ANNEX 1. REPORT OF SCIENTIFIC COUNCIL SPECIAL SESSION "*ENVIRONMENTAL AND ECOSYSTEM HISTORIES IN THE NORTHWEST ATLANTIC – WHAT INFLUENCES LIVING MARINE RESOURCES*"

The Symposium on was held in Holiday Inn Harbourview in Dartmouth, Nova Scotia during 13-15 September 2006. The purpose of this Symposium was to better understand the ecosystems in the Northwest Atlantic and what influences them. The co-convenors were: W. Brodie (Canada), Jason Link (USA), Helle Siegstad (Denmark/Greenland), and Manfred Stein (EU-Germany).

The Vice-Chair of Scientific Council opened the meeting by welcoming participants and explaining the role of Scientific Council. The Vice-Chair also introduced the work plan and objectives. Co-convenor Bill Brodie also welcomed participants and gave a brief overview of logistics and meeting arrangements.

Three theme sessions were held: 1) Climatic, Physical and Biological Factors Affecting NW Atlantic Ecosystems; 2) Dynamics of NW Atlantic Ecosystems (including a mini-session on capelin); and 3) Comparison of Ecosystems, and Social and Economic Consequences of Changes in the NW Atlantic. Summaries of each session, as well as the overall discussion, are contained below. A total of XX people from XX countries attended, and 26 papers were presented orally, and 6 as posters. Presenters were invited to submit their papers for publication, by 31 October 2006, in a special issue of the *Journal of Northwest Atlantic Fisheries Science* (scheduled print date December 2007).

SESSION 1: CLIMATIC, PHYSICAL AND BIOLOGICAL FACTORS AFFECTING NW ATLANTIC ECOSYSTEMS

Session Chair: M. Stein

Ten lectures were given in Session 1. After a presentation on climate change impacts on NW Atlantic storm, wind and wave estimates, the second contribution dealt with a comparison of two large marine systems, the Northwest Atlantic and the Barents and Nordic Seas. This was followed by a presentation on remote forcing of marine ecosystem dynamics in the Gulf of Maine. Impacts of hydrographic fronts on the variation of abundance in some commercial stocks were considered in the fourth contribution of Session 1. A lecture on warming periods off Greenland during 1800-2005 and their possible influences on the abundance of cod and haddock was presented thereafter.

The afternoon lectures started with two presentations on phytoplankton in the Labrador Sea and on the Northwest Atlantic continental shelf, followed by a presentation on variations in over-wintering depth distributions of *Calanus finmarchicus* in the slope waters of the NW Atlantic continental shelf and the Labrador Sea.

A pan-North Atlantic wide study on the influence of the spring phytoplankton bloom on the life history and population dynamics of shrimp (Pandalus borealis), and a lecture on a near-universal metric for displaying the growth of fishes, formed the end of the afternoon oral presentations.

After the session discussion, six posters were presented in the lobby area.

SESSION 2 – DYNAMICS OF NW ATLANTIC ECOSYSTEMS - OVERVIEW/SUMMARY

Chair: W. B. Brodie

Six presentations were made in the first part of Session 2. Energy modeling of George's Bank noted that despite changes to this ecosystem, many fundamental features of the ecological network have remained remarkably consistent. A paper examining the effects of fishing exclusion on groundfish in the western Gulf of Maine revealed few differences in biodiversity, abundance, biomass or size distribution in areas inside and immediately outside the closed area, although sample sizes were small. At West Greenland, stock size indices for shrimp and cod do not indicate significant negative correlations, suggesting that bottom-up mechanisms in the ecosystem may have been

responsible for increased shrimp abundance, rather than a release from cod predation. Another study of the West Greenland groundfish assemblages concluded that climate, ocean productivity, and fisheries are the main structuring forces in the groundfish assemblage. A study of the fish community in NAFO Divisions 2J3KLNO noted that major changes in this ecosystem occurred in the last 30 years, and that collapses of main commercial species were accompanied, and sometimes preceded by, collapses in non-commercial species, noticeably large demersals. A presentation on marine sponge and coral by-catch in the NW Atlantic noted that the trend toward fishing deeper resulted in increased sponge by-catch, and that some of these species take decades to form large scale patches.

In the discussion, the similarities of cod and shrimp dynamics in the west Greenland and Newfoundland/Labrador areas was noted. However, this cod/shrimp switch did not appear to occur in the more southern areas. Other discussion focused on ecsosytem dynamics, primarily on George's Bank, and how they may have changed over time.

MINI-SESSION ON CAPELIN (PART OF SESSION 2)

Chair: H. Siegstad

At this session six different subjects related to capelin were presented. The first presentation showed preliminary results from a combined survey for capelin, polar cod, krill, marine mammals and birds over the West Greenland plateau from 73°N to about 60°N, including some fjords. The survey represents a first attempt to apply an "ecosystem approach" to pelagic survey work in Greenland waters. The next presentation discussed several reasons why capelin didn't have spawning success on Flemish Cap.

Biology and behaviour of capelin in Atlantic Canada have changed dramatically in recent years, and a collaborative, multidisciplinary initiative among university, government and commercial fishermen has investigated bio-physical mechanisms to understand reasons for the observed changes. The group presented one poster and four talks: 1) Acoustic seabed mapping for identification on capelin spawning sites. 2) Comparison between two reproductive tactics 3) Seabirds as sensitive indicators of large capelin density. 4) A models assessing the consequences of density shifts for top predators.

The symposium participants had a general discussion on the role of capelin in the Northwest Atlantic ecosystem. The discussion included the role as the energy transfer: preying on invertebrates and in turn being preyed on by most large predators, including cod, seals, whales and birds. All changes in capelin biomass and distribution will have serious effects on the ecosystem – most pronounced in northern regions. The basis of the observed changes in capelin and climates is still not well understood and every piece of new information is therefore of great importance.

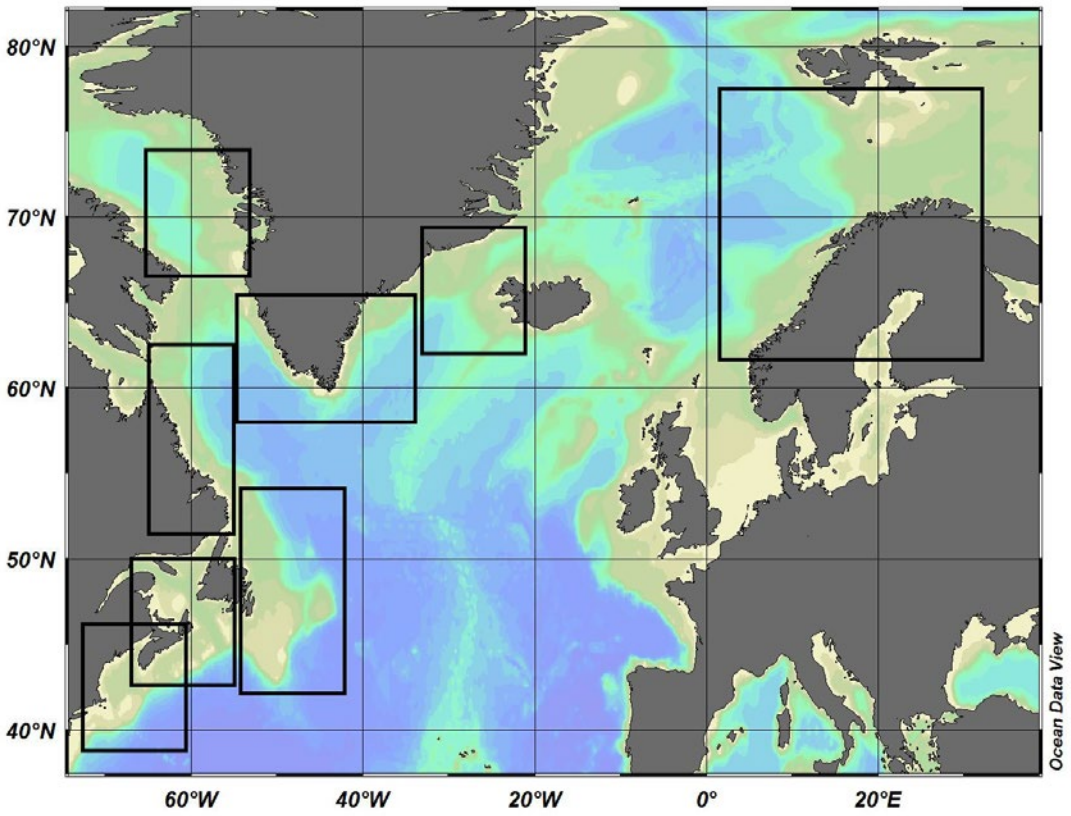
SESSION 3: COMPARISON OF ECOSYSTEMS, AND SOCIAL AND ECONOMIC CONSEQUENCES OF CHANGES IN THE NW ATLANTIC ECOSYSTEMS

Chair: Jason Link

A key talk in this session noted latitudinal gradients among North Atlantic ecosystems. All have both bottom-up and top-down processes operating, but some apparently are dominated more by one or another. Key considerations were temperature (as influencing vital rates) and food web complexity. The session discussion highlighted that there may be more to the story than solely species interactions, with some influence of environmental processes also worth examining. One recommendation would be to explore a multi-variate approach that simultaneously examines a wide range of processes as they might influence the major biological groups.

Other talks in the session emphasized socio-economic considerations, particularly landing time series from a wide range of NAFO areas and countries. The discussion noted that a systems, or operations research, approach is useful. Additionally, it was noted that some further consideration might be given to combining the fleet dynamics and fishing community dynamics with the standard biological trophic levels (PP, ZP, Forage Fish, Larger Fish) as additional trophic levels, all as part of the same model system.

Another talk noted the importance of data and databases as the basis for fisheries science and management. The discussion then led to a suggestion that as one way forward for EAF, we begin to incorporate a broad range of ecosystem considerations into standard single species assessments (e.g., more delineated natural mortality terms in a VPA, environmental factors in a stock-recruitment model, etc.).



Dynamic History and Simple Description of Changes in Major Feautres of NW Atlantic Ecosystems

+, -, 0, ?, N/A, ~	Time scale	[current trend (1995-2005)] present state of anomaly						
	Barents Sea	E Greenland-W Iceland	S Greenland	W Greenland	Labrador	could be split- N & S Grand Banks- Flemish Cap	could be split- E & W Scotian Shelf (GSL Later)	Gulf of Maine-Georges Bank
Meterology & Climate	+	+	+	+	+	+	+	+
Ice Cover	0	-	-	-	-	-	N/A	N/A
Water Masses (T & S)	+	+	+	+	+	+	?/+	0/+
PP	?	0/?	0/?	0/?	?/+	?/+	?/+	0
ZP	?	0	0	0	?	?	?	+
Other Benthos	?	?	?	?	?	?	?	0
Commercial Benthos	?	-	?	?	+/?	?	+	+
Shrimp	?	0	-	+	+	+	+	0
Demersal Fish	?	-	-	-	-	-	-	-
Pelagic Fish	?	?	?	?	?	?/-	+	+
Seals	?	++	+	+	+	++	+	0
Birds	?	?	?	?	?	0	0	?
Total Landings	?	0	0	+	0	-	-	-
Total Value of Landings	?	?	0	0	?	-	+	+
Y or N								
Capelin		Y	Y	Y	Y	Y	N	N
Cod-Shrimp switch		Y	Y	Y	Y	Y	Y & N	N
Major Fishery targets		Shrimp, Gr Halibut, Pelagics (HMS)	Shrimp, Seals, Gr Halibut, Pelagics (HMS)	Shrimp, Seals, Gr Halibut, Pelagics (HMS)	Shrimp, Seals, Gr Halibut, Redfish, Snow Crab	Shrimp, Seals, Gr Halibut, Redfish, YT, Skates, Snow Crab, Capelin, Lobster	Snow Crab, Shrimp, Lobster, Haddock, Cod, Scallops, Small Pelagics	Scallops, Lobster, Flatfishes, Goosefish, Squids
Degree of influence on PP by physic	Y	Y	Y	Y	Y, ++	Y, moderate	Y	Mild
Scale of longer time series- comparison with historical time s (have we seen it before)		Y	Y	Y	N	Y	Y	Y

SYMPOSIUM SCHEDULE

"*Environmental and Ecosystem Histories in the Northwest Atlantic – What Influences Living Marine Resources?*"
13-15 September 2006
Holiday Inn Harbourview (Alderney Room)

Wednesday, 13 September 2006

0845-0915 Registration

0915-0930 Introduction (Scientific Council Chair, Convenors)

SESSION 1. *CLIMATIC, PHYSICAL AND BIOLOGICAL FACTORS AFFECTING NW ATLANTIC ECOSYSTEMS*

0930-1000 PERRIE, W. J. JIANG, Z. LONG, Y. YAO, W. ZHANG, and B. TOULANY. Climate change impacts on NW Atlantic storm, wind and wave estimates.

1000-1030 COLBOURNE, E. B., H. LOENG, K. F. DRINKWATER, and V. OZHIGIN. Ocean climate variability - comparisons of the Northwest Atlantic to the Barents and Nordic Seas.

1030-1100 **Break**

1100-1130 PERSHING, A. Remote forcing of marine ecosystem dynamics in the Gulf of Maine.

1130-1200 SIGAEV, I. K. Interannual variations of hydrological fronts in Northwest Atlantic and tendencies in the year-class abundance of some commercial stocks.

1200-1230 STEIN, M. Warming periods off Greenland during the 19th, 20th and 21st century – Their potential influence on the abundance of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) in Greenlandic waters.

1230-1330 **Lunch**

1330-1400 HARRISON, W. G. Phytoplankton growth and regulation in the Labrador Sea – light and nutrient limitation.

1400-1430 LI, W. K. W. Multiyear change in the phytoplankton community of the Northwest Atlantic continental shelf and the Labrador Sea.

1430-1500 HEAD, E. J. H. Variations in over wintering depth distributions of *Calanus finmarchicus* in the slope waters of the NW Atlantic continental shelf and the Labrador Sea.

1500-1530 **Break**

1530-1600 FUENTES-YACO, C., P. KOELLER, K. WIELAND, U. SKULADOTTIR, M. ASCHAN, T. PLATT, and S. SATHYENDRANATH. Influence of the spring phytoplankton bloom on the life history and population dynamics of shrimp (*Pandalus borealis*) in the North Atlantic.

1600-1630 NEUHEIMER, A. B., and C. T. TAGGART. Growth in fishes – a near-universal metric.

1630-1715 **Session Discussion**

1715-1745 **POSTER PRESENTATIONS**

- ✓ WWF-CANADA. Toward ecosystem-based fisheries management in the NAFO Regulatory Area.
- ✓ CORKETT, C. J. Why an ecosystem approach is the wrong paradigm for the next stage of fisheries management.
- ✓ DAVOREN, G. K., P. PENTON, C. MAY, B. REINFORT, N. RECORD, B. DEYOUNG, C. BURKE, W. A. MONTEVECCHI, D. ANDREWS, A. BUREN, M. KOEN-ALONSO, J. T. ANDERSON, C. ROSE-TAYLOR, T. BELL, and S. GARTHE. The importance of capelin (*Mallotus villosus*) in the Northwest Atlantic.

- ✓ GARCIA ORELLAN, R. Bound for the Banks of Newfoundland.
- ✓ HEAVEN, C., L. ECKERSLEY, and R. SCROSATI. Rocky intertidal community structure across gradients of elevation, wave exposure, and ice scour in northern Nova Scotia.
- ✓ BARRETT, R. T., G. CHAPDELAINE, T. ANKER-NILSSEN, A. MOSBECH, W. A. MONTEVECCHI· J. REID, and R. R. VEIT. Seabird numbers and prey consumption in the North Atlantic.

1800 **Reception/Poster Display**

Thursday, 14 September 2006

SESSION 2. *DYNAMICS OF NW ATLANTIC ECOSYSTEMS*

0900-0930 LINK, J., W. OVERHOLTZ, J. O'REILLY, J. GREEN, D. DOW, D. PALKA, C. LEGAULT, J. VITALIANO, V. GUIDA, M. FOGARTY, and J. BRODZIAK. Comparisons of the Georges Bank Ecological Network: EMAX in historical context.

0930-1000 WIELAND, K., M. STORR-PAULSEN, and K. SÜNKSEN. Recent changes in the effect of predators on stock size and recruitment of Northern shrimp (*Pandalus borealis*) in West Greenland waters.

1000-1030 FOCK, H. O. Long-term trends in Greenland groundfish assemblages: Interplay of climate, ocean productivity and fisheries.

1030-1100 **Break**

1100-1130 BLINKOFF, K., L. KAUFMAN, R. BROWN, and J. LINK. The effects of fishing exclusion on the groundfish community in the Western Gulf of Maine.

1130-1200 KOEN-ALONSO, M., F. MOWBRAY, and G. LILLY. Changes in the fish community of the Newfoundland Shelf (NAFO Divisions 2J3KLNO) in the period 1981-2005: signals and trends from the Canadian multi-species bottom trawl survey.

1200-1230 FULLER, S., and R. MYERS. Marine sponge bycatch in the Northwest Atlantic.

1230-1330 **Lunch**

1330-1400 **Session Discussion**

1400-1430 BERGSTRØM, B., H. VILHJALMARSSON, K. WIELAND, S. JONSSON, M. SIMON, M. P. HEIDE-JØRGENSEN, and J. NYELAND. Results from a combined survey for capelin, polar cod, krill, marine mammals and birds off West Greenland.

1430-1500 BOROVKOV, V. A., A. L. KARSAKOV, and N. G. USHAKOV. Nature's experiments on capelin introduction on Flemish Cap – what are the reasons of failure?

Friday, 15 September 2006

0900-0930 ROSE-TAYLOR, C., J. T. ANDERSON, and T. BELL. Characterization and acoustic classification of demersal capelin spawning habitats in coastal northeast Newfoundland.

0930-1000 PENTON, P., and G. DAVOREN. Capelin (*Mallotus villosus*) spawning biology on the Northeast coast of Newfoundland: a comparison between two reproductive tactics.

1000-1030 BURKE, C. M., W. A. MONTEVECCHI, J. T. ANDERSON, and M. KOEN-ALONSO. Specialist (common murre *Uria aalge*) and generalist (Atlantic puffin *Fratercula arctica*) avian predators and forage fish availability.

1030-1100 **Break**

1100-1130 BUREN, A. D. M. KOEN-ALONSO, W. A. MONTEVECCHI, J. T. ANDERSON, B. DEYOUNG, and G. K. DAVOREN. Modeling the link between prey availability and diet: common murre (*Uria aalge*) and capelin (*Mallotus villosus*) interaction during the breeding season around Funk Island.

1130-1200 **Session Discussion**

1200-1300 **Lunch**

SESSION 3. *COMPARISON OF ECOSYSTEMS, AND SOCIAL AND ECONOMIC CONSEQUENCES OF CHANGES IN THE NW ATLANTIC ECOSYSTEMS*

1300-1330 SHACKELL, N. (on behalf of K. Frank - Invited Paper). Comparative analysis of continental shelf ecosystems in the Northwest Atlantic.

1330-1400 LANE, D. Fishing in the NAFO Regulatory Area: integrated modeling of resources, social impacts and fleet. Viability

1400-1430 MOTTE H., and R. GARCIA-ORELLAN. Needs of changes on the Grand Banks Fisheries Organization, a drastic change of life for Western Maritime Europe and Eastern Canada.

1430-1500 **Break**

1500-1530 BRANTON, R. M., D. RICARD, L. BAJONA, and L. VAN GUELPEN. Methods for standardizing, validating and enriching taxonomic metadata.

1530-1600 **Session Discussion**

1600-1630 **Overall Discussion/Close**

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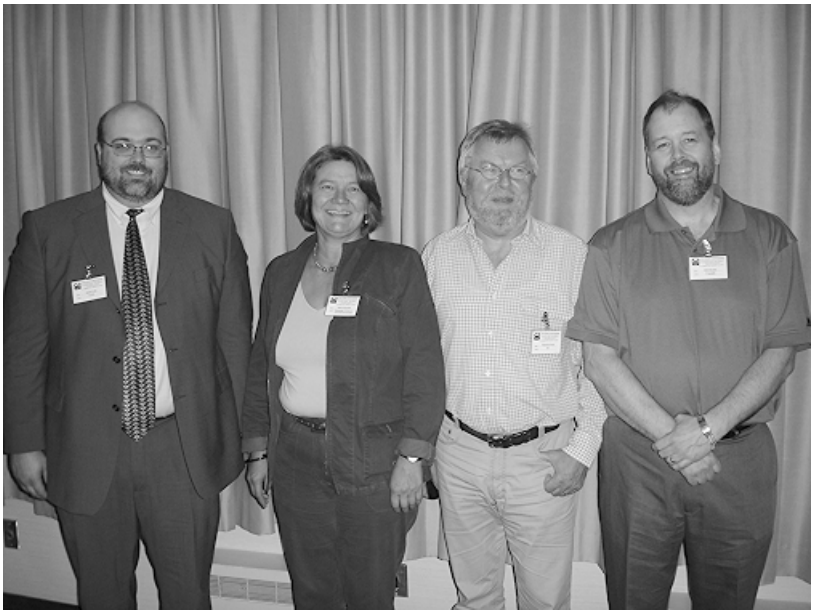
NAFO Symposium – Participants



Symposium Conveners: Jason Link (USA), Helle Siegstad (Greenland), Manfred Stein (Germany) and William (Bill) Brodie (Canada)

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