

# ESSAS

*(Ecosystem Studies of Sub-Arctic Seas)*

## Scientific Steering Committee

### Report

of the

### 2010 Annual Meeting

Hosted by the

**Marine Research Institute**

**Reykjavik, Iceland.**

**3 & 4 September, 2010**



Compiled by  
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<b>Table of Contents</b>	<b>Page</b>
1. Participants	3
2. Introduction / Adoption of Agenda	3
3. Adoption of 2008 Meeting Report	3
4. Follow-up from 2008 Meeting	3
5. ESSAS Website - Comments & Suggestions	5
6. Emerging Issues	5
6.1 ESSAS 2011 Open Science Meeting	5
6.2 ESSAS Funding	6
6.3 SSC Membership	7
6.4 ICES-ESSAS Cooperation	7
6.5 ASOF-ESSAS Cooperation	8
6.6 IMBER	8
7. Working Group Reports	8
7.1 WG-1 Regional Climate Prediction	8
7.2 WG-2 Bio-Physical Coupling	9
7.3 WG-3 Modeling Ecosystem Response	9
7.4 WG-4 Climate Effects at Upper Trophic Levels	9
8. National Program Updates	10
8.1 Canada	11
8.2 Iceland	13
8.3 Japan	14
8.4 Norway	14
8.5 USA	17
8.6 West Greenland	17
9. Multi-National Program Updates	18
9.1 ESSAR - IPY Consortium	18
9.2 USA/Norway (MENU)	18
9.3 Canada/Norway (NORCAN)	18
9.4 Trophic Interactions in the Subarctic (Tropharct)	19
10. Other Business	20
10.1 Early ASM Abstract Submissions	20
11. Next Year's Meeting	20
Appendix 1 - Contact Information of Participants	21
Appendix 2 - ESSAS 2010 SSC Meeting Agenda	22

## 1. Participants

### SSC Members in Attendance

Ólafur Astthorsson	Iceland
Earl Dawe	Canada
Ken Drinkwater	Norway
Erica Head	Canada
George Hunt	USA
Bernard Megrey	USA
Kai Wieland	Greenland/Denmark

### SSC Members Unable to Attend

Yasunori Sakurai	Japan
Hyung-Cheol Shin	Korea
Jim Overland	USA

### Invited Guests

Orio Yamamura	Japan
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### ESSAS Project Office

Margaret M. McBride	Norway
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Contact Information for the participants are listed in Appendix 1.

## 2. Introduction / Adoption of Agenda

Upon invitation from Ólafur Astthorsson (Deputy Director), the 2010 annual meeting of the ESSAS Scientific Steering Committee (SSC) was held in Reykjavik, Iceland (3 - 4 September) at the Marine Research Institute in Reykjavik in conjunction with the 2010 ESSAS Annual Science Meeting (30 August–2 September). Professor Hunt opened the meeting by introducing SSC members and welcoming guests. The meeting agenda was adopted as presented and appears in Appendix 2.

## 3. Adoption of 2009 Meeting Report

The motion to adopt the 2009 SSC meeting report passed unanimously.

## 4. Follow-up from 2009 Meeting

Margaret McBride reviewed the status of follow-up to action items from the 2009 annual meeting, including:

*ESSAS Website Development:* Margaret mentioned last year that using ESSAS as a search term on the WWW resulted in the GLOBEC ESSAS site as first hit. The questions was whether this will still be the case after the new website is developed/launched and whether or not other groups might use the name ESSAS. **ACTION:** Margaret McBride will look into purchasing the ESSAS.org domain name to be used exclusively by our project. Follow-up: Factors determining WWW site hierarchy are the number of times the search term appears on the site and the number of visits to that site. When our new site was launched, other ESSAS sites came up before ours when searching ESSAS but now our site has now been visited enough times that our new site comes up as the first hit. The GLOBEC ESSAS site now has a

link to our new site. We are not able to purchase the rights to the ESSAS name as several groups presently use the name.

*ESSAS Project Status:* George Hunt prompted a discussion on the status of ESSAS and its Working Groups and highlighted the need for a list of ESSAS primary publications. ACTION: SSC members should send lists of published ESSAS articles into Margaret so she can develop a compendium of ESSAS publications. *Follow-up:* Margaret has developed a comprehensive list of primary publications, which is now posted on our website.

*Budget:* George suggested that better control is needed to avoid being over or under budget. In the future SSC members must be specific in their requests and keep accurate records of expenditures. Possible deviations from planned budgets should be reported as soon as possible. ACTION: George will ask SSC members for requests for spending the remaining money during the later part of 2009 remaining ESSAS funds will be used to cover activities through the end of 2009. *Follow-up:* The rest of the 2009 funds were spent.

*ESSAS-ASOF cooperation:* Following the Advection Workshop discussion were held on how to improve collaboration between ESSAS and ASOF (Arctic Subarctic Ocean Fluxes). ACTION: Ken Drinkwater (ESSAS) and Tom Haine (ASOF) will explore possible avenues to develop future collaborative research and improve communication between the two programs. *Follow-up:* Ken and Tom discussed this issue during the past year via email but not specific program was developed.

*Paper on advection:* A possible paper comparing the role of advection on sub-Arctic marine ecosystems was considered a good idea. Discussed also was whether a separate ESSAS working group on advection should be established to help in this but this was generally felt not to be needed, at least not at present. ACTION: Ken will consider the possibility of such a paper and report back at the 2010 ESSAS SSC meeting. *Follow-up:* Ken still considers this a good idea but other commitments have prevented any progress on such a paper.

*WG on Climate Effects at Upper Trophic Levels:* The WG felt that Japanese and Russian scientists are needed in the Group. ACTION: Sakurai-san will try to recruitment someone from Japan to join this WG. *Follow-up:* Orio Tamamura has joined the WG.

*Japanese Surveys:* J-ESSAS has carried out a number of cruises and the Japanese standard surveys basically cover the same area each year. ACTION: Yasunori Sakurai is to provide to the ESSAS Project Office information resulting from J-ESSAS cruises. *Follow-up:* Although no action had been taken by the time of the meeting, which Sakurai was unable to attend, he did send the agenda for a “*Workshop on the Results from T/V Oshoro-Maru IPY Cruises in 2007 and 2008*” to Margaret after the meeting. Margaret responded by saying that the Project Office looks forward to receiving the summarized cruise report when it becomes available.

*BEST/BISERP:* Questions arose regarding the monitoring activities undertaking within these projects. Mike Sigler replied that the US Fish and Wildlife Service has established monitoring sites and that NOAA collaborates with USFWS to include fisheries and oceanography sampling. ACTION: Mike Sigler is to provide the ESSAS Project Office information resulting from BEST/BSIERP cruises. *Follow-up:* Mike sent the website to Margaret.

*IMBER*: The SSC voted unanimously to join IMBER. A formal letter from ESSAS should be sent requesting that ESSAS join IMBER. ACTION: George and Ken, as Co-Chairs, will write a letter to IMBER on behalf of the SSC requesting that ESSAS formally join IMBER. Follow-up: The letter was sent and IMBER formally accepted ESSAS as a regional program of IMBER.

*Next Year's Meeting*: The first week in September was suggested as a possible time for the 2010 meeting in Reykjavik but the final decision will be made after Olafur has discussed this with his colleagues at the Marine Research Institute (MRI). ACTION: Olafur is to finalize the dates of the 2010 ESSAS meetings and inform the SSC. Follow-up: Action completed.

## 5. ESSAS Website – Comments and Suggestions

- The SSC list should be updated. In particular, Vladimir Radchenko's name needs to be removed as he has stepped down as an SSC member. ACTION: Margaret will remove Radchenko's name from the SCC membership page.
- It was decided that each SSC member should be responsible for one of the monthly feature ESSAS-related research articles per year. ACTION: Margaret will send a notice to the SSC members requesting which month they will be responsible for and remind them prior to the month that the article is due.
- The presentations from the 2010 Annual Science Meeting should be made available on the ESSAS website. ACTION: Margaret will convert each presentation to pdf format and have them posted on the website.

## 6. Emerging Issues

### 6.1 ESSAS 2011 Open Science Meeting

George Hunt updated the SSC on the plans for the 2011 ESSAS Open Science Meeting.

#### OSM Program:

- The OSM venue will be the Seattle Marriott Waterfront Hotel.
- A welcoming reception will be held at the Seattle Aquarium, Monday evening May 23<sup>rd</sup>.
- Workshops will be held on Day-1, Sunday May 22<sup>nd</sup>: either 3 1-day workshops or 6 ½-day workshops.
- Thus far, the number of workshops being planned by ESSAS WGs has been disappointing. If our WGs wish to have a venue for whatever, they are available at the OSM. However, George needs to be notified of this promptly.
- SSC members should contact colleagues directly to generate interest in attending.

#### Envisioned OSM Outcome(s)

- The goal is to have journal articles as output from each of the 9 sessions, as well as 4 ICES special volumes. Session leads will be responsible to coordinate and direct these efforts. The 9 sessions are:
  1. Comparative studies of polar and sub-polar ecosystem
    - Lead: Erica Head
    - Suggested Invited Speakers: Marit Reigstad; Sarah Gaichas; Chang Ik Zhang; Ken Frank

2. New observations and understanding of eastern and western Bering Sea ecosystems
    - Lead: Mike Sigler
    - Suggested Invited Speakers: Franz Mueter, Phyllis Stabeno, Masaki Fukuwaka, Gennady V. Khen
  3. Modeling marine ecosystem dynamics in high latitude regions
    - Lead: Enrique Curchitser
    - Suggested Invited Speakers: Diane Lavoie
  4. Contributions of endogenous re-mineralization and advection to nutrient supplies in sub-polar marine ecosystems
    - Lead: Yngve Borsheim
  5. New insights from the International Polar Year (IPY)
    - Lead: Ken Drinkwater
  6. National ESSAS Programs: Recent advances and contribution
    - Lead: Svein Sundby
    - Suggested Invited Speakers: Ken Drinkwater, George Hunt
  7. Socio-economic aspects of sub-polar and polar ecosystems
    - Lead: Ian Perry
    - Suggested Invited Speakers: Toni Charles
  8. Interactions between gadoids and crustaceans: The roles of climate, predation, and fisheries
    - Lead: Earl Dawe
    - Suggested Invited Speakers: Lobo Orensanze, Denis Chabot, Alida Bundy
  9. Future climate change and ocean acidification
    - Lead: Ken Denman
    - Suggested Invited Speakers: Jim Christian, Erica Head, Ikzhang (?)
- When speakers submit their abstracts, they should be asked whether or not they want to be included in a special volume. Session convenors should make these decisions and arrangements in agreement with their presenters.
  - Presently there are a total of 39 session co-convenors. Not enough of them are women.

#### OSM Budget

- At this point, plans for the OSM are well within budget; it is expected that we'll break even.
- The reception will cost \$1500 for 4-hour rental of the facility, plus in-house catering, and alcoholic beverages.
- Guest registration will be \$75.00 to cover coffee and the poster session.
- Coffee is expensive, and plans are to have an old time fiddle band on hand to play Cajun music.
- PICES will take 13% overhead for registration fees, but George will submit another proposal for funding to have brought before the PICES Board.
- ICES has promised 10,000 EU and publication of a special volume.
- Each student is estimated to cost \$2,500 and each invited speaker \$3,000.

#### **6.2 ESSAS Funding**

Funding discussions first centered on the Project Office. It was noted that:

- The cost of Margaret's position as ESSAS Coordinator of the Project Office has increased due to annual increases of positions at IMR. The funds for the Office can still cover the salary but as of 2011 there will be no money available for travel from this fund.

- IMR may charge for maintaining the website. If so, then we will have to take the funds out of the Project Office and reduce Margaret's hours.

Discussion then switched to the general budget. George indicated that last year's ESSAS budget has been cleared. However, funding for ESSAS is decreasing. With the present lack of funds for IMBER, it was suggested that perhaps we should approach some other umbrella organization that conceivably would provide us funding. Ken felt that IMBER will continue but ESSAS cannot assume that funding will be as much as we have received in the past from GLOBEC. It was suggested that we try to approach others for funding. After the OSM, ESSAS should examine our science programs and consider where our efforts should be directed. It was noted that NPRB's next move is to conduct a major investigation of Beaufort Sea and Chukchi Sea. ACTION: Ken and George are to look into strategies and options relative to funding for ESSAS.

### **6.3 SSC Membership**

- Vladimir Radchenko has stepped down as the Russian representative on the SSC. ACTION: George and Ken will search for a replacement from Russia.
- George announced his intention to step down as co-chair as of next year's meeting. The SSC agreed to George's request to remain on the SSC, sitting as past co-chair. Ken is willing to stay on. Both George and Ken felt that ESSAS should maintain one co-chair from the Pacific and one from the Atlantic. ACTION: Ken to search for new co-chair from the Pacific to replace George.
- The possibility of adding a third co-chair from Asia was also mentioned. ACTION: George and Ken will explore this possibility further.
- Dr. Shin, the Korean representative on the ESSAS SSC, did not attend and did not respond to several emails regarding his participation at the meeting. ACTION: Ken will contact Suam Kim regarding Dr. Shin and whether Korea should suggest another candidate.
- The SSC has been seeking a representative working in Greenland. To date our efforts have failed to attract anyone. ACTION: Kai and Ken continue to work towards obtaining someone for the SSC working in Greenland.

### **6.4 ICES-ESSAS Cooperation**

At the 2009 ICES Annual Science Conference (ASC) in Berlin Ken Drinkwater made a short presentation on behalf of ESSAS entitled *ESSAS (Ecosystem Studies of Sub-Arctic Seas) Symposium 2011* to the Regional Seas Committee, chaired by Yvonne Walther of Sweden. The purpose was to solicit ICES support, including co-sponsorship for the ESSAS OSM to be held in Seattle. We also wrote a proposal to ICES for sponsorship of the OSM including a special volume of the ICES Journal of Marine Science. Our proposal was supported by the Regional Seas Committee and submitted by them on our behalf to the Science Committee (SciCom). SciCom supported the proposal and will provide 10,000 Euros plus a special volume of the journal. Ken Drinkwater is responsible to be the lead guest editor for the journal issue and ICES would like to have it within a year of the completion of the meeting.

In addition, the Regional Seas Committee liked what we were doing and have asked if we would be associated with them. This would include reporting our activities at the ICES ASC on an ongoing basis, which we agreed to do. Ken will make a presentation at the 2010 ICES ASC in Nantes in September. In addition, ICES suggested that our 2010 ASM be presented as an ICES/ESSAS Workshop with the terms of reference taken from our

planned agenda. This was agreed to by George Hunt and Ken Drinkwater as co-chairs and Olafur Astthorsson as local organizer. Although providing no financial support they will ask ICES members to encourage their scientists to attend the ESSAS ASM. In addition we will be required to provide ICES with a copy of the ASM report within approximately a month of the completion of the meeting.

### **6.5 ASOF-ESSAS Cooperation**

At last year's ASM a joint ESSAS-ASOF (Arctic Subarctic Ocean Fluxes) Workshop on Advection took place and was followed by a discussion of ways forward for ASOF-ESSAS Cooperation. It was suggested that the two organizations explore possible avenues of possible future collaborative research. While there was some email communication between Ken Drinkwater and ASOF scientists Tom Haine and Peter Rhines during the year, no specific plans were developed. It was suggested during this ESSAS SSC meeting that we approach ASOF to help put together a workshop at the OSM in Seattle. ACTION: Ken to follow-up with ASOF.

### **6.6 IMBER**

Following last year's SSC meeting, ESSAS joined IMBER as one of their regional programmes. IMBER, as GLOBEC had previously, will provide funds for the regional programmes for their SSC/ASM meetings. Ken Drinkwater, who is the ESSAS representative on the IMBER SSC, submitted a request on behalf of ESSAS for \$15 K for next year's SSC meeting and an additional \$15 K for the OSM. IMBER's financial situation is tentative at the present time and it is unclear exactly how much money they will be able to provide, however, they assured ESSAS that they will try their best to provide as much as possible.

IMBER will be holding their second major meeting, called an IMBIZO, in Crete in October of 2010. This will consist of three different workshops with the overall overarching theme being on Integration of Biochemistry and Food Webs: Comparison of Regional Programs. One of the workshops will focus on Regional Comparative Studies, which will be co-convened by Ken Drinkwater. He will present a poster on some of the ESSAS comparative studies and George Hunt will undertake and present talk on a comparative study of the Chukchi and Barents seas.

## **7. Working Group Reports**

### **7.1 WG1 — Regional Climate Prediction**

*Ken Drinkwater/Jim Overland*

The 2010 ASM Workshop on the Response to Climate Variability was held in large part to determine where ESSAS should go on this topic given that the original intent of WG1 regarding what models to use for downscaling for subarctic seas was completed. The workshop was organized mainly by Jim Overland, who due to health issues could not attend the meeting. The discussion centered on whether a new ESSAS working group should be formed to focus on the complex topic of ecosystem responses to climate variability. The conversion of red noise of the physical system to redder (lower frequency) noise of the biological response was felt to be of special interest. This would include the abrupt and discontinuous biological (regime) shifts and transient climatic disturbance to prolonged ecosystem recovery. While there was strong support for the

formation of a new WG on this topic, a decision on it and the nature it would take was postponed until detailed discussions with Dr. Overland could be held.

## **7.2 WG2 — Bio-physical Coupling**

*George Hunt*

ESSAS Working Group II, Biophysical Coupling, was terminated at the Seattle ESSAS SSC meeting in 2009. Nevertheless, several outstanding tasks remained to be completed. Papers on “hotspots” and on “thresholds” were underway, and there was a new request from PICES for ESSAS to take the lead on the Bering Sea Chapter of the 2010 North Pacific Ecosystem Status Report. Because of deadlines and the need to provide material in a timely fashion for synthesis across PICES areas, the completion of the Bering Sea Chapter took precedence over the other papers. The chapter was completed in the summer of 2010, and the complete report is to be distributed at the PICES Annual Meeting in Portland Oregon, this October. The “hotspots” paper is due to be completed in spring of 2011, prior to the ESSAS Open Science Meeting. It is unclear if the thresholds paper will be completed.

## **7.3 WG3 — Modelling Ecosystem Response**

*Bern Megrey*

This WG will continue with the development of the end-to-end model it has been working on. The modeling activities reported upon during the meeting were highly encouraging. Further cooperation and coordination of models and model development is needed. Comparison of ecosystem models of sub-Arctic seas is still a long term goal of the working group in order to increase our understanding the processes linking climate and fisheries to fish population responses. Bern Megrey and Kenny Rose who have been co-chairs of the WG are stepping down and will be replaced by Enrique Curchister.

## **7.4 WG4 – Climate Effects at Upper Trophic Levels**

*Earl Dawe/Franz Mueter*

### Activities During 2010

The membership of WG 4 expanded with the addition of Orio Yamamura to represent the Oyashio system as well as Mikio Moriyasu and Denis Chabot to represent the Gulf of St. Lawrence. Efforts to recruit a Russian scientist to represent the Sea of Okhotsk (or the Barents) have not been successful.

During 2010 the WG continued the acquisition of datasets from all sub-Arctic regions. These datasets consist of time series of ocean climate variables as well as fishery and survey data for gadoid fishes and crustaceans. Comprehensive datasets have been obtained for the Eastern Bering Sea/Gulf of Alaska, the Newfoundland-Labrador Shelf, Iceland, and the Sea of Okhotsk. Partial datasets have been obtained from the Barents Sea and from the Gulf of St. Lawrence.

A MSc. student (Laurinda Marcello) working under the supervision of Franz Mueter (University of Alaska Fairbanks) has conducted a literature review and a list of key references has been distributed to WG members. It is intended that this list be reviewed by all members, gaps identified, and that it be continuously expanded. Laurinda also prepared a poster on ‘The effects of gadoid fishes and the environment on snow crab recruitment’, comparing the eastern Bering Sea and Newfoundland/Labrador regions, was presented at the 2010 Western Groundfish Conference and won the best poster award. This modeling study was subsequently expanded to include the Gulf of St. Lawrence and addresses a

working group recommendation to incorporate time series of oceanographic and climate data into the analyses on gadoid-crustacean interactions. Preliminary results of this comparative study were presented at the Workshop on Gadoid-Crustacean Interactions during the 2010 Annual Science Meeting in Reykjavik.

The main focus of the WG in 2010 was to prepare for the 2010 ESSAS Annual Science Meeting in Reykjavik as well as the 2011 Open Science Meeting (OSM) in Seattle. It was decided to use the 2010 meeting as a forum for peer review of preliminary results from case studies and comparative studies. It is intended that review and discussion would identify gaps in research and lead to further expansion of comparative studies, and initiation of new studies, for the 2011 OSM.

#### WG 4 Workshop on Gadoid-Crustacean Interactions, Sept. 1, 2010

Representatives from all 6 subarctic ecosystems participated. The workshop featured an invited lecture by Julian Burgos on effects of physical and biological factors on recruitment of Bering Sea snow crab. This lecture was followed by 6 other presentations that included case studies as well as comparative studies. Some of these studies included consideration of spatial interactions, as recommended during the 2009 meeting.

#### WG 4 meeting Sept. 1, 2010

This closed half-day meeting focused on planning future activities of this WG including discussing means of acquiring further comprehensive datasets and the most appropriate methods for their analysis. Time lines for future meetings, workshops, results of analyses and publications were also discussed. Most of the discussion focused on expansion of comparative studies and possible new studies for the OSM in May 2011.

The Working Group working on gadoid-invertebrate interactions noted that comprehensive datasets are now available for all systems except West Greenland. A clear picture of the importance of bottom-up (vs. top-down) control of snow crab has recently developed, but the mechanism remains unclear, e.g. temperature vs. chlorophyll. It was therefore recommended that WG should investigate the relationship of bottom temperature at settlement with chlorophyll in affecting snow crab abundance. Also, it was noted that there have been no studies on king crabs. Factors controlling shrimp abundance are poorly understood and need to be addressed. The primary objectives of the WG should be met with the results presented at the OSM in Seattle, 2011 and a special volume of papers on Gadoid-Crustacean interactions published following the meeting. With these the WG ToR will be completed and will terminate.

The main focus for 2011 will be preparing for and conducting a half-day plenary session on Gadoid-Crustacean Interactions at the 2011 OSM. Plans are progressing well. Convenors have been established (Earl Dawe, Franz Mueter, Anne Dorte Burmeister and Olafur Palsson), and two invited speakers have agreed to provide initial reviews (Lobo Oransanz and Denis Chabot).

## **8. National Program Updates**

The following National Reports were available.

### **8.1 Canada**

*Erica Head*

Canada has no national ESSAS programme, although Canadian scientists have been involved in the international programme “NORCAN”, and in Working Group 4 “Relative effects of ocean climate variation on demersal fishes versus crustaceans”, reports of which are given elsewhere. As well, Canadian scientists carry out a series of activities on a routine basis that contribute to ESSAS goals. These include:

*Monitoring of the ecosystem in the Northwest Atlantic by scientists from the Department of Fisheries and Oceans – the Atlantic Zone Monitoring Programme (AZMP) and the Atlantic Zone Offshore Monitoring Programme (AZOMP)*

The AZMP includes running sections on the Scotian, Newfoundland and Labrador shelves 1-3 times per year to measure hydrographic, chemical and biological (lower trophic levels) variables. The same measurements are made at monthly intervals at a series of fixed stations including locations off Halifax (Stn HL2, Scotian Shelf), St John’s (Stn 27, Newfoundland Shelf) and in the Bay of Fundy and St Lawrence Estuary. In addition, survey cruises to assess macrofauna (fish and invertebrates) biomass are also routinely made 1-2 times per year. The AZOMP includes running a section across the Labrador Sea once per year and sampling in the deep western boundary current beyond the Scotian Shelf.

Canada supports the continuous plankton recorder (CPR) survey in the Northwest Atlantic as a component of the monitoring programmes. Processing of satellite data on ocean colour and sea-surface temperature is also carried out by DFO on a routine basis. Images are available on the DFO website ([http://www2.mar.dfo-mpo.gc.ca/science/ocean/ias/seawifs/seawifs\\_1.html](http://www2.mar.dfo-mpo.gc.ca/science/ocean/ias/seawifs/seawifs_1.html)).

The AZMP and AZOMP routinely report on conditions for the previous year in late March, although 2010 was the 10<sup>th</sup> anniversary for the AZMP, and the March meeting was a retrospective, synthesis meeting, which did not include the routine reporting.

In 2009-2010 data from the monitoring programmes, often using a comparative approach, were used by scientists at the Bedford Institute of Oceanography in the preparation of a large number of papers that were published in scientific journal or that are in press. Topics covered included acidification and recent deep convection in the Labrador Sea, inter-decadal changes in zooplankton annual abundances and seasonal cycles in the NW Atlantic, modelling *Calanus finmarchicus* life history at Stn HL2 and Stn 27, and regional and seasonal variations in *C. finmarchicus* mortality (See references). There were no doubt scientific papers published by scientists in other regions (e.g. Newfoundland, Quebec), but the information was not volunteered for this report.

As well, a series of comprehensive ecosystem status reports were prepared for all of the Department of Fisheries and Oceans regions, including reports for the Labrador/Newfoundland Shelf, the Scotian Shelf and the Estuary and Gulf of St Lawrence regions. These were published as Research Documents by DFO’s Canadian Science and Advisory Secretariat and are available to the general public on the DFO website (<http://www.isdm-gdsi.gc.ca/csas-sccs/applications/publications/index-eng.asp#RES>).

*Other ESSAS-relevant research initiatives*

The “Science Plan and Implementation Strategy” for the BASIN (**B**asin-scale **A**nalysis, **S**ynthesis, and **I**ntegration) programme was published in 2009 and is available on the IMBER (**I**ntegrated **M**arine **B**iogeochemistry and **E**cosystem **R**esearch) website

([http://www.imber.info/products/BASIN\\_article.pdf](http://www.imber.info/products/BASIN_article.pdf) ). Its goal is to understand and predict the impact of climate change on key species of plankton and fish, and associated ecosystems and biogeochemical dynamics in the North Atlantic Subpolar Gyre System and surrounding shelves, in order to improve ocean management and conservation. Thus, it shares some of the objectives of the ESSAS programme.

The EU is providing funding for a EURO-BASIN programme, although each participating nation must provide matching funds for its participants, and negotiations are ongoing for this part of the process. Its work-packages and brief project descriptions can be found at <http://www.us-ocb.org/archives/EUROBASINJAN51542.pdf> . Canada expects to be involved with one or more of the projects, by providing a platform for European scientists to work in the NW Atlantic during AZMP and AZOMP cruises. One project will involve carrying basin-scale comparisons of zooplankton physiological rates. In the US, the National Science Foundation will accept proposals for BASIN projects via the normal panels. Canada has participated in the preparation of one proposal to date. Canada's participation in EU and US projects will involve a minimal outlay of funds, but a significant input in terms of in-kind contribution (e.g. sampling platforms, data, and expertise).

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## **8.2 Iceland**

*Olafur Astthorsson*

Iceland's main contribution to ESSAS program is through The Ecology of the Iceland Sea Project, although Icelandic scientists are also contributing to the WG4 dealing with gadid/crustacean interactions. The more detailed aim of the project and subprojects are described in the progress reports for previous years.

Direct field activity related the Ecology of the Iceland Sea Project finished in 2008 while data of relevance to the project will be continue to be sampled in biological oceanographic cruises acoustic surveys of in the waters to the north of Iceland several times during the year. During past year main emphasis has been on data analysis and the synthesis and writing up of results from field work during 2006-2008 for presentation and publication. The 2010 annual science conference of the Marine Research Institute was devoted to the Iceland Sea Project. It was held on March 19 at Hotel Loftleidir in Reykjavik and attended by about 100 scientists, students, stake holders from the fishing industry and other laymen. At the conference 10 presentations by 16 scientists from MRI and the University of Iceland were presented. The presentations dealt with hydrography, nutrients, zooplankton, trophic interactions, capelin larvae, adult capelin, whales and modelling of migration of capelin. Also several posters related to the Iceland Sea Project were on display during the conference. A special invited lecture on Climate and Ecosystem Variability in Nordic Regions was given by Ken Drinkwater from the Institute of Marine Research in Bergen, Norway. Most of the presentations from the meeting are currently being written as papers in Icelandic and will be out later this year in the report series Hafrannsóknir (Icelandic Marine Research) published by the Marine Research Institute.

The following two presentations from the Iceland Sea Project were given at the International Polar Year Conference in Oslo in June:

Trophic interactions and energy flow within the pelagic ecosystem in the Iceland Sea. H. Petursdottir and A. Gislason

Abundance, composition and development of zooplankton in the subarctic Iceland Sea during summer in three years (2006-2008). A. Gislason, T. Silca, H. Petursdottir.

Presentations on most of the topics dealt with at the MRI conference in May will also be presented on an Iceland Sea-East Greenland session to be held at the ESSAS ASM in Reykjavik in September 2010. Further, it is the aim that several presentations from the Iceland Sea Project will be submitted for presentation at the ESSAS OSM in Seattle in May 2011.

The Icelandic work related to WG 4 has mainly focused on the interaction between 3 gadoid species (cod, haddock and saithe) and *Pandalus borealis* in Isafjord-deep, the largest fjord on the northwest peninsula of Iceland. Recently the *Pandalus* stock in the fjord has collapsed while at the same time there has been a marked increase in the three gadoid species in the fjord and also in the temperature of the fjord. The aim of the work is to try to disentangle the role of predation and environmental changes in the decline of the

*Pandalus* stock. The findings from this work will be reported at the ESSAS ASM in Reykjavik in September.

### **8.3 Japan**

*Orio Yamamura*

A presentation on “Recruitment control of Japan Pacific walleye pollock (JPP) in relation to environmental variability” was given. JPP is the most important fishery within the Japanese EEZ. Variable recruitment levels have been observed after the 1990s. However there appears to be a weak reproductive relationship, and the stock has been sustained by a few strong year classes. Now research is being done through the Dynamics of Commercial Fish Stocks (DoCoFis) project to specify factors determining recruitment of JPP, and to establish a tool help forecast future levels of recruitment. Focus has been placed on various factors covering a wide range of life history characteristics. The Generalized Additive Model (GAM) recruitment forecasting model has been developed to incorporate temperature, wind, and precipitation near the spawning ground, together with levels of predator in JPP nursery areas. The latest version of the model incorporates the Far East Monsoon Index, and accounted for 91% of the recruitment variability. This model would be useful to forecast recruitment levels, but many of the underlying mechanisms are still unknown.

### **8.4 Norway**

*Ken Drinkwater*

NESSAS (Norwegian component of the Ecosystem Studies of Sub-Arctic Seas), funded by the Research Council of Norway, completed its final year of a 4-year project involving 6 Norwegian Institutions. Its aims were to quantify and predict the impact of climate variability on the Barents Sea marine ecosystem. The research was carried out within 5 modules primarily through analysis of historical data and modeling studies.

Module 1, entitled *Global and Regional Climate Processes*, addressed the question: What are the processes linking global and regional climate variability to the physical oceanography of the Barents Sea? A major achievement within NESSAS was the development of a 50-yr database on the intensity, frequency and pathways of storms affecting the Barents Sea. Subsequent research using this database showed that the number and intensity of storms in the North Atlantic were linked to the large-scale climate indices such as the Arctic Oscillation (AO) and the North Atlantic Oscillation (NAO). A significant new finding was that Arctic storms were found to be the dominate factor controlling the interannual ice extent in the Barents Sea through wind-forced advection of ice from the Arctic. On the other hand, storms travelling over the North Atlantic affect sea ice variability at longer (decadal) time scales with more storms reducing ice cover due to melting because of increased inflow of warm Atlantic waters into the Barents Sea. Modelling studies suggested a new pathway for eastward flowing Atlantic Water traversing the Barents Sea that is 70% shorter than the more southern route and carries approximately 20-25% of the Atlantic Water that exits through the St. Anna Trough into the Arctic Ocean. The heat content of the Barents Sea is primarily governed by fluctuations in the Atlantic Water inflow with the variability in this inflow partly governed by centers of atmospheric sea level pressure anomalies, one located in the central and northern Nordic Seas and the other in the Mediterranean and North Africa.

In Module 2, entitled *Ecosystem Impacts*, the principal question being asked was: How does the variability in the ocean climate affect ecosystem processes and structure within the Barents Sea? Two important studies showed biological responses to the long-term (60-80 year) Atlantic Multidecadal Oscillation (AMO), in particular the warm period from 1920s to the 1960s including increased recruitment, growth, abundance and distributional shifts of Atlantic cod as well as distributional shifts of this species northward and eastward in the Barents Sea. Other species such as haddock, herring and capelin underwent similar range extensions within the Barents Sea and species that typically inhabited waters farther south appeared. In a follow-up study, a comparison of cod responses to the early warming with responses during the recent warm period was carried out that indicated similar responses but of lower magnitude during the later period. This was attributed to the effects of intensive fishing in the recent years that reduced the spawning stock biomass. Average primary production in the Barents Sea for the period 1979-2006 was found to be higher during recent years due to the reduction in sea-ice distribution. Investigations showed that observed high cod recruitment were associated with increases in modeled primary production in the Barents Sea. Shrimp abundance was shown to be positive correlated to ocean temperatures, which is believed to be due to temperature effects on shrimp recruitment.

Module 3, entitled *Predictions*, focused on how changes in future climate will affect the productivity and structure of the marine ecosystems in the Barents Sea. Analysis of results from the large-scale MICOM model suggests that that the Barents Sea region may not experience a strong freshening throughout the 21<sup>st</sup> century despite melting of sea ice and enhanced river input because of the build-up and poleward transport of saline waters from the tropical Atlantic. Another modeling study showed that the polar front, separating the cold Arctic waters from the warm Atlantic waters, will be pushed farther north and eastward. Further modelling suggest primary production will increase in the Barents Sea and the high Arctic, and while the zooplankton *Calanus finmarchicus* will expand farther east and north in the Barents Sea, they will not be able to establish themselves in the cold Arctic water. A model of capelin under future change using decision theory suggests that this species will likely move farther north and east in the Barents Sea with the possibility of establishing new spawning grounds on Novaya Zemlya and Svalbard. Based on past responses to warming conditions, fish productivity in the Barents Sea is expected to increase and their distributions expand northward and eastward under global warming increasing the importance of the Russian sectors of the Barents Sea to several fish species. Also under global warming, the optimum temperature for fish farming along the Norwegian coast will be displaced northwards from the northern part of West Norway towards the Helgeland coast.

Module 4, entitled *Economic Impacts*, examined some of the economic consequences of changes in fish stocks due to climate change. A game theory model was developed for blue whiting to analyze the stability of agreements among the countries exploiting this stock. Under a warming world and the possibility of blue whiting entering the Barents Sea in substantial numbers, Russia would need to become a member of the coalition of coastal states fishing blue whiting and such a coalition would be stable. That is, it would be worthwhile in terms of long-term economic returns for each of the coalition members to cooperate with one another than for any one nation to fish unrestricted on their own. In another study, climate change is expected to result in increased catches for both the offshore and inshore fleets in Norway. The offshore fleets would likely be able to take advantage of the increased distribution and abundance of several species such as cod,

saithe and haddock more so than the inshore fleet because of the former's ability to go farther afield. The inshore fleet would likely make up for their limitation in their ability to follow stocks by switching to new species moving in from the south.

In Module 5, *Comparative Analyses*, NESSAS scientists led efforts to undertake comparative studies between the Barents and Norwegian Seas through NORCAN and MENU. While these projects funded the workshops, follow-up work and writing of the papers by Norwegian researchers were largely undertaken as part of NESSAS. Comparisons with the Canadian ecosystems have revealed a major change in the atmospheric forcing since the mid-1990s. Prior to this time the temperature in the Labrador and Barents Seas were out of phase and were linked to the NAO, however, after this time the temperature variability in the two regions have been similar with both showing signs of warming. MENU studies indicate that temperatures are rising in all of the regions studied and that advection is the primary cause in the Atlantic ecosystems (Norwegian and Barents Seas and Gulf of Maine/Georges Bank), while in the Pacific ecosystems (Eastern Bering Sea and Gulf of Alaska) atmospheric heating plays an important role along with advection. The level of primary production between these regions appears to be related to the available nutrient supply in the deep waters. With the rise in temperatures, primary production in the seasonally ice covered Bering and Barents Seas has increased which is due to reduced ice cover. Increased production in the Gulf of Maine/Georges Bank region was also detected and may be related to increased nutrient supply. Zooplankton and fish data are suggestive of top-down control through predation in the Barents and Bering Sea but on Georges Bank it appears to be bottom-up driven by physical processes.

The results from NESSAS have been presented in 118 talks and 10 posters at ESSAS meetings, ICES, PICES, the World Fisheries Congress, American Geophysical Union, and numerous other meetings, workshops and conferences. NESSAS has contributed to 37 primary publications and 13 book chapters. A special session of the Arctic Frontiers Conference held in Tromsø in January of 2009 was devoted to the presentation of NESSAS results (6 presentations) and a NESSAS synthesis paper will be written and published as part of the proceedings of this conference.

NESSAR is the Norwegian IPY project which has focused on the fronts between the warm, salty Atlantic waters and the colder, fresher Arctic or Polar waters. The first 3 years included several cruises to the Norwegian Sea and the Barents Sea. In 2009 the final cruise was carried out in the Barents Sea in the autumn by the Norwegian Polar Institute under the direction of Dr. Vladimir Pavlov of the Norwegian Polar Institute. During last year the data have been processed and are being analyzed. Seven presentations were made at the Oslo IPY conference next June. With the large contingent of researchers in Oslo for the conference, we held a dinner meeting to discuss the progress in the writing of papers and where we need more information or collaboration between the scientists. It was decided that we should plan a special issue of the NESSAR results.

BarEcoRe (Barents Sea Ecosystem Resilience) is a Norwegian project that was endorsed by ESSAS in June of 2010. Its objective is to evaluate the effects of global environmental change on the future structure and resilience of the Barents Sea ecosystem. This will be studied by investigating the effects of past changes in climate and fisheries on the Barents Sea ecosystem, by developing indicators of ecosystem resilience, diversity and structure, and by forecasting the possible future states of the Barents Sea ecosystem under particular

environmental and fisheries scenarios. The Kick-off Meeting was held 15-17 June, 2010, in Tromsø. The Project PIs and the external BarEcoRe SSC members attended. Presentations were made on the plans for the project and the SSC commented on the plans and made suggestions on what they felt could be strengthened and what was missing. The last day of the meeting was for the PIs to discuss further planning and logistics.

## **8.5 USA**

*Mike Sigler/George Hunt*

ESSAS activities in the US included continuation of the BEST and BSIERP programs in the Bering Sea, the initiation of organization of the ESSAS Open Science Meeting for 2011, and the preparation and completion of a Chapter on the Bering Sea for the PICES Special Volume on North Pacific Ecosystem Status Report (NPESR).

The BEST/BSIERP program in the eastern Bering Sea is finishing its third field season. Eleven cruises were conducted in 2010. For the third year in a row, the Bering Sea was very cold which appears to have increased production of large zooplankton and gadoid fishes compared to the very warm years during 2001-2005. The next two years will be devoted to analyses and synthesis of the findings. Funding is in place for the BSIERP portion of the program, and additional funds are being sought from NSF to support analyses and synthesis in the BEST portion of the integrated program.

During the past year, progress has been made in developing the plan for the 2011 ESSAS Open Science Meeting that will be held 22-26 May in Seattle, Washington. The venue for the meeting will be the Seattle Marriott Waterfront Hotel, with a welcome reception to be held in the Seattle Aquarium on the evening 23 May. Plans are in place for 9 scientific sessions, co-convenors have been selected, and invited speakers are being identified and invitations sent. Fundraising for the meeting is progressing well.

The Bering Sea Chapter in the PICES NPESR involved contributions of 23 authors led by George Hunt. The Chapter summarized new information and time series on the status and trends for environmental elements from climate through to fish, birds, mammals and fishery catches. The chapter also has a brief synthesis section that updates our understanding of important mechanisms controlling energy flow and pollock recruitment. There were considerable contributions from BEST/BSIERP investigators and from the BASIS program.

## **8.6 West Greenland/Denmark**

*Kai Wieland*

Greenland does actually not have any projects endorsed by ESSAS. However, ecosystem studies are being conducted in Greenland waters by the Greenland Centre for Climate Research and its project partners, e.g. DTU Aqua (Technical University of Denmark, National Institute of Aquatic Resources). Attempts to engage researchers working in these studies into ESSAS activities have made first progress. Attempts in this respect will continue by sending ESSAS reports and information on future meetings to the Centre for Climate Research and the Greenland Institute of Natural Resources in Nuuk (Greenland) as well as to their partners at DTU Aqua in Charlottenlund and Hirtshals (Denmark).

## **9. Multi-National Program Updates**

### **9.1 ESSAR- IPY Consortium**

*Ken Drinkwater*

ESSAR (Ecosystem Studies of Subarctic and Arctic Regions) is the International Polar Year (IPY) Consortium led by ESSAS. The specific ESSAS projects within ESSAR include BEST/BISERP, the Iceland Sea Ecosystem programme and the Norwegian component of ESSAR, called NESSAR. During the past year analysis of the IPY data collected by ESSAR projects was carried out. The ESSAR consortium was encouraged to present their findings at the IPY Conference in June and of the 10 ESSAR projects, 6 were presented in Oslo, totaling around 15 presentations. In addition, one of the ESSAS OSM Sessions in Seattle in 2011 will be on results from IPY and all of the ESSAR projects are being encouraged to participate.

### **9.2 USA/Norway (MENU/CAMEO)**

*Bern Megrey/Ken Drinkwater*

The 5 papers from the initial MENU (Marine Ecosystem Comparisons of Norway and the United States) Project reported last year as on line were published in paper form as part of a MENU led special issue of Progress in Oceanography in late 2009.

Although the US proposal for funding continuation of the MENU work under CAMEO was not successful, they managed to obtain money from the CAMEO program to hold a workshop on stock production modelling. Thus, an international workshop was held on 10–14 May 2010, in Woods Hole, MA, USA. Scientists from Norway, US and Canada compiled the data required to develop stock production models at different hierarchical levels (e.g. species, guild, and ecosystem) for many of the major Northern Hemisphere marine ecosystems that have supported notable fisheries. Analyses focused on comparable total system biomass production, functionally equivalent species production, or simulation studies for 11 different marine fishery ecosystems. Workshop activities also led to new analytical tools. Preliminary results suggested common patterns driving overall fisheries production in these ecosystems, but also highlighted variation in the relative importance of each among ecosystems. A paper on the workshop was published in Biological Letters. A second workshop is scheduled for the spring of 2011 to continue the work begun at the first workshop.

The MENUII proposal, which was funded by the Norwegian Research Council, besides contributing to the Stock Production Workshop, has been comparing ecosystems across the North Atlantic through modelling of larval cod responses to temperature variability. In addition, it is beginning to develop the ATLANTIS model for the Barents and Norwegian Seas. Cecilie Hansen, a post-doc, has been hired and has been working since June. She has been discussing the model with Jason Link from the US where he led a team that built an ATLANTIS model for Georges Bank and the Gulf of Maine.

### **9.3 Canada/Norway (NORCAN)**

*Ken Drinkwater/Erica Head*

NORCAN (Norway-Canada Comparative Studies of Marine Ecosystems) has been comparing several components of the Norwegian/Barents Seas and Labrador Sea and Newfoundland/Labrador shelf ecosystems. Physical oceanographic studies confirmed the previously reported out-of-phase relationships of air and sea temperatures and sea ice conditions between the two regions because of their opposite response to the variability in

the large scale atmospheric pressure patterns as reflected in the North Atlantic Oscillation (NAO) index. An important finding is that since the mid-1990s the ocean conditions in both regions have been in phase, generally showing strong warming and resulting in reduced ice levels, a result of changes in the spatial structure of the atmospheric pressure patterns and a lessening of the importance of the NAO forcing. Observations and modeling of phytoplankton production during this warming period suggest that the timing of the spring bloom and peak seasonal productivity are occurring progressively earlier in the year, particularly at high latitudes in both regions. Zooplankton studies comparing the life history characteristics of the dominant copepod species, *Calanus finmarchicus*, found lower temperatures in the Labrador Sea lead to slower physiological rates and to changes in the timing of life-history events, although standing stocks appear to be similar. Capelin (*Mallotus villosus*) is a forage fish that has undergone large distributional shifts in the two regions, as well as off Iceland, during the past 2 decades. No common cause or timing of the observed shifts were found although they have been suspected to be through a combination of variability in physical oceanographic conditions, capelin abundance or food supply, with the regional importance of each of the factors varying. Factors influencing capelin recruitment also varied with region, with predation by herring appearing to be the dominant process in the Barents Sea and environmental factors in the Newfoundland region. Diet may also play a role, given that diet weight was significantly lower in capelin off Newfoundland compared to the Barents Sea suggesting poorer feeding conditions for the Newfoundland capelin in recent years. Finally, the reasons for the differences between the remaining collapsed state of the cod (*Gadus morhua*) off Newfoundland and high abundances of cod in the Barents Sea were investigated. In the former, poor environmental conditions and decline of the capelin stock combined with escalating fishing mortality lead to the cod collapse off Newfoundland that has yet to recover. In the Barents Sea, at a time of minimum cod abundance in the 1980s, a reduction in fishing pressure coupled with improving environmental conditions helped the stock to rebuild. The results from the NORCAN series of studies will appear in special volume of Progress in Oceanography in the near future.

#### **9.4 Trophic Interactions in the Arctic (TrophArct)**

*George Hunt/Ken Drinkwater*

TrophArct is an ESSAS endorsed project that consists of Norwegian, Canadian, US and French scientists and is led by Nils Christian Stenseth at the University of Oslo in Norway. The aim is undertake comparative analysis of how climate variability and change, and biological interactions affect the spatial and temporal match-mismatch relationships in sub-Arctic marine ecosystems. TROPHARCT held its first meeting in Oslo on 9-10 November, 2009, to discuss potential comparative papers. It was decided to explore the following five hypotheses.

- The change of the age structure of the populations affects the population's susceptibility to climate.
- The loss of population structure affects the population's susceptibility to climate (e.g. the collapse of sub-stocks/spawning aggregations leads to a decline in the stock.
- Does cannibalism and/or predation “move” the critical stage in the life history?
- Warming leads to dominance of small/short lived and fast growing individuals of the same or different species.
- Exploitation of prey fish affects recruitment and/or population growth rate via maternal effects?

A second meeting to discuss progress and to present first drafts of the papers on each of the topics is scheduled for the spring of 2011.

## **10. Other Business**

### ***10.1 Early ASM Abstract Submission***

Margaret noted that only 13 out of 35 ASM speakers responded to her requests for submission of their 2010 abstracts prior to the meeting. It is strongly recommended that speakers respond to Margaret's requests as it will significantly speed up the writing of the ASM report.

## **11. Next Year's Meeting**

The 2011 ESSAS SSC meeting will be held on Friday, May 27, and a half day on Saturday, May 28, at the Marriott Waterfront Hotel in Seattle, following the ESSAS OSM.

ACTION: Ken and Margaret will draft an agenda for the meeting and Margaret will circulate it for comments and amendment before finalizing.

Yasunori Sakurai offered to host the 2012 Annual Science Meeting in either Hakodate or Hiroshima, Japan. This offer was kindly accepted, with details of when and where to be discussed and finalized during next year's meeting.

## Appendix 1 - Contact Information of Participants

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## Appendix 2 – ESSAS 2010 SSC Meeting Agenda

### ESSAS

Scientific Steering Committee  
2010 Annual Meeting

Marine Research Institute  
Reykjavik, Iceland

#### Thursday September 3, 2010

09:00	Introduction and Adoption of the Agenda	George Hunt/Ken Drinkwater
09:10	Adoption of 2009 Meeting Report	Margaret McBride
09:20	Follow-up from 2009 Meeting	Margaret McBride
	<ul style="list-style-type: none"><li>• Did speakers get their 2010 abstracts in on time?</li><li>• Website – comments, suggestions, what is needed</li></ul>	
09:40	Emerging Issues	
	<ul style="list-style-type: none"><li>• 2011 ESSAS Open Science Symposium</li></ul>	George Hunt.
	<ul style="list-style-type: none"><li>➢ Program</li><li>➢ Budget</li><li>➢ Co-conveners</li><li>➢ Invited speakers</li><li>➢ Other activities</li></ul>	
	<ul style="list-style-type: none"><li>• Funding</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>➢ Funding from IMBER</li><li>➢ Funding from NSF</li><li>➢ Funding from Research Council of Norway including IPO</li><li>➢ Proposal to Nordic Council</li></ul>	
	<ul style="list-style-type: none"><li>• SSC Membership</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>➢ Rotations Off &amp; On</li><li>➢ Representation from Russia, Korea, and Greenland</li></ul>	
	<ul style="list-style-type: none"><li>• New Programs</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>➢ Something in the Okhotsk?</li><li>➢ New Initiatives?</li></ul>	
	<ul style="list-style-type: none"><li>• Collaboration with Other Groups</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>➢ ICES, PICES, IMBER</li></ul>	
	<ul style="list-style-type: none"><li>• How can we be more effective?</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>• ESSAS 2012 ASM</li></ul>	Open Discussion
	<ul style="list-style-type: none"><li>➢ Where?</li><li>➢ When?</li><li>➢ What should be the focus?</li></ul>	
12:30	<b>Lunch</b>	
13:30	Working Group Reports	
	<ul style="list-style-type: none"><li>• Working Group 1</li><li>• Working Group 2</li><li>• Working Group 3</li><li>• Working Group 4</li></ul>	Jim Overland George Hunt Bernard Megrey Franz Mueter / Earl Dawe
14:30	New Working Groups	Open Discussion

15:00 **Break**

15:30 National Program Updates

- Korea
- Japan/J-ESSAS
- USA/BEST-BSIERP
- Canada
- West Greenland
- Iceland/ISE
- Norway/ N-ESSAR, BarEcoRe,

Hyung-Cheol Shin  
Orio Yamamura  
Mike Sigler  
Erica Head  
Kai Wieland  
Olafur Astthorsson  
Ken Drinkwater

**Friday September 4, 2010**

09:00 International Program Updates

- Russia/Japan in the Sea of Okhotsk
- Canada/Norway in North Atlantic (NORCAN)
- USA/Norway in multiple areas (MENU&MENUII)
- TROPHARC

Orio Yamamura  
Erica Head/Ken  
Megrey/Drinkwater  
Drinkwater/Hunt

**12:00 Lunch**

13:00: Other Business

**15:00 Adjourn**