REPORT OF CFAME TASK TEAM

The Climate Forcing and Marine Ecosystems Task Team (hereafter CFAME) met from 14:00–18:00 hours on October 27, 2007. Attending were 10 Task Team members and 6 observers (*CFAME Endnote 1*). The agenda was reviewed and adopted without changes (*CFAME Endnote 2*).

Review of accomplishments after PICES XV (Agenda Item 3)

May 2007 CFAME inter-sessional workshop

Dr. Kerim Y. Aydin provided an overview of the CFAME inter-sessional workshop on "*Linking climate-forcing mechanisms to indicators of species ecosystem-level changes: A comparative approach*" held May 21–23, 2007, in Seattle, U.S.A., in which a methodology was discussed for forecasting changes in marine ecosystems from climate models (IPCC scenarios). At the workshop, an approach was developed for assembling and summarizing tables of forcing variables and intermediate mechanisms between global climate and marine species for the California Current, Oyashio/Kuroshio, and East China/Yellow Sea ecosystems. Initial drafts of these tables were created at the workshop and reviewed in the interim for presentation at the POC/CCCC workshop (W6) at PICES XVI.

PICES XVI CFAME workshop

Dr. Jacquelynne R. King provided an overview of the POC/CCCC workshop on "*Climate scenarios for ecosystem modeling*" held October 26–27, 2007, at PICES XVI in Victoria, Canada. The workshop was attended by 50 participants from all PICES member countries and included presentations from China, Korea, Russia, and the United States. The objective of this workshop was to facilitate discussion between CFAME and Working Group on *Evaluations of Climate Change Projections* (WG 20) on potential collaborative research on forecasting the impacts of climate change (as represented by IPCC projection scenarios) on regional ecosystems and species of the North Pacific. The workshop was opened with an overview of the terms of reference and workplans for CFAME and WG 20 by CFAME Co-Chairman, Dr. Aydin and WG 20 Co-Chairman, Dr. Michael Foreman. The overviews provided the context for overlap in research foci between these two groups. CFAME has focused on three North Pacific ecosystems that represent different dominant physical processes: (1) California Current System (boundary current with upwelling); (2) Kuroshio/Oyashio Current System (boundary currents); (3) Yellow Sea/East China Sea region (freshwater input). For each ecosystem, CFAME has developed conceptual models of the mechanisms relating climate forcing to the population dynamics of key species and to ecosystem processes. One of the goals for WG 20 is to facilitate analyses of climate effects on marine ecosystems and ecosystem feedbacks to climate by, for example, computing an ensemble of the IPCC model projections for the North Pacific and making these projections available to other PICES groups such as CFAME. The analyses could provide forecasts of regional parameters (such as sea surface temperature, sea ice cover, and river discharge) relevant to ecosystem processes identified within CFAME's conceptual models. Details of the workshop can be found in the *Session Summaries* chapter of this Annual Report.

Topic Sessions at PICES XVI

CFAME co-sponsored two sessions at this year's Annual Meeting: a 1-day CCCC/FIS Topic Session on "*Towards ecosystem-based management: Recent developments and successes in multi-species modeling*" (S3) and a ½-day FIS/CCCC/BIO Topic Session on "*Fisheries interactions and local ecology*" (S5). Details of the sessions can be found in the *Session Summaries* chapter of this Annual Report.

Discussion of FUTURE and plan for research activities (Agenda Item 4)

The response of CFAME members to the Science Plan (version 4.2) for a new PICES scientific program, FUTURE (**F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific **E**cosystems) was extremely encouraging. They felt that it well reflects PICES and also serves, in principle, as an excellent place to pick up from where the CCCC Program will leave off. However, in the absence of an Implementation Plan, CFAME members were concerned that there might not be a smooth transition, particularly, that momentum on projects begun by CFAME and MODEL might be delayed or abandoned. To this end, first, at least one "interim" activity was proposed by MODEL and CFAME (*MODEL Endnote 4*). Second, it was suggested that the Ocean Acidification topic within the FUTURE Science Plan might be ripe enough to pick up immediately, perhaps through a Working Group, although no specific project was proposed by CFAME.

Interactions with other groups on forecasting/ future efforts (Agenda Item 5)

ESSAS

Dr. George L. Hunt gave a presentation on the Ecosystem Studies of Sub-Arctic Seas (ESSAS). ESSAS is a GLOBEC regional program with attention to ecosystems with ice. The program has a 10-year lifespan and may become part of IMBER after GLOBEC is completed. Two ESSAS workshops on "*Evaluation of climate scenarios for subarctic regions*" and "*The role of seasonal sea ice cover in marine ecosystems*" were held in June 2007, in Hakodate, Japan, and co-sponsored by PICES. The second workshop resulted in two papers: one on hotspots and one on thresholds. The continuing theme in ESSAS is a modeling comparison of subarctic seas through Ecopath. There is also an upcoming University of British Columbia proposal through FAO (Food and Agriculture Organization) to provide funding for modeling all the Large Marine Ecosystems. Several comparative studies are underway, *e.g.*, NORCANN (Norway–Canada). Upcoming activities include a Theme Session on subarctic seas at the Ocean Sciences meeting in March 2008, in Orlando, U.S.A. An ESSAS Annual Meeting will be held in September 2008, in Halifax, Canada, and a request for travel for a CFAME member to this meeting was made (see Agenda Item 7).

CAMEO and ocean acidification initiative

Dr. Aydin gave a summary of some recent efforts and organizations which may be of interest to CFAME, including the U.S. NOAA CAMEO (Comparative Analysis of Marine Ecosystem Organization) program and initiatives on ocean acidification.

FIS forecasting workshops

On behalf of Dr. Anne B. Hollowed, Dr. Aydin gave a presentation on the inter-sessional FIS workshop, co-sponsored by PICES and NPRB, on "*Forecasting climate impacts on future production of commercially exploited fish and shellfish*" (July 19–20, 2007, Seattle, U.S.A) and plans for a follow-up workshop at PICES XVI. It was noted that, while the products of this workshop series differed from CFAME goals, and although they were excellent parallel efforts, much of the work plan developed from the first FIS workshop was similar or identical to work CFAME had performed or was currently completing. It is expected that results will be shared, but it was suggested that the best approach would be if FIS proposes a Topic Session leading on from this material at next year's Annual Meeting, and that a CFAME member be a co-convenor of this session (Dr. Gordon A. McFarlane was recommended to serve in this capacity). Due to the timing of the CFAME business meeting, no proposal for such a session was explicitly presented by FIS. Also, concern was expressed by members of WG 20 that the substantial work they were already performing for CFAME in extracting data from IPCC climate scenario models not be duplicated.

Planning for 2008 and beyond (Agenda Item 6)

CFAME work plan

The following 8-step plan was developed for completing CFAME work in preparation for the conclusion of the CCCC Program following next year's Annual Meeting. This plan was endorsed by CFAME members as a way to bring an excellent finale to this portion of the CCCC Program. Some of these steps are concurrent.

1. Team leaders for each set of ecosystem mechanism tables, Drs. Vera Agostini, Akihiko Yatsu and Young-Shil Kang (or a Korean invitee), will coordinate the review of details, providing explicit description of processes and definition of terms. Initial revisions can focus on 1–2 species (hake and sardine for the California Current; sardines and anchovy for the Kuroshio/Oyashio; hairtail and yellow croaker for the East China/Yellow Seas), but if possible, a revision will be attempted for all species that have already been completed. Drs. James Overland and Aydin will aid in this process by reviewing the tables and providing suggestions for what needs to be clarified and better defined by December 2007. The revised tables will be completed by April 2008.
2. Each ecosystem team will create graphic representations of our current knowledge of the physical processes impacting species' population dynamics. One graphic representation will be made for each of the three ecosystems, showing likely impacts under climate warming. Drafts will be prepared by April 2008.
3. CFAME will request from WG 20:
   a) Graphic representations of climate/ ocean states under climate warming for each of the three selected ecosystems: This is a short-term request to be completed preferably prior to a CFAME inter-sessional workshop in April 2008 and certainly by their final meeting in October 2008. For the Kuroshio/Oyashio this representation will be based on detailed model results available from a Japanese high-resolution global climate model coupled with a biological COCO–NEMURO model. For the California Current System, this representation will be based on either results from a high-resolution Regional Ocean Model System (ROMS) climate model, or if this is not available, from downscaled global climate model values. For the Yellow and East China Seas, this graphic will also be based on either regional climate model output or downscaled values from global climate models.
   b) Suggested detailed climate model outputs based on CFAME revisions of mechanism tables: This is a long-term request to be included as a shopping list in the CFAME final report; it could also provide future PICES expert groups with relevant output parameters from WG 20 models.
4. CFAME will hold an inter-sessional workshop on "*Linking and visualizing climate forcing and marine ecosystem changes: A comparative approach*" in April 2008, in Honolulu, U.S.A. (*CFAME Endnote 3*). The purpose of this meeting is to review and finalize the changes made in Action Item 1. In addition, CFAME will review draft versions of the graphic representations of ecosystem mechanisms (Action Item 2) and, if available, of climate–ocean scenarios (Action Item 3a). CFAME will invite the WG 20 Co-Chairmen to attend the workshop in order to receive immediate feedback on revised descriptions of relevant physical processes for the three selected ecosystems.
5. CFAME will hold, jointly with WG 20, a 1½-day workshop in conjunction with the PICES Annual Meeting in October 2008 (*CFAME Endnote 4*). The objective of this workshop is to finalize the report and to outline suggested next steps for PICES to undertake in reforming or revising CFAME under FUTURE.
6. CFAME expresses interest in being invited to give a synthesis talk of completed research at the Science Board Symposium at PICES XVII. Dr. Vera Agostini has agreed to be the presenter.
7. CFAME will complete the final report on research activities by October 2008.

8. This final report will include two examples of the types of climate change forecasts that could be provided and incorporated into the provision of forecasts of ecosystem change: (a) use of high resolution climate–ocean coupled model (COCO-NEMURO) available for the Kuroshio/Oyashio Current System; and (b) statistical downscaling from IPCC model forecasts for the California Current System.

PICES XVII

No CFAME-led Topic Sessions were proposed for next year's Annual Meeting, other than the workshop listed under Action Item 5 above. As it was previously mentioned in Agenda Item 5, CFAME would support a session on the joint FIS/CFAME work if FIS takes a lead.

Project proposal

Dr. Bernard Megrey proposed a PICES project on marine ecosystem model inter-comparisons (*MODEL Endnote 4*). CFAME felt that this project would be excellent: it would serve as a good and timely bridge between the CCCC Program and FUTURE, and it would be a forum for interactions with outside groups (*e.g.*, ESSAS, ICES, *etc.*). As such, CFAME lends this proposal its full support. However, as the mechanism for supporting the proposal was still under discussion, no specific requests or action items were recommended (it is expected that MODEL will take the lead).

PICES XVIII

CFAME members were encouraged to propose Topic Sessions for PICES XVIII (October 2009, Korea), but no sessions are currently suggested.

Travel requests for 2008 (Agenda Item 7)

Travel support is requested for:

- 1 Korean scientist (Yellow Sea/East China Sea fish expert) and 1 North American scientist (California Current fish or plankton expert) to attend the proposed inter-sessional CFAME workshop (*CFAME Endnote 3*); this was identified as the highest priority for successful completion of the CFAME work plan;
- 1 CFAME member to attend the 2008 ESSAS Annual Meeting in Halifax, Canada; this was identified as the second priority; while the Task Team felt it is good to encourage the collaboration and demonstrate a desire to work with ESSAS, it was noted that at least one CFAME member (and perhaps others) would already be attending as a current ESSAS member.

New business (Agenda Item 8)

No new business was discussed.

Rotation of membership (Agenda Item 9)

It was clarified that Dr. Aydin would remain Co-Chairman throughout the coming year for the purposes of inter-sessional work. Although he is unlikely to attend next year's Annual Meeting, he may delegate Co-Chairman tasks to another North American scientist for that meeting.

Announcements (Agenda Item 10)

MODEL members announced the publication of collection of papers on NEMURO and NEMURO.FISH in a special issue of *Ecological Modelling* (March 2007, Vol. 202, Nos. 1–2, pp. 1–224) on "Modeling of North Pacific Marine Ecosystems" (Guest Editors: M.J. Kishi, B.A. Megrey, S.-I. Ito and F.E. Werner).

CFAME Endnote 1

Participation list

Members

Vera Agostini (U.S.A.)
Kerim Y. Aydin (U.S.A., Co-Chairman)
William R. Crawford (Canada)
George L. Hunt, Jr. (U.S.A.)
Young-Shil Kang (Korea, Co-Chairman)
Jacquelynne R. King (Canada)
Gordon (Sandy) McFarlane (Canada)
Brenda Norcross (U.S.A.)
James E. Overland (U.S.A.)
Akihiko Yatsu (Japan)

Observers

Yongkyu Choi (Korea)
Kenneth Drinkwater (ESSAS, Norway)
Yeonghye Kim (Korea)
Bernard A. Megrey (U.S.A.)
Oleg Katugin (Russia)
Thomas C. Wainwright (U.S.A.)

CFAME Endnote 2

CFAME meeting agenda

1. Welcome and introductions
2. Adoption of agenda
3. Review of CFAME accomplishments after PICES XV:
   - CFAME inter-sessional workshop on "*Linking climate-forcing mechanisms to indicators of species ecosystem-level changes: A comparative approach*"
   - POC/CCCC Workshop on "*Climate scenarios for ecosystem modeling*" at PICES XVI
   - Elucidating dynamic responses of North Pacific fish populations to climatic forcing: Influence of life-history strategy
   - Topic Sessions at PICES XVI
4. Discussion of FUTURE
5. Interactions with other groups on forecasting/future efforts
   - ESSAS
   - CAMEO
   - Ocean Acidification
   - FIS forecasting workshop
6. Planning for 2008 and beyond
7. Travel requests to future meetings
8. New business
9. Rotation of membership
10. Announcements
11. Adjournment

CFAME Endnote 3

Proposal for a 3-day CFAME inter-sessional workshop on *"Linking and visualizing climate-forcing mechanisms and marine ecosystem changes: A comparative approach"*

This inter-sessional workshop will bring together the three CFAME ecosystem teams which have been working together since May 2007 on each of three selected ecosystems: the California Current, the Kuroshio/Oyashio, and the Yellow Sea/East China Sea). Prior to the workshop, team leaders for each set of ecosystem mechanism tables, Drs. Vera Agostini, Akihiko Yatsu and Young-Shil Kang (or a Korean invitee), will coordinate the review of details, providing explicit description of processes and definition of terms. Initial revisions can focus on 1–2 species (hake and sardine for the California Current; sardines and anchovy for the Kuroshio/Oyashio; hairtail and yellow croaker for the East China/Yellow Seas), but if possible, a revision will be attempted for all species that have already been completed. Other CFAME members will aid in this process by reviewing the tables and providing suggestions for what needs to be clarified and better defined.

The purpose of this meeting is to examine the revisions made and review draft versions of the graphic representations of ecosystem mechanisms and climate/ocean scenarios provided by WG 20 prior to the meeting. A Co-Chairmen of WG 20 will be invited to attend the workshop in order to receive immediate feedback on revised descriptions of relevant physical processes.

At the workshop, each ecosystem team will create graphic representations of our current knowledge of the physical processes impacting species' population dynamics; one graphic representation will be made for each of the three selected ecosystems, showing likely impacts under climate warming. This work is intended for both scientific publications (PICES Scientific Report and peer-reviewed manuscripts to be drafted at the meeting) and for distribution to the broad audience as part of PICES contributions to forecasting future ecosystem states.

Date and location: April 2008, Honolulu, U.S.A.

Recommended convenors: Kerim Y. Aydin, James E. Overland (U.S.A.) and Young-Shil Kang (Korea).

Travel request: 1 scientist from Korea (Yellow Sea/East China Sea fish expert) and 1 scientist from North America (California Current fish or plankton expert).

CFAME Endnote 4

Proposal for a 1½-day CCCC/POC workshop at PICES XVII on
"Climate scenarios for ecosystem modeling (II)"

This workshop will include presentations from members of the CCCC Climate Forcing and Marine Ecosystem Task Team (CFAME) and the POC Working Group on *Evaluations of Climate Change Projections* (WG 20) on research activities related to applying output from WG 20 regional climate models, or IPCC (Intergovernmental Panel on Climate Change) global models, to CFAME ecosystem models.

CFAME is developing conceptual and empirical models of the mechanisms relating climate forcing to the population dynamics of species and to ecosystem processes. Their work has focused on three North Pacific ecosystems with different dominant physical processes: (1) California Current System (boundary current with upwelling); (2) Kuroshio/Oyashio Current System (boundary currents); and (3) Yellow Sea/East China Sea region (freshwater input). WG 20 is developing higher resolution regional coupled atmosphere–ocean models forced by IPCC global or regional models to provide forecasts of regional parameters (such as SST, sea ice cover, and river discharge) that are relevant to ecosystem processes.

In May 2007 (Seattle, U.S.A.), October 2007 (Victoria Canada), and April 2008 (Honolulu, U.S.A.), CFAME and WG 20 collaborated by producing comparative ecosystem metrics, developing climate scenario downscaling, and inferring predicted ecosystem states from climate downscaling and summarized explicit mechanisms linking fish production to climate. This workshop is the culmination of that effort, bringing CFAME and WG 20 members together to discuss the results and present them to the broader PICES community, with an emphasis to leading into the FUTURE integrated scientific program.

Recommended convenors: Michael G. Foreman (Canada) and Gordon A. McFarlane (Canada).