

U. S. GLOBEC Scientific Steering Committee Meeting

**The Hotel Captain Cook
Anchorage, Alaska
9-10 May 2007**

Wednesday, 9 May 2007

Members in attendance were Dale Haidvogel, Chairperson (Rutgers), Nick Bond (UW), Jennifer Burns (UA Anchorage), Kendra Daly (USF), Cabell Davis (WHOI), Dennis McGillicuddy (WHOI), Arthur Miller (Scripps), David Mountain (NOAA/NMSF), Elizabeth North (UMDCES), Jeff Polovina (NOAA), Thomas (Zack) Powell (UC Berkeley), Kenneth Rose (LSU), John Steele (WHOI), and Francisco Werner (UNC). Members via conference call included Eileen Hofmann (ODU), Michael Alexander (NOAA-CIRES), Michael Fogarty (NOAA/NMFS), and Pat Livingston (NMFS/NOAA.)

Guests in attendance included Enrique Curchitser (Rutgers), Madeline Gazzale (Rutgers), Linda Lagle (Rutgers), and Beth Turner (NOAA.) Guests via conference call included Mary-Elena Carr (NSF), and Phil Taylor (NSF.)

Members not in attendance included Hal Batchelder (OSU), and Jonathan Hare (NOAA).

Dale Haidvogel, Chairperson of the SSC, called the meeting to order at 0830 hours. After the initial welcoming of the newest SSC members and round-robin introductions Dale reviewed the changes made to the agenda. Two important topics for this meeting are the Pan-regional Synthesis Announcement of Opportunity and project management issues regarding the management structure for the remaining phase of the U. S. GLOBEC program and what this implies for the activities within the national office and its personnel.

The minutes from the U.S. GLOBEC SSC Fall 2006 Meeting were presented to the SSC. A comment was made regarding the timeframe of the Joint Global Ocean Flux Study program (JGOFS) in the NSF section of the agency report. To better compare JGOFS to U. S. GLOBEC both program timeframes are needed. There was also the question of whether or not Mary Elena Carr (NSF) was comparing all of GLOBEC to JGOFS or just the U. S. contributions. These questions will be addressed and clarified. The minutes will be updated accordingly. There were no other additions or corrections to the minutes. Dale made a motion to approve the minutes which were then accepted by the SSC.

Agency Reports

NOAA

Beth Turner reported NOAA is on a continuing resolution for the entire year since Congress has not approved a budget. Her office has not received an official budget for this fiscal year. Therefore, researchers in all programs supported by her office including U.S. GLOBCEC have not received funding. The initial estimates given were not tremendously generous and were lower than previously expected. There may be reductions to on-going programs which may or may not affect U.S. GLOBEC. She has explored the possibility of available funding on the NMFS side to support the NMFS researchers and is awaiting a decision. Over the past two years her office has lost two-thirds of their budget in the appropriations process. They have not seen any indication this will change. Programs can not function with further cuts.

Since Beth's department moved to the NOS line within NOAA five years ago, she has had to justify the U.S. GLOBEC program to her office. Support for Pan-Regional Synthesis has been declined. NOAA travel to the SSC Meeting will have to come from a different source. New SSC members from NOAA will have to secure their own funding for travel to SSC meetings.

The SSC questioned why her office does not see the value in the final phase of the program after investing \$168 million dollars. Beth noted years ago it was determined this program would support the strong fisheries oceanography theme in NOAA. Since her office moved to a different area within NOAA they do not see the benefit because U.S. GLOBEC's connection to management is not as strong as her department would like. This also was true of the regional phase. There are some opportunities to make inroads on the NMFS side. The prospects would have to be on the science and technology side. There has been support from NMFS in U.S. GLOBEC with personnel time, ship resources, and in-kind support.

Beth sees the problem as lack of short term products. She needs real products from the SSC. What are the lessons learned? The example of the scallop success on George's Bank was noted. She needs more examples like this to present. NOAA is making a big push between climate and fisheries and U.S. GLOBEC fits into this. U. S. GLOBEC has to find its place within NOAA.

Beth went on to say there is a need for the SSC to present lunchtime seminars for the NOAA people in D.C. The accomplishments of U.S. GLOBEC need to be shown. A series of U. S. GLOBEC workshops would showcase these results.

Conference Call

NSF

Phil Taylor stated that funding remains level. They are eagerly anticipating the Pan Regional Announcement of Opportunity (AO.) In the current draft of the AO proposals are due to the agency by November 1, 2007. The final AO guidance proposed by the U.S. GLOBEC SSC is now due to the agency.

Pan Regional AO

Phil addressed three of the major issues he has with the draft AO. 1) How the SSC plans to get the word out to attract the “real synthesizers?” There needs to be strong encouragement for participation. 2) The impact of no NOAA Scientists on the synthesis phase. 3) The role of the Office of Polar Programs. How important is Southern Ocean in the pan-regional synthesis phase? Is the Southern Ocean community more interested in the next program or in the U. S. GLOBEC synthesis? Predictions of how Southern Ocean would advise OPP on placement of their limited resources in the near future? Would it be applied towards U.S. GLOBEC synthesis or other follow-on activities?

In response to the third issue, Eileen Hofmann, Regional Chair of the Southern Ocean stated that there is a strong interest in synthesis on the part of the Southern Ocean community. Although she can not predict the outcome she believes scientists will be doing synthesis with SO data sets. Eileen questioned the size of the resources and the time-scale Phil is suggesting. SO has talked to OPP about a follow-on program, but this would not happen until 2010 or 2011. If Phil is addressing something in the next few years Eileen does not view this as a follow-on program. Eileen believes there is still a lot of synthesis work that can be done with SO data that can be used along with other data sets from other U.S. GLOBEC programs within the U.S. She is looking at SO synthesis as synthesis across international data sets from SO as well. She views this as a valid synthesis activity.

Mary Elena noted the AO is potentially limiting in stating the proposals must compare at least one U.S. GLOBEC study region. U. S. GLOBEC goals are not limited to these regions. U.S. GLOBEC’s charge is to research how climate forcing affects various populations. As currently stated, the AO precludes U.S. GLOBEC techniques from being applied elsewhere.

Dale reminded the SSC the intent of the AO is to extract the broader lessons learned by comparing and contrasting a U.S. GLOBEC site with one or more sites of your choice. Dale asked if the SSC was satisfied with how they are defining pan-regional synthesis in the AO. The SSC was satisfied. The SSC must make sure they reach out to other communities with the AO.

Dale recapped the changes made to the draft AO incorporating the suggestions from Tuesday’s Executive Committee meeting. He restated pan regional synthesis must include at least one U.S. GLOBEC study region and at least one additional area that may or may not use U.S.GLOBEC data or models. NEP is considered one region as is NWA/Georges Banks. Southern Ocean is pan-regional by definition.

Phil sees a problem when other scientists or science programs are not part of this discussion. He went on to say there are difficulties with resources and we must map the

way towards the future with no funding from NOAA. The OPP may or may not be interested in funding synthesis for a program they had not previously participated in. Phil agrees with the definition of pan-regional as proposed. He expressed strong concern that the SSC is not getting the word out to the broader audience. He thinks the ball was dropped last time in not sending an announcement to the JGOFS mailing list. Phil questions if things are going to be done differently this time around.

Dale acknowledged the SSC must get the word out to a broader audience this time. The SSC will use a variety of mechanisms to accomplish this. One such mechanism will be a second pan-regional workshop held prior to the deadline for submission of proposals. Broader distribution of the AO to all mailing lists will take place. The SSC needs to put some effort into compiling a comprehensive mailing list which will include JGOFS, ICEES, PICES, and fisheries scientists to name a few.

Phil suggested the deadline of the proposal be delayed from November 1, 2007 so that people have enough time to prepare proposals following the workshop. A statement will be written into the AO stating other scientists are strongly invited to apply to the AO and attend the second pan-regional synthesis workshop. NCAR has been contacted to host the second pan-regional synthesis workshop in the fall.

Beth and Phil both agreed it is a false assumption that NOAA scientists can not participate. NOAA scientists will be able to participate in terms of having their salary covered with a small amount of funds for travel. The funding can not go directly to their labs. They will have to collaborate with a university. Mike Fogarty stated NMFS is still trying to obtain funding to help with pan-regional synthesis. Dennis McGillicuddy pointed out the real loss on the NOAA side of this program is in the extramural funding. Phil does not believe the lack of NOAA funding is the real issue. The NOAA scientists can be involved if they have the time, desire and limited funding. Phil said the SSC needs to discuss the ramifications of losing NOAA scientists. Phil also said the SSC has not said how much money they need to complete the program.

In comparing U.S. GLOBEC to JGOFS, John Steele stated the importance of the yearly JGOFS summer working workshops to the JGOFS program and suggested U.S. GLOBEC follow suit. Dale stated there are plans for pan-regional workshops in 2008 and 2009 for those PI's receiving funding. At present, the AO does not say PI's must attend yearly workshop, but will be changed to reflect this. Funds for these workshops are presently written into the U.S. GLOBEC Office budget renewal proposal. Travel funds continue to be a real problem for the NOAA labs.

When questioned what he meant by "real synthesizers," Phil stated he is looking for people who will think about the systems, and the data from different perspectives. PI's who will bring more effort to the program such as transformative new ways to look at the systems and how the different components interact. PI's already in the program may not be looking at things differently. We need people to look at things differently and this may only be done by new people.

The discussion returned to the lack of NOAA's involvement during the synthesis phase. If NOAA is on the AO is there an unwritten dictate one would want to get a NOAA scientist involved in their proposal and the proposal should address NOAA management needs. Without NOAA as a partner agency U. S. GLOBEC runs the risk of not emphasizing this kind of partnership with management and dictating a partnership with management applications. If NOAA is not on board now language should be written into the AO to encourage the academic community in getting resource manager partners involved with their proposals.

This brings up the issue of whether or not NOAA wants to be, can be or should be listed on the AO even if they are not providing funds. Encouragement needs to be given to people who are proposing to the AO to have interactions with people who are crucial in getting what they want done.

To what extent can NOAA be mentioned on the AO? Beth stated she sees no reason why NOAA cannot be mentioned in the AO since they have provided funds in the past. NOAA was a full partner in supporting the field programs. GLOBEC's intent was always to increase the understanding with an eye towards managing a changing climate. Beth is okay with placing the NOAA name in the AO because of its historical support. As alluded to, there is still a potential that NMFS may provide funding in the 2009-2010 time frame. The agreed upon seminar series at NOAA will highlight U.S. GLOBEC accomplishments and the importance of the final phase of the Program.

Dale stated Phil is correct in asking the SSC to decide what continuing connections with NOAA are important for a successful pan-regional phase. The NOAA connection and full partnership should be added to the AO. Phil noted putting NOAA on the front page of the AO might be a problem. This would have to be addressed with the NOAA legal department. It may not be a problem to reference the NOAA partnership in the body of the AO. Phil suggested the U.S. GLOBEC National Office send out an extra informational announcement. The field programs and synthesis within the program are all products under this partnership between NSF and NOAA. NOAA scientists are deeply interested in finishing this program.

The lack of inclusion of publishing U.S. GLOBEC books in this AO was mentioned by Zack Powell. Dale thought the books should come after the synthesis phase. Zack reiterated leaving books until the end of the program can and will be disastrous. Dale did not agree. Dale thinks it is the obligation of the SSC to obtain additional funding for books. Dennis agrees with Zack in that the planning of the book should begin now. International GLOBEC hopes to have their book available at their final meeting in 2009.

In order to write the book the SSC needs to get in touch with all the PIs to determine the top primary objectives resulting from this program. The chairs of the regional offices have stated they are having difficulty getting this information from the PIs. The importance of obtaining this information has to be enforced so U. S. GLOBEC can highlight these specific accomplishments.

Zack originally had a single author book in mind, but if it is more appropriate to have a multi-authored chapter book the latter would be fine. Dale finds Zack's argument more compelling if it is a multi authored book, but thinks it should wait until the end of the program especially if it is a single authored book. John Steele questioned if the book should just wrap up U.S. GLOBEC or bridge to future activities. Dale noted planning for future programs has already begun and is not dependant on a book.

It was suggested that language be added to the AO which suggests the PIs will contribute to the authorship of this synthesis book. No decision was reached on the type or timing of the book.

The timeline of the final symposium was questioned in regards to the end dates of the proposals submit to the AO. Some successful proposals may have a 2011 end date. The symposium is currently scheduled in 2010, but could be pushed back to 2011 in alignment with the completion of all projects. While all the work may not be finished in 2010, the bulk of people involved will be done by then. It was agree that the final symposium will be held in late 2010.

The SSC then addressed the comments made by Mary-Elena to the AO. Her first comment readdressed the importance of bringing in new investigators during the pan-regional phase. The SSC is in agreement and will open the AO up to a broader audience.

Phil stated the agency will write the AO from the suggestions presented to them by the SSC. The agency wants to be satisfied with a plan that ensures good synthesis likelihood. There should be new thinking about what U.S. GLOBEC has produced to date including its ideas, concepts, information, and data. The agency wants to make sure this happens and cannot leave it up to chance. The question of having to include at least one U.S. GLOBEC study region was readdressed. The agency feels this may preclude new PIs from getting involved. Phil stated U.S. GLOBEC is not data, but rather science ideas. To think about U.S. GLOBEC in terms of the data collected in U. S. GLOBEC regions is prescriptive.

Dales asked the SSC what they thought they were requiring when they wrote proposals must include at least one U. S. GLOBEC site. It was agreed upon this could mean a hypothesis or concept developed from U. S. GLOBEC data one wants to test at other sites. The relationship in reference to hypothesis, concepts, methods or data must relate to one of the U. S. GLOBEC programs.

The next issue addressed was the over-use of the word models. This language for the AO was taken from the synthesis plan. The potential list of approaches were fine, but should not be labeled models. The use of models was thought to be inclusion in thinking of the models as conceptual constructs. The wording will change in the AO to reflect this.

Under the Research Theme and Questions section in the AO the SSC discussed the need to rearrange the order of the items and to change the multi-scale, coupled physical/biological models/processes heading. Elizabeth North will take the lead on

changing the language for this section. Models will not be a research theme. Models will be expanded under the Research Approaches section.

Pat Livingston questioned if the AO addresses transitional activities. Should the encouragement of transitional activities be added? Community tools should be more widely available. Zack Powell would like to see a few sentences added to the AO to address Pat's concerns. Pat will draft a few sentences to enhance the AO.

In terms of follow-on programs, Mike Fogarty mentioned the joint project between NOAA and NSF Comparative Analysis Marine Ecosystem Organization (CAMEO). This is strongly related to U. S. GLOBEC issues.

Other enhancement to the AO will include the theme of prediction. While prediction is mentioned it is not strongly stressed. This will be added in two to three places in the AO. The due date for the AO will change to two months after the second pan-regional workshop. Another draft of the AO will be developed and will be discussed at tomorrow's SSC meeting.

Program Management of the National Office Responsibilities of the National Office in Pan-Regional Synthesis

- Coordinate science planning
 - Develop Synthesis Implementation Plan
 - Guide development of AO for Pan-Regional Synthesis
 - Participate in post-GLOBEC planning and transitions (e.g., BASIN, CAMEO)
- Facilitate individual projects and outcomes
 - Promote ties across projects (PRS workshops)
- Disseminate results to all audiences
 - Scientific community (Ocean Sciences, books)
 - Lay community (Books – be self-promotional)
 - Course curricula
 - Synthetical summary PPT presentations, executive summary, etc.
- Ensure effective transfers of knowledge (broadly defined) to national agencies and communities
 - Climate modeling community (NCAR, GFDL, ...)
 - Management community (fisheries, ...)
- Ensure quantitative evaluation of methodologies
 - Measures of skill (Skill Workshops)
 - Model comparisons

- Keep an eye on the ball (i.e., the Final Symposium)

Management Structure for Pan-Regional Synthesis

- Steering/Executive Committee for Synthesis
 - Downsize SSC by attrition
 - SSC becomes Exec Committee for PR Synthesis
 - Later: add PRS PIs
 - Reduced SSC size + lead PIs = O(12) members
 - Provide communication among PR groups
 - Seek support for post-PR synthesis activities
 - One Spring meeting per year + yearly PRS Workshop, plus regular e-traffic
- Personnel (present) = Haidvogel, Curchitser, Lagle, Robertson
- Personnel (recommended) = Lead on knowledge transfer to management

The above list was developed as a result of the Executive Committee Meeting and acts as a reminder to the SSC regarding the responsibilities of the National Office and its management and staffing. The Synthesis Implementation Plan will be published as U.S. GLOBEC Report #20. Dale mentioned the idea of developing a U.S. GLOBEC video game or possibly a television special with the Discovery Channel to education the non-scientific community on the merits of U. S. GLOBEC. The possibility of developing course curricula for undergraduate or graduate students will also be explored. The final U.S. GLOBEC symposium will be held in Washington DC in 2010. It was recommended the stewardship of the U.S. GLOBEC datasets should also become a responsibility of the National Office. This would include not only the maintenance of the data sets, but also the completion, integration, and construction of synthetic data as needed for projects. The data management people should be added to the list of people who will be funded to attend the pan-regional synthesis meetings. Wording will be added to the AO stating synthetic products can be identified as part of the broader impacts at the national level. A small group of SSC members will redraft the AO. Elizabeth North, Pat Livingston and Zack Powell have been given writing assignments for the AO which will be revisited on Thursday.

Eileen was asked if the SSC should send a letter to OPP managers to ask for financial support for the pan regional synthesis phase. Eileen thought this would be a good idea.

Southern Ocean

Eileen Hofmann, Chairperson of the U. S. Southern Ocean program gave an update of the Southern Ocean program via a conference call. A copy of her power point presentation was sent to the SSC and was displayed. She highlighted U.S. Southern Ocean GLOBEC synthesis program developments, the status of the second Southern

Ocean GLOBEC DSR II volume, upcoming meetings and the latest developments in the ICED Program.

A schematic diagram of the key components and types of interactions looked at in Southern Ocean Program was shown. The diagram was very krill-centric since krill was thought to be a dominant part of the food web for the Southern Ocean. But they are now finding out that krill is not the only dominant species and that in certain parts of the Antarctic it may not be present. These are the ideas that are being developed for the pan-regional synthesis phase.

The International GLOBEC Newsletter had a special section on SO GLOBEC in the April 2007 issue. There were contributions from the U.S., UK, Australian, Korean and IWC programs. A total of 19 articles were published. The U.S. portion includes articles on krill studies, acoustics for measuring krill, predators, circulation and hydrography, circulation modeling, and sea ice studies. Germany did not participate in this volume.

The second SO GLOBEC DSR II Volume will be published shortly. Manuscripts are now due. Twenty-one manuscripts have been received and most have gone through a second review. The anticipated publication date is in 2007. Plans are also underway for a third DSR II volume focusing on synthesis activities.

There have been several synthesis workshops. There was a penguin and seabird data analyses and modeling workshop in August 2006. A circulation, hydrography, and modeling workshop is set for November 2007. A predator data analyses and modeling workshop is now being organized for summer 2007.

There will be a krill symposium scheduled at the 4th International Zooplankton Symposium in Hiroshima, Japan from May 28 to June 1, 2007. There will be a full day oral session and a poster session. The results will be published as a DSR II special issue. The due date for submission will be one month after the meeting. The symposium will integrate across regions of the ocean and will be a step towards synthesis.

Eileen then spoke about the Integrating Climate and Ecosystem Dynamics (ICED) program. ICED is a circumpolar, interdisciplinary approach to understand climate interactions in the SO and implications for ecosystem function and feedbacks to biogeochemical cycles. It will implement circumpolar instrumentation and field studies. It will extend and further develop circulation, ecosystem, and biogeochemical models and will stimulate capacity building. The challenge is to combine the ecosystem and biogeochemical communities. ICED is a joint initiative between SCOR, IMBER, EUR-OCEANS, International GLOBEC and SCAR. The science plan for ICED has been finalized and was submitted to International GLOBEC and IMBER for review. The science plan will be jointly published by these two programs. An ad hoc planning group is in place.

ICED Science themes include: 1) Southern Ocean climate-ice-ocean connections; 2) circumpolar biogeochemistry and ecosystem structure; 3) circumpolar ecosystem structure and dynamics; and 4) sustainable management and ecosystem structure.

ICED has been accepted as lead project for the IPY program and coordinates 9 projects. The program office is at the British Antarctic Survey and is staffed with a program assistant. A program website was established at BAS. Its link is:

www.antarctica.ac.uk/Resources/BSD/ICED

There was a meeting of the Ad Hoc steering group in Hobart during the SCAR OSM, July 2006. Plans are underway for a modeling workshop to be held in late 2007. Funding has been received from GLOBEC, EUR-Oceans, IMBER, and Southern Ocean GLOBEC. There will be a special session proposed for the IGBP Congress, May 2008, Cape Town, South Africa. Eileen is waiting for approval of this.

Northwest Atlantic/Georges Bank

Cabell Davis, Chairperson of the NWA program reviewed the program structure, and presented project summaries and highlighted the planned activities. The objective of the program is to understand the processes controlling recruitment of cod and haddock and their dominant prey species as affected by climate change. There are five 4B synthesis projects. He showed several slides highlighting program results in broadscale surveys, 1990 freshening, physical forcing, regional-scale models, and basin-scale models.

The first project he discussed was *Processes Controlling Abundance of Dominant Copepod Species on Georges Bank: Local Dynamics and Large-Scale Forcing*. The objective is to understand 3D patterns of copepod species. Species highlighted include calanus, pseudocalanus, centropages and oithona. These species have characteristic patterns and characteristic dependencies on temperature and food dependencies for fertility, molting, growth and mortality. Physical forcing looks at local dynamics, large-scale forcing, slope water intrusions, Scotian shelf water intrusions and upwelling.

The status of this project includes initialized NPZD model with climatology for nutrients and phytoplankton. They have completed the 1995 to 1999 run with the NPZD model for this region. They have assembled all copepod data from GLOBEC, MARMAP, ECOMON, and AZMP sources. A new copepod model which uses mean-age within stage was developed. A whole-year model run for *Pseudocalanus* in 1995 was completed using this model.

Physical modeling with the FVCOM completed since the last workshop includes: 1) analysis of 27 years of meteorological model (MM5) results from 1978 to 2006; 2) FVCOM data comparison for GoMOOS, NS and New England Shelf; 3) data assimilation experiments; and 4) GoM integrated model system converted to the Northeast Coastal Ocean Forecast System (NECOFS), with upgraded meteorological model weather research forecast. Ongoing activities include: 1) data assimilation

experiments with OI and K-Filters have been completed for selected year experiments; 2) validation of the FVCOM-based unstructured grid surface wave model (SWAN-UG); and 3) improvement to the model dynamics with more accurate and complete river discharges. Slides of examples of the above work were shown and discussed.

Other modeling of the NPZD dynamics in the GoM/GB region includes: 1) completed 1995-1999 continuous run for NPZD; 2) compared data/model results; 3) examined effect of freshening on phytoplankton dynamics; 4) completed 1995 *Pseudocalanus* model run; using “stage with mean age” method; and 5) one paper was submitted to JMS and one paper was submitted to GRL. Slides of examples highlighting the above work were shown.

The next project discussed was *Development of the Lipid Accumulation Window hypothesis to explain Calanus finmarchicus dormancy*. The objectives are to identify environmental processes that control dormancy in *Calanus finmarchicus* and to develop a mechanistic understanding of dormancy for inclusion in population dynamics modeling. The approach for this project is to compile *Calanus* and environmental data across regions in the NW Atlantic. They will look for common patterns and cues. They will use an individual-based model and will develop quantitative hypotheses to explain the patterns. The Lipid Accumulation Window (LAW) was explained.

The next project was *Ecosystem Intercomparison between Nordic Seas and NW Atlantic*. The objectives are to understand recruitment of cod and haddock on Georges Bank and cod in the Norwegian Sea and to use full-life cycle models to predict changes in abundance due to climate change. Their modeling approach will include: 1) a global ROMS model run in Norway which will focus on the years of 1985 and 1986; 2) a regional zoom to the NW Atlantic focusing on the years of 1995, 1998, and 1999; and 3) individual-based models. An example of the individual-based model was shown. In this model the mechanistic feeding component uses biological and physical properties of predator, prey, and environment for calculations. Models also showed how increased hours of sunlight enhances larval growth to reach maximum rate even at low prey abundance.

The objectives of future work includes using the same model setup for the Barents Sea and the Georges Bank ecosystems for modeling drift, dispersal, growth, feeding, survival, and behavior. The major processes that affect survival variability between ecosystems will be identified. They will also simulate a set of years that contributed strongly to recruitment in each of the ecosystems, and try to understand the major underlying causes. These objectives will be met using a physical model (ROMS), and an individual-based model (IBM) for cod and concentration-based prey fields.

Other work in this region showed that seasonal trends in mortality and growth of cod and haddock larvae on Georges Bank result in an optimal window for survival. Findings show the fastest growing cohorts, those hatched in May, are rapidly lost to predators in most years. In years with abundant prey early in the year, cohorts hatching in February and March experience lower mortality and can increase rapidly in biomass. These early

cohorts may ultimately make up the bulk of the survivors. Successful cod and haddock hatch ahead of the peak abundance of prey, reaching a large size before being overtaken by the wave of abundant predators.

The fourth highlighted project was *Marine Ecosystem Responses to Climate-Associated Remote Forcing from the Labrador Sea*. The goals are to: 1) develop a retrospective analysis of Georges Bank and Gulf of Maine using the biological and physical conditions; 2) identify drivers of variability such as climate and 3) to compare within the GOM and the Scotian Shelf. There will be several working groups and workshops set-up to approach this.

The CAFÉ Gulf of Maine Workshop III was held November 7-8, 2006 in Portland, Maine. There were 24 participants from three countries. The theme of this workshop was Arctic Influences on NW Atlantic Shelf Ecosystems. The first day focused on Arctic Climate Influences on NW Atlantic and the second day focused on Top-down vs. Bottom-up drivers. Cabell also showed slides on interdecadal changes in cod/haddock growth.

The final project discussed was *Impacts of Climate and Basin-Scale Variability on Seeding and Production of Calanus finmarchicus in the Gulf of Maine/Georges Bank Region*. The goals of this project are to do basin-scale simulations from 1988-1999 using a *C. finmarchicus* IBM with regards to seeding and production on GB/GOM as affected by NAO. They will compare long-term datasets and SST. Progress to date includes: 1) Basin-scale ROMs modeling runs made for high and low NAO years; 2) corrected NCEP heat-flux error w/ SOC data; and 3) calibration with Bisagni SST 5-day composite. They still need to increase resolution to 1/6 degree for the GB/GOM. The *Calanus* data also need to be assembled for the IBM implementation.

Recent activities include:

- CAFÉ GOM, Nov 7-8, Portland, ME
- Pan-regional, Nov 27-30, Boulder, CO
- 4th DSR II volume published Dec 2006 – 17 papers
- WHOI OLI, EBM-MOS planning meeting, March 5, 2007
- BASIN meetings, January 23-25, 2007, Hamburg, May 1-3, 2007, Chapel Hill
- IMBER modeling, March 20-23, 2007, Cadiz, Spain
- ICES WGZE, March 26-29, 2007, Riga, Latvia
- 4B SI meeting April, 2006
 - Report and talks available on-line
 - GLOBEC NWA Book, Preliminary Outline

Planned activities include:

- Zooplankton Symposium, Hiroshima, May 28-June 1, 2007
- Coastal Modeling workshop, Gordon Conference Center, NH, June 17-20, 2007
- ICES Annual Meeting, September 2007
- Pan-regional, 2nd meeting, fall 2007, Boulder, CO
- 4B SI meeting October, 2007
- CAFÉ Meeting, Fall, 2007

- GLOBEC NWA synthesis talks at Ocean Sciences 2008
- GLOBEC NWA synthesis volume, Progress in Oceanography, summer 2008.
- GLOBEC NWA Book, 2008-2009

Northeast Pacific Program (NEP)

Nick Bond, Chairperson of the NEP presented the NEP program report. There are 17 NEP projects. Nine of these are California Current projects and 8 are Coastal Gulf of Alaska.

CCS Synthesis Projects:

- 1) *Effects of Meso- and Basin-Scale Variability on Zooplankton Populations in the CCS using Data-Assimilative, Physical-Ecosystem Models*
- 2) *Large-scale Influences on Mesoscale Structure in the CCS, A Synthesis of Climate-forced Variability in Coastal Ecosystems*
- 3) *Changing Ocean Conditions in Northern California Current-Effects on Primary Production and Salmon*
- 4) *Latitudinal variation of upwelling, retention, nutrient supply and freshwater effects in the California Current System*
- 5) *Coupled physical-biological dynamics in the Northern California Current System: A Synthesis of Seasonal and Interannual Mesoscale Variability and its Links to Regional Climate Change*
- 6) *Synthesis of Euphausiid Population Dynamics, Production, Retention and Loss under Variable Climatic Condition*
- 7) *Juvenile Salmon Habitat Utilization in the Northern California Current-Synthesis and Prediction*
- 8) *Effects of climate variability on Calanus dormancy patterns and population dynamics within the California Current*
- 9) *Scale-dependent Dynamics of Top Trophic Predators and Prey: Toward Predicting Predator Response to Climate Change*

CGOA Synthesis Projects:

- 1) *US GLOBEC Northeast Pacific Coordinating and Synthesis Office.*
- 2) *A synthesis of climate-forced variability on mesoscale structure in the CGOA with direct comparisons to the CCS*
- 3) *Bottom-up control of lower-trophic variability: A synthesis of atmospheric, oceanic and ecosystem observations*
- 4) *Habitat effects on feeding, condition, growth and survival of juvenile pink salmon in the northern Gulf of Alaska*
- 5) *Synthesis of biophysical observations at multiple trophic levels using spatially nested, data-assimilating models of the coastal Gulf of Alaska*
- 6) *Modeling the effects of spatial-temporal environmental variability on stage-specific growth and survival of pink salmon in the coastal Gulf of Alaska*
- 7) *Environmental influences on growth and survival of Southeast Alaska coho salmon in contrast with other Northeast Pacific regions*

8) *Links between climate and planktonic food webs (This is the new gap filling project.)*

In highlighting the *Large-scale Influences on Mesoscale Structure in the CCS, A Synthesis of Climate-forced Variability in Coastal Ecosystems* project Nick spoke about an upwelling event in late 2005. A late onset of seasonal upwelling occurred within the CCS. One slide showed a comparison between 2005 and 2006. The west coast upwelling in 2005 was delayed and weak during the onset of coastal upwelling typically in April and May. In July of 2005 in northern California Current it caught up as a whole for the year, but it was delayed. Overall there was a weaker upwelling in the southern California current in 2005 and 2006 but northern California current had a stronger upwelling.

At a workshop at the Seattle Science Investigators meeting in January 2006 this upwelling event was discussed. There was a fair amount of work done on this. As a result eight or nine published papers will be in the November issue of GRL. The workshop allowed time to look at a case study of this dramatic event.

He then spoke about the modeling study *Effects of Meso- and Basin-Scale Variability on Zooplankton Populations in the CCS using Data-Assimilative, Physical-Ecosystem Models*. He showed the results of high-resolutions ROMS runs off the Oregon coast. The model results were compared to observations to sea surface height from satellites. He also showed what a high-resolution ocean model would look like when compared to using a high resolution atmospheric model. It is better to use a high-resolution model to get the flow on the shelf.

Nick then showed various slides depicting the state-space analysis of North Pacific subsurface temperatures. He discussed the Simple Ocean Data Assimilation (SODA.) Other models shown were of a seasonal dynamic topography and surface currents off the coast of Oregon from altimeters and long-term hydrography. A model of time scales shorter than seasonal and interannual was shown. Quantifying intraseasonal [CHL] and SST Variance in the California Current was noted.

A slide of the CHL anomalies & basin-scale signals in the California Current was shown. Is there a correlation of CHL anomalies with basin-scale signals as a function of latitude? Specific latitude regions showed stronger linkage between chlorophyll variability and basin-scale signals than others.

Nick then highlighted the synthesis of coastal zooplankton community structure from southeast Alaska to northern California. Zooplankton has been sampled by NMFS-Juneau and UA-Juneau following GLOBEC protocols since 1998 during juvenile salmon surveys. Canadians have been sampling zooplankton at shelf stations as well with similar nets. GLOBEC/NEP/LTOP and the Bonneville Power study of juvenile salmon have also sampled shelf stations, following GLOBEC protocols. There has been the opportunity to compare copepod species composition in samples to look for gradients in community structure, 40° to 58°N. They will determine if there is evidence for faunal

boundaries. Cruises took place in June or July of each year. The data was divided into five clusters, and identified corresponding “indicator species.”

In highlighting the CGOA pink salmon Nick noted that ocean survival positively correlated to juvenile size and growth. Significant size-selective mortality occurs after the first summer and correlated with higher overall marine survival. Survivors’ growth diverged from average during July and August which is considered the critical period. High ocean survival correlated with higher juvenile feeding and growth rates and broader spatial distribution during the first summer. Climate affects growth and survival. There are minor direct thermal effects on summer growth. Major effects on prey composition and availability were evident. Feeding rate influences summer pink salmon growth more than temperature or prey quality in CGOA. Non-crustacean zooplankton prey are a very important part of the pink salmon diet. There will be several papers published highlighting the above work.

He also spoke about work which highlights the correlation between hatcheries. The covariability between CCS and CGOA has always been suggested. They looked at the mortality of Coho coming out of the hatcheries is the northern part related to the southern part of the region. They are finding that there is not a strong correlation. There is not really a large-scale pattern. Some hatcheries near each other are negatively related. He also showed a slide displaying the correlation matrix of regional Coho survival with climate indices.

The last project he spoke about was *Juvenile Salmon Habitat Utilization in the Northern California Current – Synthesis and Prediction*. This group has updated their model to relate temperature, salinity, and density to how often they catch salmon in their trawls. When this new model is applied there is a strong correlation between what the model says and what they actually catch. Therefore, they are moving toward predictability of their model.

Future NEP Activities include the fourth international zooplankton symposium in Hiroshima, Japan 28 May to 1 June 2007. There will be a Deep-Sea Research II special issue. The SI meeting will be held in Seattle in late 2007 or early 2008. Nick offered Seattle as a venue for the next pan regional workshop piggy backing on the SI Meeting. The 2008 Ocean Science Meeting will be in Orlando 2 to 7 March 2008. There will be the Effects of Climate Change on the World’s Oceans Meeting in Gijon, Spain in May 2008.

Nick spoke about the NEP synthesis book outline that will be spearheaded by Hal Batchelder. There will be three central themes; climate impacts, ecosystem structure and interactions, and management issues and implications. There has not been an overwhelming response from NEP investigators for writing this volume. Therefore, the quality of the volume was in question.

GLOBEC International

Cisco Werner presented a retrospective of the past ten years of International GLOBEC entitled *From Description to Prediction: A selective view of GLOBEC's Synthesis*. The goal of International GLOBEC is to advance our understanding of the structure and functioning of the global ocean ecosystem, its major subsystems, and its response to physical forcing so that a capability can be developed to forecast the responses of the marine ecosystem to global change.

National activities included work from Brazil, Canada, China, France, Germany, Italy, Japan, Korea, Mexico, The Netherlands, Norway, Peru, Portugal, Spain, Turkey, United Kingdom, and the USA. Regional programs include PICES-GLOBEC Climate Change and Carrying Capacity, ICES-GLOBEC Cod and Climate Change, Southern Ocean GLOBEC, Small Pelagic fish And Climate Change (SPACC), Ecosystem Studies of Sub-Arctic Seas (ESSAS), and Climate Impacts on Oceanic Top Predators (CLIOTOP.)

GLOBEC International was built based on the follow six building blocks which Cisco highlighted by giving a very brief overview of projects based on each.

1. Calanus finmarchicus and climate
2. Synchronicity in pelagic fish fluctuations
3. "...biological responses to physical forcing..."
4. "...New technologies..."
5. "...to predict the responses of the marine ecosystem to climate change..."
6. "The human dimension..."

Cisco's presentation showed the studies done in the International program during the life span of the program. One purpose of his presentation was to determine the types of results program managers seek to highlight program accomplishments.

Cisco then reviewed a list of the synthesis and integration symposia that were held or will be held from 2004 to 2010. The upcoming meetings include: 1) PICES/ICES/GLOBEC 4th Zooplankton Production Symposium in Hiroshima, Japan in June 2007; 2) GLOBEC CLIOTOP 1st OSM in La Paz, Mexico from 3-6 December 2007; 3) IOC-PICES- ICES-GLOBEC Climate Change & Marine Ecosystems in Gijón, Spain from May 19-23, 2008; 4) GLOBEC/ EUROCEANS Coping with global change in marine socio-ecological systems. FAO, Rome, Italy, July 2008; 5) GLOBEC/ IMBER/ SOLAS/ EUROCEANS Eastern Boundary Upwelling Ecosystems: integrative and comparative approaches in Las Palmas, Spain, 2-6 June 2008; 6) ICES/GLOBEC Herring Symposium, Galway, Ireland, July 2008; 7) The final GLOBEC Open Science Meeting will be held in Paris, France in May, 2009.

He then spoke about the book and reviewed the timeline and chapter content. The working title of the book is *Global Change and Marine Ecosystems*. There are eleven chapters:

- CH 1: The role of marine ecosystems in the Earth System

- CH 2: Observational methods
- CH 3: Modeling methodologies
- CH 4: Dynamics and structure of marine ecosystem
- CH 5: Physical forcing of marine ecosystem dynamics
- CH 6: Climate forcing on marine ecosystems
- CH 7: Human impacts on marine ecosystems
- CH 8: Impacts of marine ecosystem change on human communities
- CH 9: Predicting marine ecosystem responses to global changes
- CH 10: Marine resources management in the face of change
- CH 11: Perspectives on global change and marine ecosystems

The timeline indicated the manuscript should be submitted to the publisher in October 2008 and in print by May 2009.

The International GLOBEC program ends in March 2010. The follow-on to International GLOBEC will be IMBER. ICED is another joint project. Other follow on activities with NCAR and ICGP were discussed. U.S. GLOBEC should prepare to move towards IMBER at the close of the program. It was suggested the SSC should think about setting up a transition team to investigate this merger.

Beth Turner provided feedback on the shiny rocks from Cisco's presentation. She like the setup of contrasting what we knew years ago to what we think we know now. She would hope the U.S. GLOBEC books will use this approach. This will be a powerful way to show what was learned.

The discussion returned to the AO and the concern of attracting new people to the program and making sure there is a relationship to the U.S. GLOBEC regional study sites. The verbiage has to be carefully written.

The meeting adjourned at 1700.

**The Hotel Captain Cook
Anchorage, Alaska
9-10 May 2007**

Thursday, 10 May 2007

Members in attendance were Dale Haidvogel, Chairperson (Rutgers), Nick Bond (UW), Jennifer Burns (UA Anchorage), Kendra Daly (USF), Cabell Davis (WHOI), Dennis McGillicuddy (WHOI), Arthur Miller (Scripps), David Mountain (NOAA/NMSF), Elizabeth North (UMDCES), Jeff Polovina (NOAA), Thomas (Zack) Powell (UC Berkeley), Kenneth Rose (LSU), John Steele (WHOI), and Francisco Werner (UNC).

Guests in attendance included Enrique Curchitser (Rutgers), Madeline Gazzale (Rutgers), Linda Lagle (Rutgers), and Beth Turner (NOAA.)

Members not in attendance included Hal Batchelder (OSU), and Jonathan Hare (NOAA), Eileen Hofmann (ODU), Michael Alexander (NOAA-CIRES), Michael Fogarty (NOAA/NMFS), and Pat Livingston (NMFS/NOAA.)

Dale Haidvogel, Chairperson of the SSC, called the meeting to order at 0845 hours. The agenda was reviewed. A redraft of the AO was handed out along with a list of changes made.

Dale reviewed the changes made to the AO after yesterday's discussion. Phil Taylor's and Mary-Elena Carr's suggestions were incorporated into the AO. The suggestions and changes from Elizabeth North and Pat Livingston were added. The concept of prediction was enhanced. Language to encourage new investigators to U.S.GLOBEC was added to the summary at the beginning of the AO and in the Who May Apply Section. The expectation of coordination of workshops and dissemination of results from the National Office was also added. Dale asked for additional comments.

He then reviewed the AO action items. The participation status of OPP will need to be determined. Eileen Hoffman will take the lead on this. The participation of NMFS will be investigated by Mike Fogarty. The AO will be finalized as soon as possible. The AO will be distributed to a broad list of people and organizations. The Pan-Regional Workshop #1 report will be finalized and posted to the website. Planning for the second Pan-Regional workshop will now begin. The AO due date will be two months after the workshop.

Dale asked for additional comments. Beth commented that the partnership between NSF and NOAA was not added to the opening section as discussed. Under the Research Data Sets Section the location of these data sets should be noted. An introduction to the data

port should be given. In the opening paragraph the SSC has to decide whether or not to leave in the names of the three regional programs. In the Research Themes section the wording should be changed to include these “interrelated” themes in the second sentence of the second paragraph.

Dennis McGillicuddy liked the reorganization of this section, but was concerned about the sentence describing topic one, “The influence of climate on physical/processes and lower trophic levels.” Is the intention to limit this to the physics, nutrients and phytoplankton or was thinking more broadly on the influence of climate on ecosystems dynamics. After some discussion, the sentence was then changed to “the influence of climate on physical and biological processes.” In example one in this section the wording will be changed from “ecosystems-based management” to “ecosystem approaches to management.” Additional comments on changes to the AO must be sent to Dale by May 14, 2007.

Synthesis Activities

Implementation Plan

Dale noted the Implementation Plan is taking shape. Based on the discussion at the last SSC Meeting there had been cuts and improvements made to the plan. Mike Fogarty went through the draft with an eye toward improving the language for ecosystem approaches to management stemming from the first pan-regional synthesis workshop. Dennis updated the assimilation and skill assessment information. Several of the figures were redrafted. The Implementation Plan is now almost complete. Dale will modify the language in the National Office Management section to reflect yesterday’s discussion. The plan will then be sent to the SSC one more time before being sent to the printer.

Pan-Regional Synthesis Workshops

Dale noted the First Pan-Regional workshop held at NCAR was successful particularly in shaping the AO. There will be three more workshops. The focus of this year’s workshop will be to form partnerships and lay plans for submissions of proposals. There will be working workshop in the fall of 2008 and 2009. These workshops will give PIs the opportunity to conduct, communicate, and enhance their pan-regional activities. Planning for this year’s workshop will begin immediately since its timing will dictate the due date of the proposals.

The tentative date for the second pan-regional synthesis meeting will be September 24-28, 2007. It will be a three-day workshop and will follow the first pan-regional workshop format. Possible venues include facilities in Seattle, NCAR’s Mesa Lab or Chapel Hill.

Skill Assessment Workshops

Dennis McGillicuddy presented a report on the skill assessment project. There are grand expectations in terms of what models can deliver in terms of ecosystem management tools. The activity of skill assessment and these workshops are aimed at quantitative evaluation of models products of U.S. GLOBEC and other related programs.

To set the stage Dennis showed slides depicting skill assessment. He reviewed the Stommel 1948 model of westward intensification. He showed examples of other models showing meanders, and eddies within the Gulf Stream. Do these models have skills that can transition to management?

The goals of skill assessment workshops are: 1) to assess the state-of-the-art quantitative evaluation of coupled physical-biological models. 2) to provide recommendations for future progress in this area in support of NOAA's ecosystem approaches to management and ecological forecasting initiatives.

A special issue of a journal and the workshop report will be given to NOAA. This special journal is now in progress as is the workshop reports. More information can be found at http://www-nml.dartmouth.edu/Publications/internal_reports/NML-06-Skill/.

Dennis provided a list of attendees for the workshops which included an impressive list of both national and international scientists. He reviewed the timeline for this project which began in July 2006 and will conclude in April 2008. The scope is larger than just U.S. GLOBEC. The issue of quantitative skill assessment pervades many different applications that require coupled physical models. The four scientific applications for this project are carbon cycle, harmful algal blooms, ecosystem dynamics and fisheries, and estuarine/coastal water quality. The cross-cutting themes include skill vocabulary, metrics and data assimilation.

Dennis then spoke about the truth of the system and how it fluctuates in terms of data, models, prediction and misfit. You want to find truth about the system, but the models and the data have some errors. Predictions from the models and the data will have some errors too. The combination of this error is complex and unknown. We can make the model match the data perfectly by driving the misfit down to zero. But skill is not that same as driving the misfit down to zero. Skill has three aspects, misfits should be small and noisy; deduced inputs, small and smooth and processes and features should be realistic. Systematic model evaluation requires a hierarchy of performance metrics. Definitions include bias, RMS difference, centered RMS difference, correlation coefficient, coherence, and model efficiency. He then showed and explained slides using the Taylor diagram, Target diagram, and the receiver-operator characteristic (ROC) diagram. Dennis noted the skill metric is application-dependant.

In summary, Dennis said there is a need to move beyond qualitative phenomenological evaluation science (hypothesis testing) and management (prediction.) Methods for quantitative skill assessment of coupled models are in their infancy. The special volume is underway. The first manuscript was submitted April, 2007. Additional submissions will be accepted until the summer 2007. The manuscript will be published in the spring 2008 issue of *Journal of Marine Systems*. There is a need for potential interagency partnerships. An implementation plan for Model Intercomparison and Evaluation Projects (MIEPs) will be developed. Additional information can be found at: http://www-nml.dartmouth.edu/Publications/internal_reports/NML-06-Skill/ or http://www.whoi.edu/sites/skill_assessment.

The issue was addressed as to who gets credited for this work. Will it be U.S.GLOBEC? This workshop was developed as a subcommittee of U.S. GLOBEC. It can be a report out of U. S. GLOBEC and CCORE. If it is a dual publication it can be shared by both and distributed by both groups. It was agreed that the volume will be jointly published. A tool box on the web may also be made available for model inter-comparisons.

Dale mentioned the Basin Meeting Report from the first basin meeting was jointly published and distributed. This was U. S. GLOBEC report number 20. He also noted an article highlighting the first pan-regional workshop appeared in the International GLOBEC newsletter.

GLOBEC Model Evaluation Project

Dale opened a discussion regarding whether or not there can be an analog activity that the SSC could take in the context of GLOBEC models that will be helpful and as successful as that of the Regional Test Bed Model project that stemmed from JGOFS synthesis and modeling. Dennis McGillicuddy showed examples of the Regional Test Bed models. There were 16 models of various degrees of complexity. An important aspect of this model comparison and evaluation project is that when you have numerous models with different degrees of freedom you find out immediately that parameter optimization is an essential component of skill assessment. If you don't have some way of optimizing the parameters evenly among the models then you are not testing if one is better than the other, but rather how well tuned the data is to the model. Dennis showed examples to back this up.

Dale asked if U. S. GLOBEC is ready for model intercomparisons and if so what form should they take. Approximately 14 U. S. GLOBEC biological models are fully integrated into ROMS at this point. With additional man hours it could be possible to have GLOBEC trophic models in the same circulation context as ROMS. The importance of this would be to show the bottom shelf topography. These would be three dimensional models. Comparison in part would be determined by your data set. There is a lot of science that needs to be done to determine model skill assessment. To date Dennis has not come across a good skill assessment metric for an IBM model.

Dale stated an interest in following up with these ideas in the U. S. GLOBEC context. SSC members wanting to further this topic should schedule some time for a dialogue during the intersession to push this forward. Topics such as toolboxes, metrics, model inter comparisons will be fruitful approaches for the pan regional phase. Wording in the AO will be included expressing the above.

Synthesis Activities: Outreach

Zack Powell spoke about intersession activities. Several SSC members are working closely with NCAR in order to form partnerships for future follow-on programs for GLOBEC. In 2005, NCAR internally invested \$100K in the Connecting Community Climate and Ecosystem Impact Research endeavor. The goals of CCEIR are: 1) modeling climate variability; 2) couple climate ecosystem models 3) climate impact studies. These

three goals are GLOBEC-related. The climate model that NCAR sponsors is the CCSM model. Another larger model is at GFDL. These two models are feeding in to the international community which is interested in collaborating.

Zack showed a slide of multi-scale modeling in the North Pacific based on work performed by Enrique Curchitser. It starts at the largest scales and gets smaller and smaller down the scale. This is the first steps of two-way coupling. It is a way to link different scales. He then showed an example of recent studies of the ocean model which is part of the Parallel Ocean Program (POP.) ROMS is done in a downscaling mode. There is more detail with ROMS. This example is driven by the climate model of CCSM. This is a way for U. S. GLOBEC to link into climate-driven variability at the levels that the ecosystems models have to be put into. In the three U. S. GLOBEC regions ROMS is already being run. It is the mechanistic need to move toward climate impacts. U.S. GLOBEC is ready to move towards these things. Zack showed more examples to prove this point.

NCAR is also trying to find different ways to nest models. U. S. GLOBEC has made a big impact. ROMS is important to them in nesting models. Zack gave other examples of ROMS suite of models that are being used. The final direction is to drive all the U.S. GLOBEC Regions and International regions with ROMS models.

Pilot programs have been suggested. NSF liked the work being performed. A formal written proposal will be sent to NSF to pursue funding. U. S. GLOBEC would also like to build partnerships with GFDL.

Invited Talk: “Understanding Arctic Social-Ecological Systems through Data Synthesis: Uncertainty, Complexity and Management” was presented by Dr. Lillian Alessa. Dr. Alessa spoke about various ways to develop a knowledge management system. She stated that we live in a time of unprecedented global distribution of the human species. The social ecological systems which constitute the world around us present management challenges which may determine the long-term viability of the environment. Such systems have traditionally been managed using linear, deterministic models, but increasingly their universal applicability has come into question as we begin to resolve the characteristics of emergent patterns, hierarchies and feedbacks. In her talk she discussed how scientists can resolve the dynamics of marine complex systems, how agencies may need to manage for non-equilibria and how institutions can respond and cope with uncertainty. In order to address these questions the role of data synthesis and integration was presented using other communities of practice as examples. She stressed the fact that the pace of progress for understanding is not matching the pace of change in the world.

Synthesis Activities: Reports, Meetings, and Books

The topic of outreach was revisited. Beth Turner strongly suggested the SSC present a U.S. GLOBEC seminar series at NOAA during its lunchtime seminars. The seminars could either run for a full week of back-to-back seminars or one seminar per week for several months. Beth would like to see this activity start at NOAA in fall 2007. These seminars should highlight the important accomplishments of GLOBEC. The talks should be general in that many attendees may not be experts in the field, but would be interested in learning about its broader impacts. GLOBEC should pick diversified topics so as to attract the different offices at NOAA. Beth would like the SSC to come up with a list of topics and speakers. These seminars can also be presented at NSF.

Dale will look for volunteers to present these seminars. He related these seminars to the ROMS training workshops he is giving at NOAA. These training sessions have been very successful and well attended. Dale will write a brief paragraph describing this training and will forward it to Beth.

The topic of books was readdressed. Given the time remaining in the program regional books may have to be multi-authored. Are Southern Ocean and NEP regional programs writing books? And is the SSC requiring them to write these books? These are still some of the questions that are being addressed. A commitment on the part of the writer of these books has to be made.

Zack Powell volunteered to undertake the pan-regional synthesis book. It will be similar to the multi authored JGOFs volume. He will be working on this volume during the pan regional synthesis time frame.

There will be three special sessions at the Ocean Sciences Meeting. The SSC will do what ever they can to make sure the three sessions will not overlap.

The fall SSC meeting will be held in Chicago during the week of November 5, 2007. The Executive Committee will meet the afternoon of November 6 followed by the full SSC on November 7 and 8. Possible venue for this meeting will be the Lincoln Park Zoo.

The spring 2008 SSC meeting will be held in Portland-Maine, Monterey-California, or New Orleans. The week of May 12 is preferred, but the week of May 26 will also be explored.

The final Symposium will take place in late 2010 in Washington, DC. There will be plenary session in the morning, invited talks in the afternoon, and poster sessions. It may last 3 days. Planning will begin in the near future.

Action Items

Enrique handed out the following list of action items:

- 1) Finalization of AO: the AO will be finalized as discussed. Dale will take the lead.
- 2) SSC 2008 Meeting: The time, location and venue will be narrowed down before the next SSC Meeting. Linda Lagle will take the lead.
- 3) Final Symposium: Venues in DC will be explored.
- 4) GLOBEC Model Inter comparison sub committee: Elizabeth North, Dale Haidvogel, Zack Powell, Cisco Werner, Kenny Rose, Enrique Curchitser and Dennis McGillicuddy would all like to serve on the sub committee. Enrique will start an email conversation with this group.
- 5) Speakers for agency seminars: Beth will start the email conversation with the SSC to get this seminar series started.
- 6) Formation of an outreach sub committee: Beth would like to see a formation of an outreach sub committee formed from the SSC committee before the next SSC meeting.
- 7) Poll SSC and PI's to identify "shiny rocks" and broader impacts. These accomplishments need to be addressed on paper. The SSC should be polled to determine the shiny rocks in the U.S. GLOBEC program. The PI's should also be polled. The SSC should start to generate the stories of what U. S. GLOBEC has accomplished. A suggestion was made to determine the metrics of U. S. GLOBEC papers cited in other papers.
- 8) An outreach expert will be invited to speak at the fall 2007 SSC meeting.
- 9) Follow up on looking for supplemental funding for the GLOBEC National office through outreach funding. This would be in addition to the research funding.

The above action items will be addressed before the next SSC meeting.

This meeting adjourned at 1515.