

REPORT OF CFAME TASK TEAM

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The Climate Forcing and Marine Ecosystems Task Team (hereafter CFAME) met from 8:30-17:00 hours on October 2, 2005. Attending were 8 Task Team members and 8 observers (*CFAME Endnote 1*). Dr. George L. Hunt, Jr. was appointed as a new US member since the first CFAME workshop (May 14-15, 2005, Victoria, Canada). The agenda was reviewed and adopted with minor modifications (*CFAME Endnote 2*).

Follow-up of the May 2005 CFAME Workshop (Agenda Items 2a-2c)

Dr. Kerim Y. Aydin reviewed the summary of the first CFAME Workshop published by the Co-Chairmen in PICES Press (Vol. 13, No. 2). At this workshop, several speakers provided background material on some conceptual models, climate linkages and trophic level interactions. The workshop outlined the terms of reference for CFAME, and a general 2-year workplan, with initial work to begin with a workshop in January 2006. Terms of reference were developed under three key themes related to specific action items within the workplan:

- Mechanisms:
 - Hold a workshop in January 2006, on conceptual/regional models, with a specific goal of providing developed mechanisms for the PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” (April 19-21, 2006, Honolulu, U.S.A.);
- Ecosystems:
 - Hold a workshop prior to PICES XV (October 2006, Yokohama, Japan), on changes in ecosystem structure in response to climate forcing, in preparation for a 2007 joint POC/CFAME scenario exploration workshop (next bullet);
- Scenarios:
 - Hold an inter-sessional joint POC/CFAME Workshop in 2007 for climate modelers to provide regional indicators identified at the

January 2006 workshop, and for CFAME to apply climate output to developed conceptual models.

Dr. Akihiko Yatsu provided an update on efforts to obtain information on the target species (pollock, sardine, herring, pink and chum salmon) that includes data on biomass, catch and surplus production, recruitment indices, and reproductive success. Since many of these indices are difficult to measure, a simpler index of surplus production [biomass (year) – biomass (year-1) + catch (year-1)] was proposed.

There is general concern that for many species or stocks there are no biomass, recruitment or spawner data. Other possibilities need to be explored, for example, a standardized year-class index or relative abundance indices (*e.g.*, catch per unit effort - CPUE), or alternatively to expand the species list so that species are included for which biomass, recruitment or spawner data might be available. Periodic strategists (*e.g.*, long-lived demersal species) and equilibrium strategists (*e.g.*, elasmobranchs or long-lived very low fecundity species) are currently missing from the list of target species. There was general agreement that three data types should be collated for target species (or target-like species):

- Catch
- Biomass or relative abundance (*e.g.*, survey CPUE)
- Recruitment or relative year-class strength (*e.g.*, juvenile CPUE).

The Task Team expanded the list of species to encompass sablefish and halibut (periodic strategists) and dogfish (equilibrium strategists), and identified CFAME members to provide the three types of data for their regions (*CFAME Endnote 3*). Members are at liberty to collate or report data by region, and are also requested to provide any published literature that might identify specific mechanisms of production variability. Members are also asked to provide a

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basis for developing a conceptual model for each species (and region) for which they are reporting data. This will require an identification and provision of regional climate/ocean drivers. Applications of these data will be the eventual development of conceptual mechanisms of climate forcing on species population dynamics (abundance and recruitment success).

A follow-up to the January 2006 CFAME Workshop will be the identification of basin-wide and regional-scale climate variables that are driving forces for biological responses.

Definition of carrying capacity (Agenda Item 2d)

The 1996 definition of carrying capacity is a general term for production limits (K), where K represents an equilibrium state. In 2005, production levels can vary with climate regimes, moderated by life histories, where K has multiple equilibrium states. In reality, ecosystems are never in an equilibrium state but they achieve *relatively* stable states. Changes in equilibrium state might include not only a change in traditional K (production limits) but also in production rates (marine survival, larval survival, functional relationship between S and R), and therefore response time in population (abundance). Are structural/life history descriptions of regime response more robust, more comparative?

In anticipation of the January 2006 CFAME Workshop and the April 2006 PICES/GLOBEC Symposium, Dr. Kerim Aydin proposed to produce a paper that describes the rates of change between K s and implications for long-term production, citing some specific mechanistic examples (life-history specifics) and some ecosystem-level implications, and focuses on answering questions posed during the breakout session on ecosystem response at the 1998 CCC Workshop on “*Development of cooperative research in coastal regions of the North Pacific*” (PICES Scientific Report No. 9, 1998), and to circulate a draft in January 2006. Dr. Aydin will take the lead on the development of a paper, with indication from Drs. George L. Hunt, Jacquelynne R. King and Akihiko Yatsu,

and Gordon A. McFarlane that they will provide assistance.

Preparation for the January 2006 CFAME Workshop (Agenda Item 3)

A CFAME Workshop is proposed for January 2006 (*CFAME Endnote 4*). At the May 2005 CFAME Workshop, a representative from China suggested his country as a suitable location for the January workshop, since the previous meeting was in Canada, and China is close to the Yellow Sea, which is one of the focus areas of the Task Team. However, no Chinese members of CFAME attended PICES XIV to discuss this possibility, so Japan was selected as an alternate host in the western Pacific. The workshop will take place during the week of January 10-14, 2006 (exact days to be set to accommodate various members' schedules), at the University of Tokyo. Instead of 3 days, an intensive 2-day workshop was suggested. The three ecosystems to focus on at that workshop will be:

- Sea of Okhotsk (lead by Drs. Igor Volvenko and/or Victor Lapko)
- California Current System (lead by Drs. Vera Agostini and Gordon A. McFarlane)
- East China/Yellow Sea (lead by Dr. Hyung-Ku Kang; contact Dr. Qisheng Tang for input).

The Task Team discussed the option of focusing on the Oyashio/Kuroshio region rather than the East China/Yellow Sea. The latter was selected to be of greater interest to China, but so far it has been difficult to receive any input from Chinese members (Dr. Qisheng Tang might be a suitable invited speaker to address this issue). It was suggested that the Kuroshio/Oyashio region will have more evidence of climate impacts and might serve as a focus of the Task Team.

Various CFAME members were assigned to be lead-presenters for each ecosystem, for providing overviews of dominant species and how they have changed over time, some basis on relevant physical variables and other trophic levels. The workshop must also begin to include other trophic levels (aside from fish) in the consideration of ecosystem changes and development of these mechanistic models. As

with target fish species, time series on the abundance of other trophic levels will need to be compared (*e.g.*, include jellyfish; euphausiids). Lead-presenters are asked to draw on relevant discussion of other trophic levels and dynamics.

CFAME contributions to the 2006 CCCC Symposium (Agenda Item 4)

It was agreed that the following products from the January 2006 CFAME Workshop will be presented at the PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” (April 19-21, 2006, Honolulu, U.S.A.):

- Mechanistic model comparison (Dr. Akihiko Yatsu to prepare an abstract);
- Ecosystem (food-web structure) comparison (Dr. Jacquelynne R. King to prepare an abstract);
- Carrying Capacity definition (Dr. Kerim Y. Aydin to prepare an abstract).

Topic Session for PICES XV (Agenda Item 5)

CFAME proposes, jointly with MODEL and FIS, a 1-day Topic Session on “*Key recruitment processes and life history strategies: Bridging the temporal and spatial gap between models and data*” (CFAME Endnote 5).

Travel requests/priorities for 2006 (Agenda Item 6)

CFAME requests support for (in the order of priority):

- 2 scientists (Dr. Qisheng Tang of China and Dr. Victor Lapko of Russia are suggested) to attend the January 2006 CFAME Workshop to ensure participation by China and Russia, particularly since the Yellow Sea and the Sea of Okhotsk are two (of only 3) ecosystems selected for the discussion at the workshop;
- 1 invited speaker for the CCCC/FIS Topic Session on “*Key recruitment processes and life history strategies: Bridging the temporal and spatial gap between models and data*” at PICES XV;
- 1 PICES representative to attend a possible ESSAS/PICES Workshop in St. Petersburg,

Russia discussed under Agenda Item 8, below.

Future PICES integrative scientific program (Agenda Item 7)

Dr. Harold P. Batchelder reviewed the outcome of the discussion at the inter-sessional Science Board meeting (April 2005, Seattle, U.S.A.) on the development of the next integrative scientific program for PICES. The Study Group on *Future integrative scientific program(s)* (SGFISP) has considered several themes proposed to them as future integrative science programs:

- Ecosystem-based Fisheries Management and Sustainable Use
- North Pacific Marine Ecosystem Response to the Global Change (including climate change, expanded fishing, population growth)
- A New Integrative Scientific Program built upon the Foundations of CCCC
- North Pacific Ocean Sustainability
- Coastal Ocean Ecosystems – The Human Dimension and Climate
- Marine Biodiversity: Status and Trends

SGFISP would like feedback on these initial themes (and accompanying outlines). Which themes meet the needs, are cross-disciplinary, and are of interest to the greatest number of nations? Feedback is solicited from CFAME, but the Task Team did not receive the outlines prior to this business meeting. CFAME Co-Chairmen agreed to provide themes to Task Team members who had not yet seen them. Individual scientists are encouraged to provide their comments on themes/outlines through the Co-Chairmen or to SGFISP members directly.

Other business (Agenda Item 8)

Gordon McFarlane presented an update to the Task Team on the upcoming CCCC/CFAME Topic Session (S4) “*The comparative response of differing life history strategists to climate shifts*” that will take place on Tuesday, October 4, 2005. There have been a number of cancellations, but a full-day of presentations has been achieved. Most papers look to be on topic,

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so the session should be of interest to Task Team members.

Dr. Richard J. Beamish (WG 16 Co-Chairman) discussed a proposal that he will present to the FIS Committee for a workshop to follow-up the completion of the WG 16 report (*FIS Endnote 3*). The workshop will focus on key commercial fish species to further identify the specific linkages between climate and trends in their production. An objective of this workshop could be to achieve consensus on a list of 12-15 of the most important commercial species and further clarify the effects of climate variability. The key species could then be used as indices of climate impacts. CFAME was asked for interest in co-sponsoring the workshop. CFAME noted that this proposal overlaps with CFAME terms of reference and workplan, and requests further clarification on how the proposed workshop varies from CFAME activities, particularly the upcoming January 2006 workshop. CFAME participation could occur after the January 2006 workshop, so that Task Team members could focus on the objectives of the CFAME Workshop, and perhaps these could form an initial basis or starting point for the proposed FIS Workshop.

Dr. Michael G. Foreman provided an update on the development of a POC Working Group on *Evaluation of climate change projections*; the proposal will be brought to Science Board on Saturday, October 8, 2005 (*POC Endnote 5*). If approved, the Working Group will have its inaugural meeting at PICES XV. CFAME expressed strong interest in the products of the

proposed Working Group and stressed its importance to making future biological forecasts.

Dr. George L. Hunt presented a proposal for continued collaboration between PICES and a new GLOBEC regional program on *Ecosystem Study of Sub-Arctic Seas* (ESSAS). The first collaboration occurred at a symposium in May 2005, in Victoria, which was both well-attended and successful. A 3-day workshop is planned for June 2006, in St. Petersburg, Russia. The goals of this workshop are to: (1) outline approaches to assessing which processes in the sub-Arctic seas will likely be most impacted by climate variability and might warrant future focus; (2) identify key datasets; (3) develop standard methodologies for comparing responses to climate variability in different systems; and (4) assess whether similar changes in climate cause similar responses in four different sub-Arctic ecosystems (*CCCC Endnote 3*). Dr. Hunt proposed that CFAME support this workshop and request funds to send a CFAME member to this workshop to ensure that all selected sub-Arctic systems will be covered. Other PICES Committees will be approached for similar support. Dr. Hunt encouraged members of the Task Team to attend the workshop to ensure collaboration between ESSAS and CFAME, particularly because the issues to be considered are similar between the two groups. CFAME supports PICES collaboration with ESSAS and recommends that PICES provides travel funds for Pacific Rim scientists to attend the June 2006 ESSAS/PICES Workshop.

CFAME Endnote 1

Participation list

Members

Kerim Y. Aydin (Co-Chairman, U.S.A.)
George L. Hunt, Jr. (U.S.A.)
Masahide Kaeriyama (Japan)
Hyung-Ku Kang (Korea)
Jacquelynne R. King (Canada)
Gordon A. McFarlane (Canada)
Yoshiro Watanabe (Japan)
Akihiko Yatsu (Co-Chairman, Japan)

Observers

Harold P. Batchelder (U.S.A.)
Richard J. Beamish (Canada)
Suam Kim (Korea)
Vadim Navrotsky (Russia)
Jake Schweigert (Canada)
Muyin Wang (U.S.A.)
Yury I. Zuenko (Russia)
and unidentified Russian scientists

CFAME Endnote 2**CFAME Task Team meeting agenda**

1. Introductions and nomination of reporter(s)
2. Follow-up of the May 2005 CFAME Workshop:
 - a. expand the Excel template (used at the May 2005 workshop) to include a simple production-rate indicator
 - b. collect data for our target species
 - c. compare collected data
 - d. definition of carrying capacity
3. Preparation for the January 2006 CFAME Workshop
4. CFAME contribution to the 2006 CCCC Symposium
5. Topic Session and Workshop proposals for PICES XV
6. Travel requests/priorities for 2006
7. Future PICES integrative scientific program
8. Other business

CFAME Endnote 3**Assignments to coordinate data for the January 2006 CFAME Workshop**

	Sardines	Pollock	Sablefish	Halibut	Herring	Pink/Chum	Dogfish
Japan	Yatsu	Yatsu	NA	NA	Yatsu	Kaeriyama	Yatsu
China	No member identified but Yatsu will attempt to contact						
Korea	Kang	Kang	NA	NA	NA	NA	NA
Russia-Bering	Zuenko (TINRO)	TINRO	TINRO	TINRO	TINRO	TINRO	TINRO
Russia-Okhotsk	TINRO	TINRO	NA	TINRO	TINRO	TINRO	TINRO
Canada	McFarlane	McFarlane	McFarlane	McFarlane	Schweigert	Beamish	McFarlane
USA-Alaska	NA	Aydin	Aydin	Aydin	Aydin	Aydin	Aydin
USA-West Coast	Agostini	Agostini	Agostini	Agostini	Agostini	NA	Agostini

CFAME Endnote 4**Proposal for a workshop on*****“A comparison of regional mechanisms for fish production: Ecosystem perspectives”***Justification

We propose to hold a workshop on conceptual/regional models, with a specific goal of providing developed mechanisms for the PICES/GLOBEC Symposium on *“Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”* (April 19-21,

2006, Honolulu, U.S.A.). This workshop will seek to develop regional and Pacific-wide conceptual models describing mechanisms linking climate to fish production by focusing on two methods:

1. Attendees will develop mechanistic models for the following species in eastern and

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western ecosystems: pollock, sardine, herring, pink and chum salmon, sablefish, halibut and dogfish. This approach will include the refining of regional climate indices to specifically and directly represent processes of interest, while allowing for linkages to large scale climate patterns or models.

- Attendees will identify the set of key fish or squid species in the following ecosystems: California Current, East China/Yellow Seas, and Sea of Okhotsk. The set of key species may differ over time within each ecosystem. The aim is to describe the mechanisms between climate, ecosystem history, food web structure, and life history strategies which have led to the selected species

playing a pivotal role in their respective ecosystems. It is expected that these descriptions will contribute to understanding patterns of variation and potential for changes in overall ecosystem structure, stability, or other ecosystem properties.

Time and place: 2-day workshop to be held between January 10-14, 2006 (exact dates TBD), in Tokyo, Japan.

Co-conveners: Kerim Y. Aydin (U.S.A.) and Akihiho Yatsu (Japan)

Travel request: funds for 1 Russian and 1 Chinese expert in regional ecosystems: Sea of Okhotsk and East China/Yellow Seas.

CFAME Endnote 5

Proposal for a 1-day CCCC/FIS Topic Session at PICES XV on “Key recruitment processes and life history strategies: Bridging the temporal and spatial gap between models and data”

Stock-recruitment relationships for exploited fishery stocks quite often show large deviations from theoretical curves. This results from the tremendous variability in survival rates in the early life stages of marine species. In the synthesis phase of the PICES CCCC Program, comparison of life-history strategies in relation to climate changes are recommended for pollock, pink salmon, capelin, sardines, anchovies, saury, euphausiids, squids, and others. Among the potential causes of succession of different life-history strategists, recruitment variability is one of the most important factors. To perform scientific management for target species, appropriate

modeling of recruitment processes, including environmental effects, is needed. Under this theme, we will review the temporal and spatial variability of recruitment processes of key species, their linkages to climate changes, human impacts and regional ecosystem structure. Moreover, this session will explore new methodologies to plug the gaps between data and the current state of modeling.

Recommended convenors: Kerim Y. Aydin (U.S.A.), Shin-ichi Ito (Japan), Jacob Schweigert (Canada), Akihiko Yatsu (Japan) and Yury I. Zuenko (Russia).