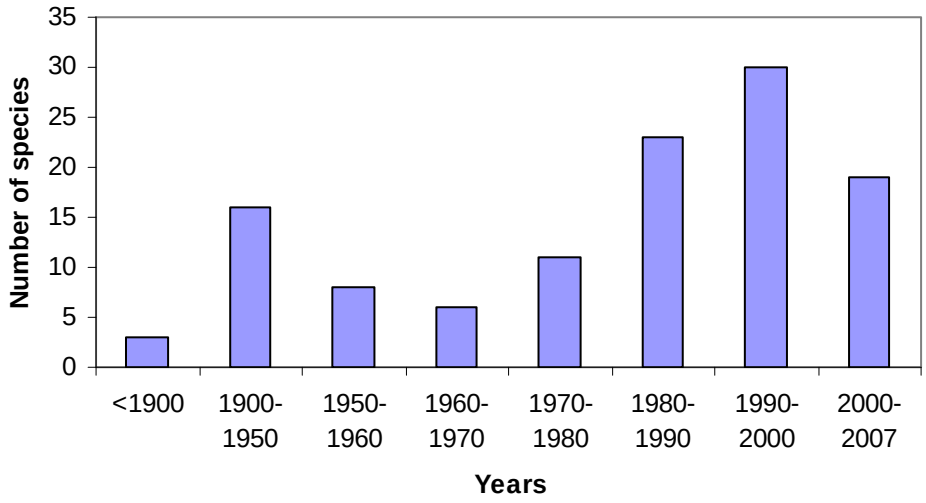

Figure 1 New records of non native species in Spanish coast from 1900.

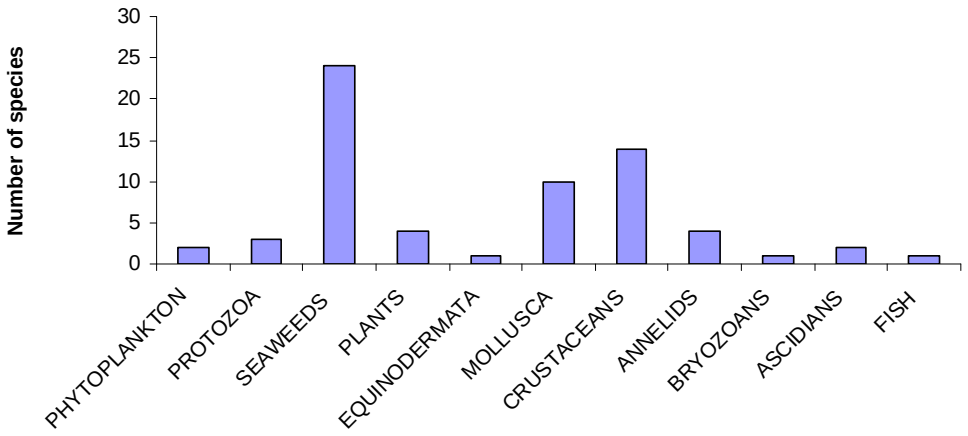

Figure 2 Non native species in the Continental Atlantic coast of Spain.

4 Pathogens

Non native marine pathogens were found in oyster and clams from the aquaculture industry. The main species introductions are *Marteilia refringens*, *Bonamia ostrae*, and *Perkinsus atlanticus*.

5 Meeetings

European Conference on Invasive Alien Species 2. This Conference was held in Madrid from 15 to 16 of January 2007. This conference provided stakeholders with an opportunity to meet and exchange knowledge on the issues involved in this matter. The Conference was attended by approximately 250 participants including representatives from governments and international organizations, experts in species and trade issues, networks and NGO. For further information refer to http://www.fundacion-biodiversidad.info/eei/.

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Rolán E and Horro J. 2005. *Crepipatella dilatata* (Gastropoda, Calyptraeidae) nueva especie introducida en aguas gallegas. Noticiario SEM, 44: 60–63.

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National Report 2007/2008 Sweden

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Audience: ICES, Member Countries and Observers, and Scientists.

Highlights

The saltmarsh grass *Spartina anglica* was detected as an isolated population in the northern archipelago of Göteborg in summer 2007. This first record for Sweden consists of a small population, probably having been there for some years.

The first finding of European perch rabdo virus was isolated from farmed fish in Southeastern Sweden (the Baltic Sea) in spring 2007.

The Japanese oyster *Crassostrea gigas*, <1 year old, was reported from the Swedish west coast, from close to the Norwegian border and down to the city of Falkenberg, province of Halland. Although some specimens from Wales had been introduced during 1973–76, it is believed these originate from newly introduced spat from populations in Denmark or Germany.

The American comb jelly, *Mnemiopsis leidyi*, first identified on the Swedish west coast in autumn 2006, was extremely abundant during summer and autumn 2007 along almost all of the Swedish west coast. It was also found in the Baltic Sea, in the Landsort Deep, in the Åland Sea, in the Gulf of Finland, and as far in as the northern Bothnian Sea, but not in the Bothnian Bay.

1 Regulations

The Swedish legislation for release of fish is based on National legislation (Fiskeförordningen 1994:1716 with complementary regulations in FIFS 2001:3). A new fish health Directive 2006/88/EG was decided in 2006 and is supposed to be implemented in National legislation during 2008. A comparison of the former directive reveals that stocking actions is more taken care of within the new legislation. A European Council Regulation 708/2007 concerning the use of alien and locally absent species in aquaculture was decided in 2007.

The Swedish legislation for release of GMOs is still based on National legislation (Miljöbalken 1998:808; the Regulation on enclosed use of GMOs SFS 2000:271; the Regulation on stocking GMOs in the environment SFS 2002:1086, complementary directions on GMOs FIFS 2004:2), all of which mainly follow the new EU Directive 2001/18/EG. Sweden is involved in the reporting system according to regulation EC nr 1946/2003.

A report from the Swedish Board of Fisheries on risks associated with the spreading of alien species along coastal waters was presented to the government on the 1th of March 2008 (Anon.,2008).

2 Intentional

Finfish

About 0.5 million glass eels (*Anguilla anguilla*) from England were released in coastal areas. The former transfer of small adult eels from the Swedish west coast into the Baltic Sea is practically ruled out as a part of a plan for the protection of the eel stock.

In 2006 (no figures available for 2007) 2.1 million Baltic salmon (*Salmo salar*) smolt and 0.8 million smolt sea-trout (*Salmo trutta*) were released in rivers and coastal areas (both probably mainly of Swedish origin). In 2007, 10 00 pike-perch (*Sander lucioperca;* young of the year) were released in the province of Uppland (probably of Swedish origin; and since not all county councils have replied, the figure might be higher).

3 Unintentional

3.1 New sightings

Invertebrates

Large numbers of the Japanese oyster, *Crassostrea gigas*, <1 year old, were reported from the Swedish west coast in summer 2007 within an area almost 300 km long, from close to the Norwegian border and down to the city of Falkenberg (ca 65°54'N, 12°30'E), province of Halland. In the north densities were >400 ind. m^{-2}, while being less dense further south (Susanne Lindegarth, Univ. of Gothenburg, pers. comm.). Although some specimens from Wales had been introduced during 1973–76, it is believed these originate from newly introduced spat from populations in Denmark or Germany, probably having had good growth conditions due to the mild winter and spring 2007. One record at the Tjärnö Marine Biological Laboratory (58°52'N, 11°06'E) was from a boat motor, which had been hanging in the water since October 2006, thus these specimens were younger than 1 year.

Algae and Higher Plant

The saltmarsh grass, *Spartina anglica,* was detected as an isolated population on the island of Rörö (56°47.5'N, 11°36.2'E) in the northern archipelago of Göteborg in summer 2007 (Ferm 2007). This first record for Sweden consists of a population of around 7 m^2, probably having been there for some years, but did not exist there in the mid 1990s. The nearest area, where it occurs, is on the Danish island of Læsø, in the northern Kattegat, ca. 70 km southwest of the Swedish site.

3.2 Previous sightings

Invertebrates

The comb jelly, *Mnemiopsis leidyi,* was extremely abundant during 2007 all along the Swedish west coast, also in very shallow water. Parasitic larvae of a sea anemone has been found infesting the comb jellies in the southern Skagerrak area, the same parasites also occurring in its native area in USA (Lene Friis Møller, Univ. of Gothenburg, pers. comm.). The comb jellies might have benefited from the unusually warm water during winter-spring 2006–2007, perhaps in combination with less competition from other scyphomedusae that occurred deeper down. In early spring 2008 only a few adult specimens have been seen in the southern Skagerrak (Peter Tiselius, Univ. of Gothenburg, pers. comm.). It was first identified outside Tjärnö (58°52'N, 11°06'E) at the northern part of the Swedish Skagerrak coast in mid-September 2006.

The comb jelly was also found in the Baltic Sea, but often at larger depths. In March 2007 around 200 individuals m^{-2} were found in the Landsort Deep (58°35.0'N, 18°13.9'E), and in August 2007 around 200 individuals m^{-2} occurred in the Åland Sea (60°11.3'N, 19°14.7'E), and around 600 individuals m^{-2} as far north as the northern Bothnian Sea (62°36.0'N, 20°15.8'E). It was not found in the central Baltic Sea in summer, nor in the Bothnian Bay (Lehtiniemi *et al*., 2007). The same authors also reported on populations in the Gulf of Finland, with maximum abundances of

around 500 individuals m^{-2} in the western part in September, but low abundances also occurred quite far in the Gulf in December 2007. In a recent publication Dascalov *et al*., 2007 emphasized the role of ecosystem regime shifts for the success of *Mnemiopsis leidyi* in the Black Sea, where overfishing has played a crucial role, and that sprat and anchovy stocks started to recover when *Mnemiopsis leidyi* was still abundant, but when fishing pressure had decreased.

In 2007 quite high abundances of the polychaete *Marenzelleria viridis* were found in shallow waters at Kristineberg (58°14.9'N, 11°27.0'E), in the southern Skagerrak (Thomas Dahlgren, Univ. of Gothenburg, pers. comm.), which was confirmed by DNA analyses carried out in Rostock by Miriam Blanck. Previously, only a single damaged specimen had been found there (WGITMO 2004). Populations found further south around Helsingborg (WGITMO 2007) have also been analyzed in Rostock and proven to be the "true" *M. viridis* (Lindholm, 2007). She reported that the species in 2006 had been found at seven localities, four of which were new, and the highest density was 168 individuals m^{-2}. In 2007 there was a large increase in the densities at the island of Sandön in Skälderviken (ca 56°14'N, 12°48'E) with densities up to almost 2 500 ind. m^{-2} (Truedsson *et al*., 2007).

In the Baltic Sea, it is in some studies still referred to as *M.* cf. *viridis* in the monitoring programmes. Cederwall *et al*., 2007 reported on a survey of benthic macrofauna along ca 55 km of the coast of the province of Södermanland, the northern Baltic proper, and they found *Marenzelleria* (no species name given) at 51 of 66 sites, with a maximum density of 1518 individuals m^{-2} and around half of the stations had densities >100. In 2006, *Marenzelleria* had decreased in abundances in the area (60°27'N, 18°14'E) around the nuclear power plant at Forsmark, the Southern Bothnian Sea, to much lower densities than before (Adill *et al*., 2007). On the other hand *M. neglecta* had increased at the reference station (ca 58°10'N, 16°39'E) about 60 km north of outside the nuclear power plant at Oskarshamn (Franzen, 2007).

Every year specimens of the Chinese mitten crab, *Eriocheir sinensis*, are reported. However, in 2007 much fewer individuals were caught in the lakes of Vänern and Mälaren compared to in 2006 (Lundin *et al*., 2007; WGITMO, 2007). One of the northernmost record was in 2007 reported from Jävre (65°09'N, 21°30'E), southeast of Piteå in the inner part of the Bothnian Bay, while it was already in 1946 reported further north in the Luleå archipelago. Distribution data, based on old data and updated with reports on the Internet to the Swedish Museum of Natural History (www.nrm.se/ullhandskrabba) have been summarized and people are encouraged to send in reports (Lundin *et al*., 2007). There are NO reports of mass migrations.

Results from studies of the crustacean, *Cercopagis pengoi,* have been included in the WGITMO reports since 2002. Those studies by Gorokhova and coworkers will be summarized in English in the report from the programme AquAliens (see also e.g. Svensson and Gorokhova, 2008; Lehtiniemi and Gorokhova, in press). There, also management aspects are discussed in relation to an ecosystem-based approach to fisheries management. No substantial changes in its distribution in the Baltic Sea have been reported, and it is still not found in freshwater in Sweden (Elena Gorokhova, Stockholm Univ., pers. comm.)

Macroalgae and Higher Plants

During 2007 the large Asiatic red alga, *Gracilaria vermiculophylla,* was recorded from a small marina on the island Koön (57°53.4'N, 11°35.3'E), inside the town of Marstrand, at the border area between the Skagerrak and the Kattegat (Lars-Harry Jenneborg,

pers. comm., Wallentinus' own observations). Since it was quite common, it probably had been there for some years. This is the second northernmost site in Sweden, the northernmost record being a single specimen in Brofjorden, about 50 km further north. The species was first recorded during August–September 2003 in the Göteborg archipelago, (Nyberg 2007, see also WGITMO-reports 2004, 2005, 2006, 2007).

In the southern Bothnian Sea the stonewort, *Chara connivens,* has been found at some new stations outside the town of Öregrund (60°28.5'N, 18°33.4'E) and in Lövstabukten, southeast of the town of Gävle, during 2006 (Hjelm *et al*., 2007).

There are no reports of changed distributions for other introduced macroalgae.

3.3 Species Not Yet Reported or Observed

Finfish

A Ph.D. student within the research programme AquAliens has worked for his thesis (Gustaf Almqvist, 2008) with the ecology of the round goby *Neogobius melanostomus* in Poland (Karlsson *et al*., 2007, see also WGITMO-reports 2004, 2005, 2006, 2007), since we did not want to take this species to Sweden. So far there has been NO reports of it from Swedish waters to him or the Swedish Board of Fisheries, despite its common occurrence in Gdansk Bay, Poland, at some sites in northern Germany, Estonia, Lithuania, and, a record from the Turku archipelago, Finland.

Invertebrates

The Swedish Board of Fisheries has long been following the records of American lobster in Norway, and although some suspicious individuals have been noted in Sweden in the past, they turned out to be only European lobster. Thus there are still NO confirmed reports of the American lobster from the Swedish west coast (Mats Ulmestrand, Swedish Board of Fisheries, pers. comm.)

Although the sea squirt, *Styela clava,* occurs in quite shallow waters in Denmark (Hansson, 2008), there are NO reports from the Swedish west coast (see also Davis *et al.*, 2007).

There are NO reports from Swedish waters of the two *Hemigrapsus* crab species (Hansson, 2008), although they are increasing in the Netherlands and Belgium in northwestern Germany (see National Report from Germany from this meeting). Lundin *et al*., 2007 also mentioned records of *H. takanoi* from the southwest coast of Jutland in Denmark.

The blue crab *Callinectes sapidus* was found in Denmark at Skagen in January 2007, but there are NO records from the Swedish west coast (Hansson, 2008).

Macroalgae

There are NO observations of the Japanese brown alga, *Undaria pinnatifida,* on the Swedish west coast (the Baltic Sea would be too brackish), although it occurs in Belgium and Dutch waters.

Parasites

A widened study of the native European flat oysters in Sweden (a total of 10 sites with 15 specimens per site) was carried out in 2007 for investigating if the parasites *Bonamia* and *Marteilia* were present in Swedish populations, but NONE were found (Valero and Loo, 2008). This is part of the work towards having Swedish waters declared free of those parasites according to the EU directive 2006/88/EEC.

4 Pathogens

The first finding of European perch rhabdo virus in farmed fish in Sweden was isolated in spring 2007 at the southern part of the Swedish east coast (the Baltic Sea).

In the spring of 2007 a routine viral sample revealed an IPN-infection (Sp-type) in an inland trout farm also used for breeding of smolt from coastal wild brood stock of sea trout. The follow up by viral sampling at contact farms revealed one other site at the coast that fed sea trout smolts for delayed release. This farm was also found positive for the same type of IPN infection.

5 Meetings

The programme AquAliens, financed by the Swedish EPA 2002–2007, had two final seminars (given in Swedish) followed by panel discussions in Stockholm on October 22, and in Göteborg on November 14, 2007. A report in Swedish is available at the Swedish EPA website, and an English version will come in spring 2008 at AquAliens' website, where also the Swedish version can be found (http://www.aqualiens.tmbl.gu.se).

On August 17, 2007, the "First Symposium on Marine Bioinvasions in Denmark" was held in Copenhagen, where 14 oral presentations were given (Thomsen *et al*., 2007).

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National Report 2007/2008, United Kingdom

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Audience ICES, Member Countries and Observers, and Scientists.

Highlights

No records of species new to the UK have been reported. There is increasing concern about the spread of Pacific oyster, *Crassostrea gigas,* in the wild and also of seed mussel consignments acting as vectors for introductions of associated species. Monitoring and other studies continue with a range of previously introduced species, including fresh water fish, pumpkinseed L*epomis gibbosus*, sunbleak *Leucapiu delincatuss*, topmouth gudgeon *Pseudorasbora parva* and marine species *Caprella*, *Styela* and *Sargassum*. There are several legislative changes under consideration affecting introductions of alien species.

Content

1 Regulation

Defra and the Welsh Assembly are seeking comments on proposals to review Schedule 9 to the Wildlife and Countryside Act 1981. The schedule lists non-native species that are already established in the wild but that will continue to pose a conservation threat to native biodiversity and habitats, such that further releases should be regulated. The consultation proposes that various species, including many of interest to WGITMO, be added to Schedule 9. These include freshwater grass carp *Ctenopharyngodon idella*, freshwater freshwater pikeperch *Sander lucioperca*, sunbleak, various, freshwater crayfish species, bitterling, marine American hard-shell clam *Mercenaria mercenaria*, Chinese mitten crab *Eriochier sinesis*, American oyster drill *Urosalpinx cinera*, slipper limpet *Crepidula formicate*, and various seaweeds including japweed. For a full list, see: http://www.defra.gov.uk/corporate/consult/wca-schedule9/index.htm.

The devolved administration in Scotland is conducting a similar exercise with a broadly similar list of species that also includes Pacific oyster *Crassostrea gigas*. For full details, see:

http://www.scotland.gov.uk/Publications/2006/11/InvasiveSpeciesResponse.

The UK Government consulted on its draft Invasive Non-Native Species Framework Strategy for Great Britain in 2007, with the intention of publishing a definitive strategy in spring 2008. This Strategy is expected to focus efforts via three-pronged approach agreed under the Convention on Biological Diversity, emphasizing prevention measures, early detection and then carefully considered appropriate action.

The European Commission Decision 2003/858/EC, to harmonise fish health rules was followed by the new fish health Directive 2006/88/EC and then the EC Decision 2006/656/EC on ornamental fish, which was implemented on 1 April 2007. This extended the EU definition of tropical fish, as regards importation from third countries, to include all fish not susceptible to diseases specifically listed by the EU. This is a major departure from the UK definition, which was that the species could not survive in UK waters. UK legislation (Animal and Animal Product (Import and Export) Regulations) was geared around a licensing system, which precluded the

import of any species, which could feasibly survive in UK waters. As a result, from 1 April 2007 importers have technically been able to import most of the world's temperate fish species into the UK for ornamental purposes, on the basis only of their clinical freedom from disease. The UK government, nevertheless, has sought to maintain a restrictive approach (based on the previous UK definition), pending further consideration on the implications of relaxing the arrangements and the expectation of introducing further controls.

At the same time, the UK government is putting together the '*Marine Bill*', which is expected to include provisions to modernise powers for the management of migratory and freshwater fisheries. In particular, this is expected to include framework powers that will enable the UK Environment Agency to assess properly the risk to native species and habitats of live fish movements, and prevent potentially damaging introductions where necessary. The existing legislation, the *Import of Live Fish Act*, would therefore serve no further useful purpose and is expected be repealed in 2010.

2 Intentional introductions

Fish

Summaries of imports of salmonid eggs into the UK can be found in Finfish News (for England and Wales, http://www.cefas.co.uk/news-and-events/finfish-news.aspx) and FRS survey reports (for Scotland, http://www.marlab.ac.uk/Delivery/Information_resources/information_resources_view_documents.aspx?resourceId=23693). UK export statistics are also presented in these publications. Over 20 different live fish species were imported from 10 other EU member states, for farming or human consumption.

Invertebrates

Deliberate releases of Pacific oyster *Crassotrea gigas* for cultivation continue at a similar level to that in previous years. Stock was imported from France, Ireland and the Channel Islands. The species is recruiting naturally in several areas of the UK, leading to increasing concerns from the statutory conservation agencies. They are supporting an independent study into the stats of this species in the UK, together with the potential for mitigating measures, for example the use of triploid stock. Naturally recruited Manila clams *Venerupis philipparum* have been found in Southampton Water. Commercial exploitation is limited by the minimum landing size of 40 mm. Most of the population is much smaller than this and the industry is campaigning for a significant reduction. There is evidence that these clams are fertile at a much smaller size.

Imports of non-native species of live bivalve molluscs and crustaceans for human consumption continues. There are strict controls to prevent them being deposited into the wild, through both disease control and wildlife legislation. Implementation of the new aquatic animal health legislation (2006/88/EU) should help in the administration of disease controls. About 2500 tonnes of live molluscs were imported in 2006, with 63% of this total from other EU Member States. In addition, about 241 tonnes of live Canadian/American lobsters were brought in to the UK.

3 Unintentional introductions

New sightings

No new species are known to have been recorded in the UK during 2007.

Previous sightings

Fish

Topmouth gudgeon *Pseudorasbora parva* has been eradicated from various waters in the UK continue (Britton *et al*., 2007, 2008).

The North American centrachid sunfish, pumpkinseed *Lepomis gibbosus*, occurs in a number of small water bodies in southern England, but the first report of a population on the Isle of Wight comes from a small artificial stream reservoir near Sandown airport (Latitude: 50:39:16N; Longitude: 01:10:41W), which was first reported by the UK Environment Agency in 2003 but overlooked in previous reports to ICES. Data on this population will be given in manuscript under review (Cucherousset et al., unpublished). A second population on the same island was reported in 2007 (D. Longley, Environment Agency, pers. communication) for a fishery near Whitwell (Latitude: 50:36:04N; Longitude: 01:15:24W), which is about 8 km to the southwest of the Sandown site.

In a comprehensive review of rainbow trout introductions to the UK (Fausch, 2007) found that overall, the primary factors to consider in any risk analysis of rainbow trout, *Oncorhynchus mykiss*, invasion in the UK include the decline of native salmonid populations due to degradation or over-harvest, the evolutionary history of newly-introduced rainbow trout stocks, the local or global influences that change aquatic environments and reduce biotic resistance by native parasites or diseases, and the rapid evolution of local adaptations by new or marginally-established populations of rainbow trout, which makes them more invasive.

The potential relationship between the intensity (i.e. propagule pressure) and diversity of fish imports and the occurrence in the wild of non-native freshwater fishes has been examined for England both from a historical perspective and with particular reference to the years 2000-2004 (Copp *et al*., 2007). The main pathways of introduction were via imports of fish for ornamental use (aquaria, garden ponds) and angling amenity, with the occurrence of non-native fishes in the wild related to the period of time since the decade of introduction. The number of established non-native species was found to increase significantly with increasing import intensity and with increasing consignment diversity.

Recent work has examined the ability of non-native fishes to tolerate elevated salinity levels, in order to assess their risk of dispersal between river catchments via 'salt bridges'. Sunbleak and topmouth gudgeon were found to be relatively intolerant of even weakly elevated salinities (Scott *et al.*, 2007a, 2007b), whereas pikeperch was able to tolerate salinities close to ocean seawater. However, radio tracking of acoustic tagged pikeperch in the upper River Thames estuary over 18 months revealed no incursions into saline waters (S. Stakėnas, formerly of Cefas-Lowestoft, pers. comm.).

A review paper to appear in 2008 examines the importance of risk perceptions to the policy process (Gozlan, 2008), in particular the pattern of small risks being over emphasized, such as is apparent with regard to non-native freshwater fish introductions. This paper examines the global scale, demonstrating that the majority of freshwater fish introductions are not identified as having an ecological impact

whilst having great societal benefits. Using case studies, e.g. from the African Lakes, the contrasting outcomes that result from fish introductions are examined, contributing to the debate surrounding the current rise in aquaculture production (to substitute for the declining wild production) and increasing concerns over threats to biodiversity.

Invertebrates

Attempts to eradicate the slipper limpet *Crepidula fornicata* from the Menai Strait appear to have been successful. The method was to dredge and remove the seed mussels with which they were introduced and then to relay a consignment from an area free of this pest species onto the grounds, so as to smother the limpets. Monitoring is on going.

Demand for seed mussels in Ireland has led to concerns that the consignments might be contaminated with slipper limpets-a species that is absent. Shellfish health controls allow GB services to alert the Irish authorities. In The Netherlands there are similar concerns over the introduction of American tingle *Urosalpinx cinerea* but this is less easily monitored as no shellfish health controls apply to these consignments.

Studies have been published on the range expansions of *Caprella mutica* (Cook *et al*., 2007) and *Styela clava* (Davis *et al*., 2007) in Europe. There are anecdotal reports of an increase in population densities of *S. clava* in southwest England, to the extent that fouling is interfering with shellfish farming (rope grown mussels).

A PhD student from the University of La Coruña (NW Spain) working on *Ensis* spp. evolution approached Cefas with a view to obtaining samples of this species from the UK. One of the goals of his PhD thesis is to perform a phylogeographic study of the alien razor clam *Ensis directus* (the American razor clam) in Europe.

Algae and higher plants

The rapid expansion in range of *Sargassum muticum* has been studied and documented (Harries *et al*., 2007).

A dense bloom of the diatom *Attheya armatus* was observed off Minehead (Bristol Channel) in early June 2007. This species is previously recorded from eastern Scotland in 2002. The natural distribution of this species is uncertain.

Species Not Yet Reported or Observed

Didemnum is spreading in Ireland and as there is regular boat traffic with the GB mainland there is concern that this species will be introduced via either a port or marina.

There has been an increase in the numbers of illegal crayfish for sale in aquatic outlets and garden centres. Of particular concern is the number of marbled crayfish being found. Marbled crayfish can survive in temperate water and there is a concern that it will become established in the UK if released. Wild populations of the marbled species have already been confirmed in Germany and possibly Holland.

The round goby *Neogobius melanostomus* has been spreading through Europe via the canals that connect river catchments as a 'hitch-hiker' (hull fouling) on riverboats. It was first recorded in the lower Rhein, Netherlands, in 2004 (van Beek, 2006), and as such the species is amongst the most likely of the Ponto-Caspian gobies to find its way to the UK as a boat 'hitch-hiker'.

4 Pathogens

Bonamia ostreae was detected for the first time in two further areas of Scotland, on the west coast (Loch Sween and West Loch Tarbert) in 2007. It is not known how the disease was spread into these previously uninfected areas.

Eradication of Viral Haemorrhagic Septicaemia (VHS) in farmed rainbow trout, *Oncorhynchus mykiss*, in North Yorkshire appears to have been successful. The affected farm site was cleared and disinfected and samples of susceptible species re-introduced to this site and at other sites in the area have tested negative for this pathogen. Movement controls remain in place until disease-free status is officially re-instated.

A limited survey of Gaffkaemia in European lobsters from fished areas in South Wales has shown that the causative organism, *Aerococcus viridans* is evident at a level of around 5% in lobster samples from keep pots.

5 Meetings

Past

A one-day meeting on 'Climate change and UK's aquatic ecosystems' was held at University College London (www.ecrc.ucl.ac.uk/content/view/349/151/) in May 2007, with non-native species being an important theme in a number of the communications.

The annual conference of the Fisheries Society of the British Isles (FSBI), which was held in Exeter during July 2007, had the theme of: 'Non-native fishes: Integrated biology of establishment success and dispersal' (www.fsbi.org.uk/2007/index.html). Papers from this meeting are available in the *Journal of Fish Biology*, Vol. 71, Supplement D.

The 12th European Congress on Ichthyology (www.biol.pmf.hr/%7Eecixii/) was held in Dubrovnik, Croatia, in September 2007, and had 'symposium' on 'Invasive fish species in the Mediterranean Sea'. The proceedings are anticipated to appear in the 'Electronic Journal of Ichthyology'.

The 15th International Conference on Aquatic Invasive Species (www.icais.org/) was held in Nijmegen, the Netherlands, in September 2007.

Future

The EIFAC symposium on 'Interactions between social, economic and ecological objectives of inland commercial and recreational fisheries and aquaculture' will be held 21–24 May 2008 in Antalya, Turkey. It includes a session on fish farm escapes and the introduction of alien species.

The 5th European NEOBIOTA Conference ' Towards a Synthesis' will be held in Prague, Czech Republic, on 23–26 September 2008.

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United States 2007/08 National Report

Prepared by Paul Fofonoff, Judith Pederson, Fred Dobbs, and Greg Ruiz.

Highlights

Two haplotypes of the Indo-Pacific lion fish (Pterois miles/volitans complex) were first observed in the Northwest Atlantic in 1992 in Biscayne Bay, Florida and have subsequently been observed from Bermuda to Rhode Island (with juveniles in Massachusetts and Long Island Sound), in the Gulf of Mexico (Tampa Bay) and regularly off the coast of North Carolina.

Several species, identified in earlier reports, continue to spread. These include the *Phyllorhiza punctata* (Australian Spotted Jellyfish), *Megabalanus coccopoma* (Titan Acorn Barnacle), *Stramonita haemostoma floridana* (Southern Oyster Drill, Florida Rock Shell), *Penaeus monodon*, (Asian Tiger Shrimp), *Didemnum* sp A. (an invasive colonial tunicate, previously called *D. vexillum*, *D. vestum*, *D. lahillei*), and the Eriocheir sinensis (Chinese mitten crab).

On the Pacific coast, the *Rhinogobius brunneus* (species complex, Amur Goby) was reported expanding in the Columbia River watershed, Washington; and *Assiminea parasitologica* (a brackish water snail), was found in Coos Bay, Oregon estuary; and *Littoridinops monroensis*-(a brackish-water snail) was found in San Francisco Bay, California.

A second attempt has been made to eradicate *Avicennia marina* (Gray Mangrove) and ongoing efforts to eradicate *Zostera japonica* (Japanese eelgrass) continue, both on the West Coast of the US.

Bonamia sp. (Protozoan oyster parasite) appears to infect *Crassostrea ariakensis* cultures and the native *Ostrea equestris* oyster in high salinity waters.

1 Regulations

No change in ballast water or invasive species regulations at the national level in the U.S. even though legislation has been proposed.

There continues to be regulations passed at the state level. In the Great Lakes region, several states are considering or have passed regulations. It is not clear whether these are enforced or how well they are succeeding. Current Minnesota is considering ballast water regulations.

California is one of the states that have been successful with ballast water regulations. The have adopted standards that will go into effect by January 1, 2009. They evaluated 28 systems and plan to continue testing others with their testing guidelines that are being produced for developers and independent labs to ensure that they are compliant with the California laws.

2 Intentional introductions

Crassostrea ariakensis triploids continue to be introduced in the Chesapeake Bay, Maryland. A process similar to the Code of Practice has been followed. However C. ariakensis was introduced into Bogue Sound North Carolina where it is susceptible to Bonamia sp .in high salinity areas (discussed under pathogens section). This continues to be reviewed and discussed, but is viewed differently in states surrounding the Chesapeake Bay. The opportunity for one state to make a decision

about introducing a non-native species, underscores the potential for escape that affects bordering jurisdictions.

3 Accedental introductions and transfers

3.1 Fish

Atlantic/Gulf Coasts

Pterois miles/volitans complex-Indo-Pacific lionfishes of the genus *Pterois* have been observed in the Northwest Atlantic, since 1992. The first sightings, in Biscayne Bay, Florida, were probably of escape aquarium fishes. Subsequently, starting in 2000, lionfishes were regularly observed off North Carolina south of Cape Hatteras, and by 2004, substantial abundances were observed in this region (Whitfield *et al*., 2006), with captures of adults or juveniles occurring from Tampa Bay and Bermuda to Rhode Island (USGS Center for Aquatic Resource Studies 2008). DNA studies of 98 specimens from the Indo-Pacific and 170 from the Western Atlantic (from Florida, North Carolina, and New york) indicate that two species, *Pterois volitans* and *P. miles* have both been introduced to the northwest Atlantic-158 Atlantic specimens had *P. volitans* haplotypes, but 12 had *P. miles* haplotypes (Hamner *et al*., 2007). *Pterois miles* (Devil Firefish) is native to the western Indian Ocean from the Red Sea to South Africa, west to Sumatra, while *P. volitans* (Red Lionfish) ranges from southern Japan and Indonesia east to the Marquesas and northern New Zealand (Froese and Pauly, 2007). Within both species, genetic diversity was very low in the introduced populations, but this does not seem to have hampered their growth and spread (Hamner *et al*., 2007). There is no information yet on any differential distribution or behavior of these two similar species in the Western Atlantic.

Pacific Coast

Rhinogobius brunneus (species complex, Amur Goby), an amphidromous goby native to East Asia (Russia and Japan to the Philippines), was discovered in Lewis Fork River, a Columbia River tributary in 2004, and was later found to be established and reproducing in drainages of the Columbia River in Washington State. In April 2007, a specimen was collected in Ramsey Wetland, a tidal inlet of the Columbia in Portland Oregon (USGS Center for Aquatic Resource Studies 2008). This goby appears to be expanding its range in the Columbia River system, but has not yet been reported from other Pacific coast river systems in the US. It was most likely introduced to North America in ballast water, although websites indicate that it sometimes occurs in the aquarium trade.

3.2 Invertebrates

Atlantic/Gulf Coasts

Phyllorhiza punctata (Australian Spotted Jellyfish)-This Indo-Pacific scyphomedusan first appeared in the Gulf of Mexico in 2000 in massive blooms off Alabama and Mississippi, and has recurred sporadically since then. The jellyfish has been expanding its range northward on the Atlantic coast of the US. In 2001, *P. punctata* was seen on the Atlantic coast of Florida in the Indian River Lagoon, Brevard County, and in July 2006, this medusa extended its range about 200 km north to Guana Lake, a lagoon near Augustine Inlet, Florida (USGS Center for Aquatic Resource Studies 2007). In 2007, it was collected near Georgetown, South Carolina, and in North Carolina near Brunswick and near Beaufort (USGS Center for Aquatic Resource Studies 2008).

Stramonita haemostoma floridana (Southern Oyster Drill, Florida Rock Shell)-This subspecies of the amphi-Atlantic *S. haemostoma* is native to the northwest Atlantic south of Cape Hatteras. Since 1955, it has been known to occur in Atlantic coastal bays (Hog Island Bay, Chincoteague Bay) in Maryland and Virginia, where it may have been introduced with planted oysters. In 2005 and 2006, two small collections of this snail were made in Chesapeake Bay proper, in the James and York Rivers, Virginia. Molecular analysis indicated that these animals originated from Atlantic Coast populations, and not from Europe or the Gulf of Mexico (Harding and Harasewych, 2007). The coastal currents between Cape Hatteras and the mouth of Chesapeake Bay are variable, but tend to flow southward, so that anthropogenic movement with fisheries or shipping may be more probable than natural dispersal. The occurrence of established populations in Chesapeake Bay has not been established.

Megabalanus coccopoma (Titan Acorn Barnacle)-This Eastern Pacific barnacle, native form the Gulf of California to Peru, had colonized Brazil by 1961, and has been collected from 2001 through 2004, at several locations in the Gulf of Mexico (Florida, Texas, and Lousiana), although established populations were not found. In 2005 into 2007, it has been collected at numerous Atlantic Coast locations from Fort Pierce, in the Indian River Lagoon, Florida, north to Beaufort, North Carolina (USGS Center for Aquatic Resource Studies 2008; Ruiz *et al*., unpublished data). The Beaufort specimen was a single barnacle on a buoy, but established populations now occur established least as far north as Wilmington, North Carolina (USGS Center for Aquatic Resource Studies 2008).

Eriocheir sinensis (Chinese Mitten Crab)-The Chinese Mitten Crab was first collected on the Atlantic Coast of the US in 2005 and 2006, in Chesapeake Bay, at the mouth of the Patapsco River near Baltimore, Maryland (Ruiz *et al*., 2006). These two specimens were adult male crabs, caught in brackish water in traps set for Blue Crabs, *Callinectes sapidus*. In 2007, 10 specimens of *E. sinensis* were reported, in Chesapeake Bay (Maryland), Delaware Bay (Delaware), and the Hudson River (New York State). In 2007, 6 adult male crabs and 3 adult females (adults of both sexes ranged from 60–70 mm carapace width) were caught in brackish water of the three estuaries. However, two juvenile Mitten Crabs (25–30 mm) were caught in fresh water in the Hudson estuary at Cold Spring, New York (October 2007) and Newburgh, New York (January 2008) (Carin Ferrante, personal communication, USGS Center for Aquatic Resource Studies 2008) suggesting that some reproduction could be taking place in the region. State agencies in the region are coordinating sampling, information-sharing, and public education activities, meeting regularly, and encouraging the public to call a 'Mitten Crab Hotline' at the Smithsonian Environmental Research Center. Sampling activities will be planned in the spring of 2008 to see whether more juvenile crabs are present in brackish and fresh waters of the mid-Atlantic (New York-Virginia) region (Carin Ferrante, personal communication).

Penaeus monodon, Asian Tiger Shrimp- This Indo-Pacific shrimp is widely reared in aquaculture operations around the world. In 1988, large numbers of Tiger Shrimps escaped from a rearing operation in South Carolina. About 1000 shrimps were captured from North Carolina to Florida that year (USGS Center for Aquatic Resource Studies 2008). However, no reproduction was documented. In 2006 and 2007, several specimens were caught on the Atlantic and Gulf Coasts of the US, in Pamlico Sound, North Carolina (2006, 5 specimens, 2007, 1 specimen), near Beaufort, South Carolina 2007, 1 specimen), near Mobile Bay, (2006, 1 specimen), and in Vermillion Bay, Louisiana (2007, 1 specimen) (USGS Center for Aquatic Resource

Studies 2008). These captures probably represent occasional escapes from aquaculture.

Didemnum sp A (an invasive colonial tunicate, previously called *D. vexillum*, *D. vestum*, *D. lahillei*). The first collection of this colonial tunicate in the northwest Atlantic was in 1991, in the Damariscotta estuary, Maine. In 2006 and 2007, it was reported from Eastport, Maine, in Passamaquoddy Bay, on the US-Canada border (USGS Wood Hole Science Center 2008). Its southernmost limit on the US Atlantic Coast is Shinnecock Inlet on the south side of Long Island, New York, where it was seen in 2004 (USGS Wood Hole Science Center 2008). The biology and distribution of this sheet-forming tunicate is reviewed in a special issue of the Journal of Experimental Marine Biology and Ecology (Vol. 432: Agius 2007, Altman and Whitlatch 2007; Bullard *et al*., 2007, Dijkstra *et al*., 2007; McCarthy *et al*., 2007; Osman and Whitlatch, 2007; Valentine *et al*., 2007a; Valentine *et al*., 2007b).

Pacific Coast

Assiminea parasitologica (a brackish water snail). In July 2007, in the upper reaches of the Coos Bay estuary, Oregon, very high densities (1000's/m^{-3}) of a very small (~5 mm) unidentified snail was observed. At one site, this animal co-existed with *Potamopyrgus antipodarum*, the New Zealand Mud Snail). The snail was later identified as *A. parasitologica*, native to southern Japan and Korea, by Dr. Hiroshi Fukuda of Okayama University. In 2008, sampling is planned to determine whether this snail occurs in other West Coast estuaries (James T. Carlton, personal communication, USGS Center for Aquatic Resource Studies 2007). This genus includes snails both with direct development and planktonic larval development, so that the mode of transport is unclear.

Littoridinops monroensis (a brackish-water snail). In 1999, two unidentified types of small (~5 mm) hydrobiid snails were collected in Suisun Bay, a brackish water portion of the inner San Francisco Bay estuary. One was identified as *Littoridinops monroensis*, previously known from brackish and coastal freshwater habitats in the southeastern US (Maryland-Mississippi), and clearly an introduction. Molecular analyses indicated a close affinity with East coast populations. Ballast water sediment was suggested as a vector for this species, which lacks a planktonic stage. The date of introduction of this easily overlooked species is unknown. The other species, *Tryonia porrecta*, is native to interior basins of the southwestern US and was considered cryptogenic in California (Hershler *et al*., 2007).

3.3 Algae and higher plants

Pacific Coast

Avicennia marina (Gray Mangrove)-This mangrove species has a wide Indo-Pacific range, from Arabia and South Africa to China and New Zealand. In the 1960s, researchers planted a few trees in a reserve in Mission Bay, San Diego, California, as a source of leaves for their research. By the 1980s, these mangroves had spread, and were recognized as invasive. Eradication was attempted and was thought to be successful (Zedler, 1992). However, by 2007, the mangroves had regrown, and eradication attempts were renewed in 2007 (Lee, 2008).

Zostera japonica (Japanese Eelgrass)-This seagrass has a wide native range from Vietnam to Japan. It was first found in the Northeast Pacific in Willapa Bay, Washington in 1957. Subsequently, it spread north to British Columbia by 1979 and southward to Coquille Bay, Oregon by 2005 (Invasive Species Specialist Group, 2006).

This species forms extensive beds in the intertidal zone, covering areas which had been bare mudflats, modifying habitat and foodwebs in estuaries. In 2002, this seagrass was detected in Humboldt Bay, California. Eradication was attempted in 2003, apparently with a combination of hand removal and herbicides (Invasive Species Specialist Group, 2006). This control program has been described as 'ongoing' (Williams and Grosholz, 2008).

3.4 Parasites, pathogens, and other disease agents

Atlantic/Gulf Coasts

Bonamia sp. (Protozoan oyster parasite). Transplanted triploid Suminoe Oysters (*Crassostrea ariakensis*), in Bogue Sound, North Carolina, showed high mortality, due to a parasite of the genus *Bonamia*. In 2004, a broader survey found that these parasites were found in *C. ariakensis* transplanted to high salinity areas infecting transplanted triploid Suminoe Oysters (*Crassostrea ariakensis*) was discovered in Bogue Sound, North Carolina in 2003 (Carnegie, 2007). The same parasite was also found in the native oyster *Ostreola equestris* (Crested Oyster). In subsequent surveys, *Bonamia* sp. was found as far south as Fort Pierce, Florida, but has not yet been detected in Chesapeake Bay. The parasite does not appear to be infective at salinities below 18 PSU, and does not infect the native Eastern Oyster (*Crassostrea virginica*). The presence of *Bonamia* sp. may restrict the culture of *C. ariakensis* to high-salinity waters. The origin of this parasite is unknown, but DNA analyses suggest that the Bogue Sound parasite as an affinity with southern hemisphere species of *Bonamia* (Carnegie, 2007).

National Report 2007/2008 Italy

Prepared by Anna Occhipinti-Ambrogi, Ecology Section, Dept. "Ecologia del Territorio", University of Pavia, Via S.Epifanio,14–, I–27100, Pavia, Italy

Audience: ICES, Member Countries and Observers, and Scientists.

Highlights

No new alien species of invertebrates and fishes have been recorded in the Italian waters in 2007. A potentially toxic algae has been isolated. Studies on the biology and ecology of species that had been introduced previously have been continued especially on invading algae (*Caulerpa* spp.) and fish (*Siganus luridus* and *Fistularia commersonii*). A section is added on information obtained from neighbouring seas (Slovenia, Croatia, France, Malta and Tunisia), including a new introduction of fish species in the Mediterranean.

1 Regulations

The National Agency for Environment (APAT) has launched a survey about the institutions active in the field of alien species introduction (prevention, monitoring and mitigation). Three selected Regional Agencies have collected questionnaires that had been circulated among public administrations and relevant technical and scientific institutions. A coordination of efforts is sought in order to implement the European, national, and regional regulations.

2 Intentional

No new intentional introductions have been reported.

3 Unintentional

New sightings

During a survey for ballast waters carried out in 2006 in the harbour of Trieste, the diatom *Pseudo-nitzschia* cf. *subfraudolenta,* belonging to the *"Nitzschia seriata* complex" has been isolated. This species, never found in the Gulf of Trieste, is potentially toxic (Amnesic Shellfish Toxins) (M. Cabrini, personal communication).

Previous sightings

A population of *Caulerpa racemosa* has been observed in the protected marine area of "Isole Ciclopi" (East Sicily, 37° 33' 25"N-15° 09' 16"E, depth 13 m) (Catra *et al*., in press). Piazzi *et al*., 2007 describe the effects of the invasion of *Caulerpa racemosa* v. *cylindracea* and *Womersleyella setacea* on the coralligenous communities along the Tuscany coasts.

In the Mediterranean Sea, degraded *Poseidonia oceanica* meadows are often colonised by *Cymodocea nodosa* and by three species of the green algal genus *Caulerpa*, which may in turn act as substitutes for *P. oceanica*: the native Mediterranean species *Caulerpa prolifera* and the two alien species *Caulerpa taxifolia* and *Caulerpa racemosa*. According to the literature, a different degree of colonisation potential seems to characterise these four species, the *Caulerpa* species being superior colonisers. The study by Montefalcone *et al*., 2006, 2007 a, b aims at identifying and measuring the intensity of the phase shift occurring in 6 seagrass meadows along the Ligurian coast. The study uses three indices (Conservation Index, Substitution Index and Phase-Shift

Index) at a regional scale, quantifying the changes occurring in these fundamental coastal ecosystems.

The brackish water hydrozoan, *Cordylophora caspia*, previously known from the Northern Adriatic, has been recorded in the "Palude del Capitano", a small pond along the Apulian Ionian coast (Denitto *et al*., 2006).

The symbiotic scleractinian coral *Oculina patagonica* is known, between 3·m and 10·m depth, in several Mediterranean Sea locations; in the Ligurian coast, where inusually high temperatures have been recorded, colonies collected from Albissola (W Liguria) and Levanto (E. Liguria) were used for experiments. A test was designed to measure the growth and photosynthesis of corals maintained at 20°C, and 26–28°C (Metalpa *et al*., 2006). The results indicate that during warm summers O. *patagonica* may suffer less than *C. caespitosa*, which is endemic to the Mediterranean.

The Asian mussel *Musculista senhousia*, already present in the Northern Adriatic, Taranto Gulf and Northern Sardinia, has been observed also in the Southern coast of this latter island, inside the harbour of Cagliari (De Longueville and Scaillet, 2006).

Percnon gibbesi has expanded northwards in the Tyrrhenian Sea reaching the Giglio Island (off Tuscany) (*http://www.ciesm.org/atlas/*).

The abundance of the rabbitfish *Siganus luridus* was assessed by visual census (Azzurro *et al*., 2007c) around the island of Linosa (Sicily Strait); this small population, thought to have arrived in Linosa in 2000, is reproducing actively (Azzurro *et al*., 2007a) and exploits different algae from native species (Azzurro *et al*., 2007b).

As reported in a previous NR, the bluespotted cornetfish *Fistularia commersonii* was found as far as Italy after a short period after appearing in the Levantine basin. A genetic study on various populations showed that this invasion resulted from the success of very few individuals, unlike other cases of Erythrean fishes in the Mediterranean that failed to give evidence of genetic bottlenecks (Golani *et al*., 2007).

Species Not Yet Reported or Observed

Sightings in waters near the Italian peninsula (Slovenia, Croatia, France, Malta, Tunisia) are reported in this section, as the probability of further spread into the coasts of Italy are high.

Ballast water was sampled on 15 ships calling at the Port of Koper, Slovenia. This was the first ballast water sampling study in the Mediterranean Sea. The paper by Matej *et al*., 2007 summarizes the sampling results: samples were analysed for all types of aquatic organisms including bacteria. The results may be considered as background information for an initial risk assessment of future species introductions and an important tool for the implementation of ballast water management measures.

Earlier reports (Šiletić, 2004, 2006) of the pectinid bivalve *Semipallium coruscans coruscans* (now transferred to the genus *Pascahinnites*) from the Adriatic Sea island of Mljet (Croatia), was in fact a misidentification of juveniles of *Manupecten pesfelis*, a native Mediterranean species (Trono and Resta, 2007; Prkić *et al*., 2007).

The hydrozoan *Clythia linearis* has been recorded in the waters of La Ciotat (French Mediterranean coast) (Galea, 2007).

A colony of the Erythrean gastropod *Cerithium scabridum*, already known from Sicily (Garilli and Caruso, 2004) has been found living at the Island of Gozo in the Maltese Archipelago, at the CentraI Mediterranean. The local habitat (salt water reservoirs for

salt recovery) and the possible food source (Cyanobacteria) have been described. (Mifsud and Sammut, 2007). Also the Red Sea opistobranch *Haminoea cyanomarginata* was recorded from the Island of Malta, confirming the spread of this species across the Mediterranean (Mifsud, 2007).

The inter-regional project MonItaMal launched by the Italian Institute ICRAM and Malta comprises an early alert system for non indigenous species aimed at involving local communities, especially fishermen and divers.

The first occurrence in the Mediterranean Sea of a single individual of the silvery John dory, *Zenopsis conchifera*, has been reported in July 2006 off the northern Tunisian coast. This fish species is widely distributed in the Indian Ocean and in the eastern and western central Atlantic and reached the north-east Atlantic coasts of Europe only in 1966 (Ragonese and Giusto, 2007).

4 Pathogens

No information on alien pathogens has been collected.

5 Meetings

Past

A review of alien mollusks in the Mediterranean has been presented during the 40th meeting of the Belgian Royal Society of Malacologists. De Longueville and Scaillet, 2007 give an annotated and illustrated list, largely drawn from personal collections, and discuss such items as vectors and origin of the species. Detailed surveys have been performed in some areas, namely on the Turkish coasts.

A special issue comprising nine collected reviews on different aspects of marine alien species has been published (Occhipinti Ambrogi and Sheppard, 2007).

A meeting of UNEP Mediterranean body RAC SPA (Regional Activity Center-Specially Protected Areas) dealing with alien species and navigation has taken place in Istanbul, September 2007. A collective book presented at the meeting will be published next year.

The Mediterranean Science Commission (CIESM) has published the Workshop Monograph n°32, 2007 on "Impact of Mariculture on Coastal Ecosystem", which can be downloaded freely at *http://www.ciesm.org/online/monographs/Lisboa.html*.

Future

The project *IMPASSE* "*Environmental impacts of alien species in aquaculture*" (*http://www.hull.ac.uk/hifi/IMPASSE/*) was funded within the EU's Sixth Framework Program for Research and Technological Development in order to address the EC's need for a thorough evaluation of the potential impacts of non-indigenous species in aquaculture. Its overall goal is to develop guidelines for environmentally sound practices for the introductions and translocations in aquaculture, guidelines on quarantine procedures and risk assessment protocols, and procedures for assessing the potential impacts of invasive alien species in aquaculture and related activities.

Among the dissemination actions the final international conference "*Managing Alien Species for Sustainable Development of Aquaculture and Fisheries*" (*MALIAF*) will be hosted by the University of Florence (Italy) on 5–7 November 2008. Its main objective is to present *IMPASSE*'s results to the scientific community, administrators, and

stakeholders, but also to extend the discussion on the strategies needed to develop sustainable and profitable aquaculture and fisheries (*http://www.dbag.unifi.it/maliaf/*).

The World Marine Biodiversity Conference will be held in Valencia, Spain on November 11–15, 2008 (*http://www.marbef.org/worldconference/*). A special session on "Marine bioinvasions and Ecosystem Functioning", chaired by Sergej Olenin, Anna Occhipinti Ambrogi and Stephan Gollasch, will be arranged within that Conference aimed at functional aspects of marine bioinvasions (such as introduction of unusual ecosystem functions, modification of benthic and pelagic habitats, alteration of the energy and material transfer pathways; methods to assess and compare various effects of invasive species in marine ecosystems).

In the same period, November 12–14, 2008, a Symposium entitled "50 years of Invasions Ecology-The Legacy of Charles Elton" will be held in Stellenbosch (South Africa) hosted by the the Centre of Excellence for Invasion Biology at the Stellenbosch University (*www.sun.ac.za/cib*).

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Highlights

Development and implementation of the Australian National System for the Prevention and Management of Marine Pest Incursions (National System) is continuing. The National System comprises three elements aimed at providing a holistic approach to marine pest management. The three elements are prevention (of marine pest introductions to Australia and translocations within Australian waters), emergency management (preparedness for and response to new incursions) and ongoing management and control (containment of established pest populations).

The Black Striped, *Mytilopsis sallei*, and Asian Green mussels, *Perna viridis* (species exotic to Australia), were both detected on vessels within Northern Australian waters during 2007. These species are of particular note as the mussels have the potential to cause significant environmental and economic impacts on Australia. These vessels were treated to remove or kill the mussels. Ongoing investigative surveys have not detected either species since the initial identification, indicating that the species have not transferred from the vessels to the Australian marine environment.

1 Regulations

Ballast water legislation

Since 2001 the Australian Government, through the *Quarantine Act 1908*, has regulated internationally sourced ballast water coming into Australian territorial waters. The requirements ensure that ballast water is managed appropriately before permitting its discharge in Australia's territorial sea. The Australian Quarantine and Inspection Service administer these requirements.

Currently, Australia is considering legislative changes required to give effect to the International Convention for the Control and Management of Ships' Ballast Water and Sediments. These changes will also require the management of ballast water between ports within Australia. These changes are expected to be completed by July 2009.

Biofouling legislation

Australia is also in the process of developing legislation and best practice management guidelines to control biofouling. Requirements for the management of biofouling on vessels arriving in Australia are expected to be implemented through the *Quarantine Act 1908* in mid 2008. National best practice management guidelines are being finalised for a range of sectors including:

- Commercial non-trading vessels;
- Commercial vessels;
- Commercial trading ports;
- Boat harbours, marinas and boat maintenance facilitates;
- Abandoned, unseaworthy and poorly maintained vessels;
- Recreational vessels;

- Commercial fishing vessels;
- Apprehended vessels;
- Aquaculture; and
- Petroleum vessels and equipment.

These guidelines will assist vessel owners in managing biofouling and complying with the requirements.

Monitoring strategy

As part of the National System, Australia has developed an ongoing monitoring strategy that focuses on standardised monitoring processes to detect high risk species at 18 priority locations (National Monitoring Network) around Australia. Primarily, the strategy aims to detect new incursions of established target species to a location and to detect species not previously recorded in Australia that are likely to have a significant impact. Results from the monitoring program will support the prevention and emergency preparedness and response elements of the National System.

2 Intentional

No deliberate releases or planned introductions of invasive marine pests have occurred within Australian waters.

3 Unintentional

New Sightings

Bivalves

During 2007, Black Striped Mussel (*Mytilopsis sallei*) and Asian Green Mussel (*Perna viridis*) have been detected during routine inspections on several vessels arriving in Australia. Vessel types on which mussels have been detected have included: a barge, a large dredge, a petroleum support vessel, several illegal fishing vessels, and a navy vessel. All of these vessels were treated to remove or kill the mussels. Several vessels were treated in-situ in Australia, although two vessels had to return to Singapore to access suitable dry-dock facilities.

Table 1 New Sightings reported in the published literature.

Species	Common name	Location	General information	Invasion date	Reference
Mitrella bicincta	East Asian dove snail	Various, New South Wales	Widespread	1960s	Beechey and Willan, 2007
Tridentiger trigonocephalus	Asian trident goby	Port River, South Australia			Hammer, 2006

Previous Sightings

Echinoderms

Investigations of scallop beds in Northeast Tasmania in June 2007 uncovered a small number of Northern Pacific Seastars (*Asterias amurensis*). This finding was approximately 120 km further north than any previous record of the species. A reliable specimen for confirmation was not obtained but Tasmania is responding by

asking fisherman to thoroughly clean decks and dredges before returning to port and retain any specimens (based on ID cards) for further examination.

Green macroalga

Range extension of the green macroalga, *Caulerpa taxifolia*, was confirmed in July 2007. The finding of the species in Wallagoot Lake in southern New South Wales was some 120 km further south of the previously known extent of the species. Its distribution is now just 80 km north of the Victorian border. The number of known affected estuaries is now 13. Populations of *Caulerpa taxifolia* in New South Wales have not been confirmed as exotic strains of the species.

In May 2007 the green macroalga, *Codium fragile* ssp. *tomentosoides*, was confirmed from ad hoc samples collected from 10 New South Wales estuaries. It is still being determined whether this constitutes a significant range extension from previously known populations.

Dinoflagellates

The toxic dinoflagellate *Gymnodinium catenatum* was found in a sediment core taken from Port Stephens, New South Wales. Relevant health authorities were notified for further monitoring, no further toxins were found.

Species Not Yet Reported or Observed

As part of the 'National System for the prevention and Management of Marine Pest Incursions' a list of trigger species has been developed (Table 2). If any of the listed species are detected in Australian waters an emergency response will be triggered by the Commonwealth and state governments. The marine species included on this list have the potential to have significant impacts on the Australian environment.

Table 2 CCIMPE Trigger List.

	Scientific Name/s	Common Name/s
Species Still Exotic to Australia		
1 *	*Eriocheir* spp.	Chinese Mitten Crab
2	*Hemigrapsus sanguineus*	Japanese/Asian Shore Crab
3	*Crepidula fornicata*	American Slipper Limpet
4 *	*Mytilopsis sallei*	Black Striped Mussel
5	*Perna viridis*	Asian Green Mussel
6	*Perna perna*	Brown Mussel
7 *	*Corbula* (*Potamocorbula*) *amurensis*	Asian Clam, Brackish-Water Corbula
8 *	*Rapana venosa* (syn *Rapana thomasiana*)	Rapa Whelk
9 *	*Mnemiopsis leidyi*	Comb Jelly
10 *	*Caulerpa taxifolia* (exotic strains only)	Green Macroalga
11	*Didemnum* spp. (exotic invasive strains only)	Colonial Sea Squirt
12 *	*Sargassum muticum*	Asian Seaweed
13	*Neogobius melanostomus* (marine/estuarine incursions only)	Round Goby
14	*Marenzelleria* spp. (invasive species and marine/estuarine incursions only)	Red Gilled Mudworm
15	*Balanus improvisus*	Barnacle
16	*Siganus rivulatus*	Marbled Spinefoot, Rabbit Fish
17	*Mya arenaria*	Soft Shell Clam
18	*Ensis directus*	Jack-Knife Clam
19	*Hemigrapsus takanoi/penicillatus*	Pacific Crab
20	*Charybdis japonica*	Lady Crab
Species Established in Australia, but not Widespread		
21 *	*Asterias amurensis*	Northern Pacific Seastar
22	*Carcinus maenas*	European Green Crab
23	*Varicorbula gibba*	European Clam
24 *	*Musculista senhousia*	Asian Bag Mussel, Asian Date Mussel
25	*Sabella spallanzanii*	European Fan Worm
26 *	*Undaria pinnatifida*	Japanese Seaweed
27 *	*Codium fragile* spp. *tomentosoides*	Green Macroalga
28	*Grateloupia turuturu*	Red Macroalga
29	*Maoricolpus roseus*	New Zealand Screwshell
Holoplankton Alert Species * For notification purposes, eradication response from CCIMPE is highly unlikely		
30 *	*Pfiesteria piscicida*	Toxic Dinoflagellate
31	*Pseudo-nitzschia seriata*	Pennate Diatom
32	*Dinophysis norvegica*	Toxic Dinoflagellate
33	*Alexandrium monilatum*	Toxic Dinoflagellate
34	*Chaetoceros concavicornis*	Centric Diatom
35	*Chaetoceros convolutes*	Centric Diatom

*** species on Interim CCIMPE Trigger List**

4 Pathogens

No accidental introductions or transfers are known.

5 Meetings

National Introduced Marine Pests Coordination Group (NIMPCG) meetings to further develop the National System for the Prevention and Management of Marine Pest Incursions. NIMPCG consists of federal, state/territory governments, industry, environmental groups, and scientific bodies.

NIMPCG Meeting 22, 3–4 April 2007

NIMPCG Meeting 24, 25 July 2007

NIMPCG Meeting 25, 23–24 October 2007

NIMPCG Meeting 26, 29–30 April 2008

NIMPCG Meeting 27, 28–29 October 2008

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Annex 7: Review report of Section 3.7 and Annex 5 of Working Group on Introductions and Transfers of Marine Organisms (WGITMO)

- The review took place during the WGECO meeting (6th May–13th May 2008).
- Reviewers: Jake Rice (Chair), Catherine L. Scott, Ellen L. Kenchington, Gerjan Piet, Keith Brander, Stuart I. Rogers, Øystein Skagseth, Cristina Morgado (Secretariat)

The reviewers provided written comments to Section 3.7 and Annex 5 of the WGITMO report. This section is related to WGITMO ToR a).

General comments

WGITMO had provided useful material in their report in 2007 and added to it this year in Annex 5. Their report is well-written and informative

They state that the OSPAR request is limited to non-indigenous species; it is not clear where this information came from and it is not correct. Nevertheless they do give some information on vagrant, Lusitanian and West African species. They also drew attention to a useful Icelandic report on unusual species records.

Three species were chosen as likely examples of range expansion related to warming temperatures; however the evidence presented in the report did not make it clear what the evidence was.

The review group considered that the *Crassostrea* map showed relatively local range extensions away from the site of introduction and was not explicitly related to warming. It would have been useful to see information on the overall distribution and whether there is evidence of a thermal (winter?) limit on breeding both in European waters and in the native range.

The reference provided on *Codium* showed that the invasive strain of this cryptic species had been present in European waters for over a century, but did not give information on its spread in relation to rising temperature. The references for *Elminius* were fairly local and did not give evidence of spread in relation to temperature.

The WG note that they were not given guidance on how to relate range expansion to climate, nor was there an overview of the changes in temperature in the areas they were looking at.

It is fairly clear that future requests of this kind will require more detailed dialogue between the WG and the group carrying out the overview and analysis in order to ensure that there is a common basis and methodology and that the WG is clear about what information is required. A common source of data and products on changes in ocean climate is an essential part of this.

[i] locally absent species = species being absent from a zone within its natural range.