

U.S. GLOBEC Scientific Steering Committee Meeting

Lincoln Park Zoo
Laflin Memorial Building
Chicago, IL
7 November 2007

Members in attendance were Dale Haidvogel, Chairperson (Rutgers), Nick Bond (UW), Jennifer Burns (UA Anchorage), Cabell Davis (WHOI), Dennis McGillicuddy (WHOI), Arthur Miller (Scripps), David Mountain (NOAA/NMSF), Kenneth Rose (LSU), and Francisco Werner (UNC). Members participating via conference call included Michael Alexander (NOAA-CIRES) and Jeffrey Polovina (NOAA).

Guests in attendance included Enrique Curchitser (Rutgers), Pam DiBona (COSEE), Linda Lagle (Rutgers), and Phil Taylor (NSF). Participating via conference call was Beth Turner (NOAA).

Members not in attendance included Hal Batchelder (OSU), Jonathan Hare (NOAA), Eileen Hofmann (ODU), Elizabeth North (UMCES), Thomas (Zack) Powell (UC Berkeley), and John Steele (WHOI)

Dale Haidvogel, chairperson, called the meeting to order at 8:45 AM. After the initial welcoming of the SSC members present and on the phone, Dale reviewed the changes made to the agenda. The minutes from the May meeting in Anchorage were approved as written.

Synthesis/Pan-Regional Activities Updates (Intercession)

National Office

Dale Haidvogel, chairperson, announced that the national office received renewal funding on 15 September so it is good to go through 2010. He reminded all that the AO for Pan Regional Synthesis is out on the street and that it calls for proposal submissions on January 8, 2008. He acknowledged that some of the SSC will have been at or heard about the second PRSW held in September in Seattle at the Watertown and University Inn. It was very successful and had about 60-65 attendees, many of them without present affiliation with the GLOBEC program. Dale added that quite a few of them were young scientists interested in being part of the Pan Regional phase. It had a very good flow with a lot of information exchanged in various kinds of formats that included some longer, invited talks, primarily from international participants. There were some moderate length talks on strategic themes of the Announcement of Opportunity, and everyone else had a chance to give a five-minute talk. A lot of information was also exchanged at a social event every evening. A brief report of what happened at that workshop will be coming out shortly.

Skill Assessment

Dennis McGillicuddy next updated the committee on the Skill Assessment workshop. He first announced that the Skill Volume is now well advanced. Many have already heard the background behind the Skill Assessment Workshop initiative. The goal is to assess the state of the art in quantitative evaluation of coupled physical-biological models and, since this is a NOAA-sponsored activity, to provide recommendations for future progress in that area in support of NOAA's ecosystem-based management and ecological forecasting initiatives.

The workshops were organized around four different science themes as GLOBEC is not the only type of program facing this need. The science themes included:

- ecosystem dynamics and fisheries for GLOBEC purview
- carbon cycle
- harmful algal blooms
- estuarine and coastal water quality.

The cross-cutting themes are: a common vocabulary to be able to speak in specific terms about how we assess coupled physical biological models and the relationships to observations; metrics that can be used to evaluate the misfit between models and observations; and also data assimilations and the assessment of the skill of a model into which data have already been assimilated.

The first workshop was held in July of 2006, a follow-up workshop was held in March 2007 to finalize manuscripts and stimulate their coordination. They are now in the final stages of submission to a special issue of the *Journal of Marine Systems* that will be published in spring of 2008. There are 16 submissions to date. The center of mass is in the GLOBEC arena with five of the 16 papers in the category of ecosystem dynamics and fisheries, four under carbon cycle, three under estuarine and water quality applications, and two in the harmful algal bloom arena. The deadline was November first but they will be somewhat flexible.

Dennis is pleased with the way this is going so far. This particular collection of authors is committed to communicating with each other. They have a password-protected, dedicated website for the authors to download their papers so there is a lot of cross pollination taking place there. Moving toward a more specific terminology for skill assessment and also trying to advance the methods by which models are fit to observations is quantitatively assessed. They have in mind to set up a library of software that facilitates evaluation of misfit. Many of the authors have volunteered to contribute some software, too. There will be a repository for people to put useful IDL or Mat lab codes. They anticipate a final report to NOAA in the spring of next year that will coincide with sending the volume off to JMS, sometime around April 2008.

David Mountain asked about availability and McGillicuddy anticipates it will be summer 2008 sometime. Dale asked if an electronic version would be available formally prior to that. It will be available electronically prior to that.

Special Sessions

Enrique Curchitser told the committee about the submission to the AGU Ocean Sciences coming up in March. There was a fairly successful response with nearly 40 submissions to the session. About half of them are from currently funded US GLOBEC people. There are also other parallel sessions specific to the different regions. In particular, there is one on the California Current, one that David is involved with in the sub-arctic, and one on the northern North Atlantic. Enrique still hasn't heard what the session will look like, but should have at least one or two days of GLOBEC-specific sessions at AGU.

They also were accepted in the Asian Oceanography and Geophysics Society for a meeting that is going to happen in Pusan, South Korea in June. That just got going now so there are no submissions yet. Enrique will be working on this soon.

Cabell Davis will be one of the co-chairs at an AGU session with Enrique and Eileen and Hal. An abstract was submitted for him while he was at sea. Enrique invited Cabell to elaborate on that in an opening presentation that will summarize the NW Atlantic and US GLOBEC as a whole.

Nick Bond mentioned that there is also a session for the California Current system that he and Mark Ohman will co-convene. Nick said he had on the order of 30 submissions. Hopefully they can coordinate the timing of those with the GLOBEC session so they are not right in parallel with one another. Nick said they don't yet know how much time they have. No one has been told the dates or when the sessions are.

Dale mentioned that it seems there are upwards of 60 or 70 GLOBEC people involved in the sessions. Cabell suggested that the individuals presenting use the GLOBEC logo on their opening slides or PowerPoint presentations so people in the audience know what is going on.

Ocean Sciences

Dale asked Beth to say a few words about the Climate and the World's Ocean meeting. **Beth Turner** said that at the Ocean Sciences meeting, NOS is going to sponsor a town hall, or at least has submitted a request for a town hall. It will be on ecological forecasting and the transition between research models to operational models. The deadline for submitting town hall requests was later than the deadline for special sessions. Beth was not the person who submitted this so she doesn't know what the status is right now.

As far as Climate and the World's Oceans, that is a meeting sponsored by PICES and ICES with a reduced international GLOBEC sponsor effort. That is happening in May in Spain. Beth had talked to Dale about trying to get a US GLOBEC presence there specifically to outline the plans for Pan Regional synthesis. It would be of some interest to the international audience so she and Dale will be submitting an abstract on that topic.

Beth thought a poster would be the best way to discuss it. Bill Peterson is quite involved in this endeavor so he will be trying to get zooplankton folks and larval fish folks to that meeting as well.

NOAA Seminar Series

Beth next talked about the NOAA Seminar Series. After the last SSC meeting they talked about having a seminar series to show all the things that GLOBEC has accomplished. This series is the result of the previous SSC meeting discussion. Everyone she contacted said he or she would be willing to speak. However, NOAA has no money for travel so the series is on hold until money is available and will have to be postponed. The topics are really relevant and will resonate with NOAA and show the diversity of things GLOBEC has been able to do. Now that climate is suddenly such a popular topic within DC circles Beth thinks that this will be a really good venue to show the results of GLOBEC. She is hoping they can reschedule these for early calendar year 2008, although travel is still uncertain.

NCAR Updates

Enrique presented updates on what is happening with NCAR. He said there are two interesting developments. The first one is that they are seeing the fruits of our work over the last couple of years in terms of having a regional model nested within the NCAR climate model. He said they did a lot of work with that this past summer while he was in Boulder. They are beginning the testing of the model coupling and, so far, the connections are there. He's hoping that some time within the next year he'll be able to showcase a coupled regional model within a big climate model and start exploring some of those scenarios.

The second development is that Enrique has been asked to serve on a committee that will be writing a strategic document that will outline the needs for the next generation earth system model. NCAR wants this to be operational by 2015. The first step is to decide what will be in that model, including everything from physics, to ecosystems, to economic models, to impact models: They want input on everything, including what resolution these models should be, any regions that they should concentrate on, what physics, what biology and so on. As that comes along he will be contacting people in the community to give input.

Questions that arose: What kind of immediate plans do they have for using the two-way coupled ROMS CCSM? What do they want to do with it? Enrique said that once they're done testing they'll look at the NE Pacific because of his involvement with that. That is where they are doing the testing for the system. Beyond that there are plans to extend it to other Eastern boundary currents. Beyond that it will depend on whoever is interested in putting manpower into it. It will be available for people in the community to test and try.

Dale asked if there is anyone at NCAR who will be working on this on a continual basis?

Enrique said there is no money dedicated to this. It's volunteer work, which is why it took a few years to put together. Once the concept is proven they will go ahead and try to make it a more central part of the CCSM effort. On some level, there is some understanding at NCAR that they want to move in that direction ultimately. It will take dedication and dedicated people to maintain this.

Cisco Werner added that this whole NCAR effort is resonating strongly with some PICES activities linking ecosystem models and climate models. There is a PICES working group, 20 or so, that is looking at climate and down-scaling it to ecosystems. He told the committee that Enrique presented some of this stuff at PICES and he's receiving quite a bit of support.

David Mountain wanted to know if it is likely that marine systems might come into the next IPCC? Enrique said yes, it's one of the exciting applications. As Cisco brought up, Enrique talked at PICES this past week and tried to make a point there that this is what we need to think of coupled regional systems, especially for the next IPCC report if interested in regional high resolution models. He started his talk indicating there is a cottage industry that developed in downscaling with IPCC scenarios. It can be argued for a long time that's not really being done properly. It's one way downscaling for future scenarios. Enrique thinks that if they get it to work and show to the community that this is ultimately the way it should be done than this is the natural way since they have experience with ecosystems in the high resolution regional models more so than they do with the global models.

Cisco said that there is a new project being led by Manuel Barange. If members do a web search on quest-fish they'll find it. It's a project funded by the UK Natural Environmental Research Council and where they are downscaling based on LME's – Ken Sherman's Large Marine Ecosystems- models that go from physics to fish, all the way to bio-economic global markets, focusing initially on small pelagic and fish meal. Fish meal in turn is used for aquaculture and so on. They are looking at both climate change on the populations and also on the global markets and how they balance the whole issue of fish meal and soybeans and things like that to make economic and social decisions. In reference to the IPCC thing... their target is to contribute to the next assessment. Cisco's understanding is that it's going to have more of a balance of biological and other assessments and not have strictly the physical climate change assessment. That project is looking to make contributions like that. They've got a nice web site on it so people can look it up They describe the different modules all they way from the full 3-D circulation models all the way to bio-economic models.

Dale added that the idea that the IPCC scenarios could be downscaled as a useful contribution to Pan- Regional synthesis in GLOBEC was quite a theme at the PRS workshop. The topic received a lot of thought and attention. He would expect to see one or more proposals coming into Phil that bounced some good GLOBEC synthesis off of the existing IPCC scenarios.

Dale then asked is there was anything at the PICES meeting last week or the ESSAS meeting that should be mentioned.

Enrique responded that the IPCC topic got a lot of billing in PICES starting with Ken Denman, who gave the keynote address. The Nobel Laureate, Ken Denman, got an award and gave a keynote address and also talked about the IPCC report. There was a lot of talk in sessions about where that's going. In ESSAS as well they've taken the approach that maybe one of the contributions in the future could be to contribute to those reports.

Regional Program Progress Reports

NWA/GB Program

Cabell Davis, director of the Northwest Atlantic Regional Program, reviewed the five Phase 4B synthesis projects in the program which includes three copepod projects, a larval fish project, and the synthesis workshop project of Pershing and Greene.

He then showed a series of slides related to each of the projects, with field data showing that Copepods have increased during the GLOBEC years in association with the low salinity anomaly which also affects the spring bloom. There is a paper now in press in *Geophysical Research Letters*, by Ji et al. He said that the spring bloom is happening earlier. In the Scotian Shelf in the eastern Gulf of Maine (GoM), copepods affect larval fish growth. Higher copepods meant cod and haddock did better and had lower mortality. There was a relationship between mortality and salinity.

There was discussion about how far back the time of the spring bloom has been measured historically and whether there were other estimates of spring bloom that biologists made of that area or if it was always based on the SeaWifs. Cabell said a very high resolution in time and space is needed and that is why SeaWifs is the best check, although there are some issues with SeaWifs.

The point was where does the fresh water come from? Cabell said that Houghton's work indicated that it comes from the Labrador Sea.

The next slide was based on work by Green and Pershing published in *Science* earlier this year and that dealt with freshwater in the early 1990's being traced to the Arctic. The models showed NAO slope water vs. warm slope water. The surface salinity didn't appear to be related. Cabell brought this up because of the Labrador Slope water that was entering the region.

Remote forcing was the basis for the next slide followed by one that Jim Bisagni shared at the Pan-Regional Synthesis Workshop. This slide showed shelf salinity data back to the '50's and up to recent years. You don't see big pulses in salinity so perhaps slope water is coming down elsewhere.

Cabell also showed a schematic from 2002 by Ken Drinkwater that shows that some of the water could conceivably come up onto the Scotian Shelf. He said that Ken is going back to look at the slope water data and will do an analysis on that.

Cabell said they are modeling this and that they have the ROMS Model. The progress in FVCOM Physical Modeling includes the following:

- 1) Upgrade the MM5 to WRF (Meteorological Forcing)
- 2) Upgrade the GoM FVCOM to the third generation
- 3) Data assimilation experiments for the GLOBEC hindcast years
- 4) Development of Northeast Ocean Forecast System (NeCOFS)
- 5) Arctic and Global models

Cabell showed a number of slides on each of the above and gave brief informal comments about the work and the processes to further illustrate the progress being made on getting an operational ocean model going.

One of the slides represented work that Dave Townsend is doing on nutrient data. He looked at stations greater than 34 parts per thousand and greater than 100 meters deep from 1996 to the present. Cabell reported that Townsend didn't find any relationship with nitrate and silicate but found that the nitrate to silicate ratio seemed to match up to temperature. This is pretty preliminary, but he did see that there seems to be this decreasing trend in temperature. He's looking further into this.

Cabell and Ji have been doing copepod modeling. They are using the FVCOM forcing, NPZD. They have two papers in press, *Journal of Plankton Research* and *Marine Ecology Progress Series*, based on the model shown.

This is the chronological mean of the ECOMON (NMFS) data through the 1990s. Cabell said this slide is basically showing that through the June timeframe that calanus is more abundant in the shallower areas in Georges Bank.

There is an increase in pseudocalanus in the GLOBEC years in the crest region.

Cabell showed an animation unavailable to conference callers. Basically, pseudocalanus blooms up with the peak occurring when it is supposed to around the June timeframe and with the highest concentrations along the coast. Lower concentrations are near the GoM.. High concentrations of blooms in the shallower areas matches the data.

That was for 1999. They also ran the model for 1995 and when they compare the two they find more copepods in 1999 than 1995, which is encouraging. This is preliminary. They need to go back and assess the exact parameter values as to why and when this is happening. Is it food limitation effect, which they think it is? Earlier spring bloom might lead to a higher copepod concentration. Dale asked where they get the initial values for the NPZD. Cabell said it was from the climatological mean. Both start off at the same with different forcing. So far they initialize it at the beginning of each year. Cabell said

they want to run it from winter 1994 all the ways through the GLOBEC years but that's next.

Cisco asked Dennis how this compared to what he found. Dennis replied that they didn't attempt to forecast for individual years. The simulations that were published a while back dealt only with that mean climatological seasonal cycle. The data show that pseudocalanus is most abundant on the crest of the bank and then the CGoM. That's what the observations show and it looks like both models show that. Dennis was curious about the extent of the pseudocalanus in the basin in 1999. Cabell replied that Durbin did find that. Cabell also added that this is a log scale as opposed to a linear scale. Globally pseudocalanus are more abundant in the shallower areas. Dennis commented that it's clear how the transport can keep the coastal population in tact. He was curious about how the center population stayed abundant on the crest. In general it is the food limitations that cause them to die when they leave the crest.

Next was a comment on the lipid accumulation. The model sort of fits the data and they improve it more. They need to figure out how to incorporate the ideas into calanus models that they are doing next for Georges Bank. There was an explanation on the model showing the percentage of the population of the different life stages throughout the year. There are some details about this model they don't understand and they need Andrew Leising to run the model for them on specific areas of detail.

Another project is by Cisco, Tron, Greg Lough, and others. Tron is using an individual based model for larval cod and haddock. Cabell said Tron has done some really nice work on the Norwegian Shelf and they are now applying that to the GLOBEC GB area. They've chosen some selected stations where they actually applied this model, given these inputs of temperature and prey, availability of light. They found that the larval fish have had enhanced growth on GB in '97 and '99 and agree with the data. He's getting the 3-D ROMS model running in this area -- the one with higher resolution -- one that's nested in the GLOBEC model and it's almost ready. Cisco commented that next week they would be going to Norway. There was a problem with the large-scale simulation. But the physical model is almost ready. Cabell is transferring the NPZD copepod model directly to him so they can swap models. With this mesh they're not quite capturing the northern flank jet. . It will be interesting to have the NPZD and copepod -- the same model -- running in two different physical models.

Cabell commented on a grad student's proposal for a thesis that will be modeling the processes affecting cod and haddock.

He showed Avijit Gangopadhyay's project on large BASIN- scale assimilations that shows the Labrador Slope water coming down. Avijit's got some physical model runs that are available for Hal Batchelder.

Andy Pershing is continuing his analysis of Mid-Atlantic Bight CPR data on freshening in the North Atlantic issue. They are going to have an Ocean Sciences session on this and there will be a CAFÉ workshop in the spring.

Cabell wrapped up his report reiterating that they had their meeting last Monday and the reports and the talks are outlined. They're having a GLOBEC session. There's a Montpelier working group on Zooplankton Ecology and Elizabeth North has tagged on a workshop on larval fish Lagrangian models. There will be another PI meeting in late April. They are doing a synthesis volume on the NWA program. It will be published in *Progress in Oceanography*, sometime in late 2008, probably in 2009. There is going to be a workshop sponsored by the Coastal Ocean Life Institute next May to help transition NWA GLOBEC science into operational management tools. This would include a modeling observation system tied into EBM off Georges Banks, which is why it will be held at WHOI.

NEP Program

Nick Bond, chairperson of the Northeast Pacific Program, reported that the SI meeting was held in September right before the second PRSW. He passed around a handout showing the mock exercise held at the meeting. He said they wanted to get away from the usual thing where the PIs get up and report on their projects. NEP has a high number of projects (high teens). Nick had the idea to take the existing climate forecast and see if they could apply what they knew about ecosystem forcing in the NEP and actually make forecasts for what was going to be happening in the next year. Nick told them about the La Niña that is in place now and that is liable to strengthen a little and they explored how they thought the system would respond to that.

Before that, he wanted to talk about some highlights from that investigator's meeting and, in particular, some projects from which Nick had not seen a lot of results. He also wanted to talk about the Dagg project, the zooplankton gap-filling one that started late, and that he thinks is seeing some progress there.

The first slide is actually some work by Tim Cowles working with Andy Thomas in Maine. What is interesting is the use of a lot of the survey data, remote sensing and so forth, to try to determine the essential habitats at least from the lower trophic level in the California Current System. It turns out that seven or eight classes can characterize this system. It's not surprising that the coastal system is different from that off-shore. If you go a little bit on the larger scale, this is the habitat that you come out with. It's interesting in how it kind of sorts itself out. Nick thought this to be an important result that for monitoring can be valuable in where you put your resources.

David asked if this is based on SeaWifs chlorophyll data. (SeaWifs chlorophyll, SST, variability-- the kind of spatial and temporal patterns of the variability-- that these regions are coherent together.) Do they move? Presumably they can. The nature of the analysis was not to take that into account. In this kind of region, where the west wind drift comes into the coast and presumably moves north and south, those boundaries would shift as well. The basic message here is that Cowles and company seem to be making good

progress in putting together all the meso-scale data in the CCS. David said it was important that the Gulf of California become part of GLOBEC with this.

The next slide referred to some of Bill Peterson's work with a particular species of euphausiid. Bill was arguing that these blooms that occur in the winter aren't really sizeable, but that it can be important to the system in that it produces a cohort that recruits as an adult in the summer and is important to the higher trophic level. This is for the CCS part of the NEP. The focus there has been on what summer conditions are like and the forcing response. What's going in winter forcing to allow this kind of bloom, which isn't happening in a lot of other areas, could be key to the system. That's kind of a new wrinkle.

The next slide he showed was from the Dagg project. This is based on measurements and their doing some kind of carbon budgets. This is in the Gulf of Alaska and is basically the carbon flow in spring and in summer. Nick said something they've been realizing for a while is that it tends to be a large-scale dominated community in the spring and transitions to a small-scale dominated food web in the summer, which is more characteristic of the off-shore waters rather than the coastal waters. They are actually working with some models to see if they can replicate the measurements that have been taken of these zooplankton communities. The reds are the smaller cell -- in terms of phytoplanktons -- and the blues are the larger cells. It is going offshore, from near-shore to off-shore on the Seward line along the Kenai Peninsula. In May, especially near-shore, there are more of the larger cell phytoplankton than later in the summer. At least the model does have a greater proportion of large phytoplankton early in the growing season. It's not all the way there yet.

Another model result that Nick found interesting is semi-independent from that. Al Hermann and company have been running a fairly complicated biological model on top of the ROMS model. At least in May they get some patterns here that look quasi-consistent with what the observations show. Nick said it's important to have two kinds of size classes of phytoplankton and zooplankton and to have iron limitation to get it even qualitatively right. So there is some promise there.

Another slide shown was on Dave Beauchamp's work in the Gulf of Alaska on the diet of pink salmon in various years. The salmon are very opportunistic. Some years, such as in 2002, the diets are dominated by pteropods and other years they have different prey. It seems like it really matters what kind of prey you have is how much of this off-shore water gets onto the shelf versus its more coastal water. It turns out there are big differences here in survival of the pink salmon coming back. In two of the GLOBEC years it was sometimes three times as high as in two others of the GLOBEC years. It makes sense, to a degree at least, on what was out there and depending on what kind of physical conditions there were each year. In 2002, there was a lot of on-shore directed flow in the upper ocean. What Nick hasn't seen is that we haven't linked that to the large-scale forcing. We can see the response in the biology to these changes from year to year, but we don't know what causes those changes in the flow itself.

He showed another slide related to the feeding rate. When it's higher there is greater survival.

In the Gulf of Alaska, it's been known for a while that there's a correspondence between the numbers of pink and chum salmon and the Coho survival. This is in SE Alaska and based on the surveys done out of Auke Bay Lab. It's not a question of there being more pinks and chums around because there's more food so the Coho are fat and happy. It's more that the pinks and chums are predation buffers for the Coho. A lot of pinks and chums are out there and the other things are feeding on those rather than the Coho. Cisco asked if these fish are overlapping. Nick said they are, at least in the juvenile stage. Conceivably the Coho are older when they go out to sea and they could eat the pinks and chums as they're a lot bigger, but they don't find them in their stomachs. It's definitely not a question of when there's a lot of food out there and it's good for pinks and chums that's why it's good for the Coho.

Nick thought we had a story there on predation buffering. That story was based on looking at the Auke Creek Coho salmon survival, where there's a positive relationship between the hatchery release of the pink and chum and the Coho survival. But then they see there are other stocks where it is just the opposite. So that's a little discouraging. Nick said he doesn't know enough about the different kind of life histories there that could account for this.

Nick then went back to the mock exercise with which he first opened his talk. (SSC members were given a three page document that explains it more fully). The charge to the workshop participants –divided into three groups – was that the Society of Pacific State Governors had asked him to make some predictions for them. He told the groups he couldn't pull it off. The charge to the breakout session groups at the workshop was to come back and say what's going to be happening in those ecosystems and to report back.

Nick showed a table of what these forecasts from the groups were with some sort of qualitative indication of the certainty of the forecast. The part Nick found interesting was the unanimity of the forecasts for the CCS -- all the groups basically said the same thing – and how much different both the forecasts, even in the physics, were for the CGOA. Some groups said it was hopeless as they didn't know the links from the climate to the meso-scale. Others went boldly forward. The measure of uncertainty is the disparity between the forecasts. It's an ensemble of three forecasts.

Cabell asked if it has to do with the data from the areas and the history of the studies in the areas. Nick replied that a lot of it is the CCS, talking about an ENSO forcing that is certainly closer to the equatorial Pacific so it has that coastal ocean connection there. The atmospheric forcing is probably a little more robust, Nick thinks, and it's mostly understanding that the links between large-scale and meso-scale that Art has are just as well-known for the GOA. What Hal and Nick are talking about is writing up a three paragraph blurb for EOS and the experience of doing this kind of exercise. What was important was that they didn't divulge the nature of this ahead of time. They just had to

rely on the wisdom they had. He encouraged others to do something like this as their programs wind down. It was a way to stimulate discussion.

Art asked about the climate expertise in the groups. Nick said they weren't real careful about trying to make sure each group had expertise in every arena.

Ken asked if Nick was familiar with the Delphi Technique. Nick explained it to the group. You talk about your forecast formally and then go back and you have a chance to modify your forecast. Ken said it was common in fisheries as they don't really know what's going to happen. Nick added that's the way the weather service used to make their seasonal weather forecasts. It was formerly with a Delphi sort of approach.

Beth commented that this is a really important exercise. She said if we expect to be able to do what we say GLOBEC was designed to do, this is the type of thing we have to encourage within the program. It gets people a little out of their comfort zones to make speculations. Nick said they do have their forecasts written down and that the nice thing about ENSO is that it is a fairly short time scale so they won't have to wait too long to see if they were right or not. He added that perhaps they should write up the EOS article before they can verify that.

Dennis agreed that this was an important exercise. In particular, he noted, the point that Nick just mentioned (the opportunity to evaluate quantitatively the forecasts that were made). He agreed with Beth that they should think about other opportunities for doing those sorts of forecasting activities in situations where they can be quantitatively evaluated. They will come back to that tomorrow with the model inter-comparison project. He'd like to see this kind of thing gather some steam. Dale said it was a very important reality check to sit down cold and see if they made some progress in being able to answer some questions. Art then asked if there was actually a threshold specified ahead of time to indicate highs and lows. Nick said it was all qualitative but in principle you should do that. Cabell said you could expand the time scale and give them the problem up front and they could run their models and come back later. Nick said he wanted to see what they knew as a group without their doing extra work. Cabell said that for Dennis' modeling group you may want to do some actual model runs to make your predictions. Dennis said there is a sort of rule of thumb, process oriented prediction and then the quantitative predictions. Nick said for some of the Alaska fish stocks for some of the fisheries councils it is valuable information just to say it will be better or worse without any sort of quantification of that.

Beth said this also gets back to what they talked about earlier for the next IPCC report. This is exactly the type of thing they will be looking for. She suggested that they may all win a Nobel Prize.

Art asked if they were given the current conditions. Nick said yes. He did a briefing on what was going on now and what the forecasts were and from the forecast models what the sea level pressure and anomaly patterns were forecast to be and so forth.

SO Program

Eileen Hofmann, director of the Southern Ocean Regional Program, prepared a report that was presented by Dale.

Their request for a third SO GLOBEC *Deep Sea Research II* volume was approved. That volume will focus on synthesis and integration. The editors are intending to solicit synthesis/overview articles from the groups that were funded as part of the U.S. SO GLOBEC synthesis and integration phase. Eileen said they already have promises from some of the other SO GLOBEC programs. Two examples are Germany and the UK for similar articles from their program. One *Deep Sea Research II* volume is in the bag and another is being planned.

Two important SO GLOBEC synthesis workshops were held in the past three months. The first one focused on predator studies. It involved inputs from all parts of the SO GLOBEC program. This one was hosted by Dan Costa at UC Santa Cruz and included several students, post-docs, and funded PIs. The second one focused on circulation and hydrography and was held at the end of November (2007) at Old Dominion. Eileen was the host for that one. This workshop expanded far beyond the circulation modeling group. It included inputs from all parts of SO GLOBEC. It was successful and resulted in new collaborations. Students also attended that workshop. The SO GLOBEC planning office funded this.

The US GLOBEC Special Session for Ocean Sciences meeting was well subscribed. There will be many papers highlighting the results from the general GLOBEC program as well as the SO GLOBEC program. Dale commented that Eileen's office did a good job at getting a turnout for Ocean Sciences from their group.

A special session that includes SO GLOBEC and ICED has been accepted for SCOR Open Science meeting that will be held next summer in St. Petersburg, Russia. Abstracts for the meeting are due in January. The ICED Science and Implementation Plan has been reviewed now by International GLOBEC and IMBER Science Steering Committees. The reviews are being summarized. Eileen and Gene Murphy expect to receive them soon and will address the concerns. They believe that at that point the ICED program should be formally endorsed by International GLOBEC and IMBER. Eugene and Eileen are hoping this will happen by the end of the year. There will also be a special session focused on ICED at the International Geosphere Biosphere Program Congress which is in May 2008 in Cape Town, SA. The IGBP Congress will unwrap ICED there in May 2008. They hope to have a formal endorsement so they can make a big splash at that session. They are hoping that ESSAS will also be a part of that special session.

Dale asked for comments on the report from Eileen. There were none. He then added that much like NEP and GB there was lots of activity on the special volume side and participation at the national meetings. Nick also mentioned that they have a special issue in the works. Fourteen papers for the NEP have been submitted. Almost all have been

reviewed. The vast majority are from the CGOA, which hasn't had a lot of publications compared to the CCS, so there is a little catch up there.

Dale asked if there was any thought for what comes after this special volume. Nick said that he and Hal think a publication would be appropriate that is much in the same form as what Georges Bank plans. It would be something that would be a coherent, multi-author special volume. Dale thought perhaps something that would be more coordinated than a collection of special papers and Nick agreed. Dale thought that would be a good idea and more palatable to their rank and file. Nick said that it will take more time and put them a little out of their comfort zone in terms of the things they normally like to write about.

International GLOBEC

Cisco Werner presented a slide show to update the committee on synthesis and next steps plus regional and national program syntheses that are happening through symposia. Cisco verified with Dale that the U.S. contribution to the international newsletter will be in the April newsletter. There have already been several other country contributions that are very nice. There are some dedicated journal issues beyond that. His talk covered new programs, a GLOBEC book, the Rome symposium, and the third open science conference, and the merger with IMBER.

He showed a map with the six countries involved in synthesis. There are six regional programs. These include: PICES 4Cs, ICES 3Cs, SO GLOBEC small pelagic fish and climate change with SPACC, ESSAS, CLIOTOP, and ICED, which is a joint GLOBEC-IMBER Program going forward. The colors on the map also showed countries that at some point had a GLOBEC program.

3Cs had a synthesis symposium in Norway in 2004 and there is a cod book coming out any moment. It's part of the IGBP series. It should be out in the next two to three months. It's everything you need to know about cod from the science side. The PICES 4C's synthesis happened in Honolulu in 2006. Hal Batchelder, guest editor for the volume, hopes to have all of the papers to Cisco for *Progress in Oceanography* in the next two months or so. ESSAS had its open meeting in British Columbia in 2005 and they have a special issue in *Deep Sea Research* that's about to come out. CLIOTOP has its first Open Science meeting in La Paz in Baja, CA this December. SPACC has a meeting 2-6 June 2008 in the Canary Islands on The Dynamics of Easter Boundary Upwelling Systems, so California Current should play a big role. Cisco wasn't sure if it was too close to the AGU Ocean Science meeting or not, but it should bring that whole community together. Dale asked who was sponsoring the SPACC meeting. Cisco said GLOBEC, the French Institute of Research and Development are behind it. IMBER also is a co-sponsor as is Euro-Oceans. Pierre Freon from IRD and Manuel Barange from GLOBEC are among those making up the program and would have details. The call is out, so interested parties can do a web search to find the information. SPACC also has all the chapters of a SPACC book that, hopefully, will be published in time for this meeting. It's a synthesis effort of all the SPACC programs. Ken Rose is in one of the chapters, as is Cisco, even though neither one was ever in a SPACC program.

The last one is SO GLOBEC which is morphing into ICED. ICED did get the reviews of the Science Plan and are digesting them and will be passing forward the comments on to Eileen and Eugene on what the reviewers concerns were. It will be pretty tricky writing as there are some concerns that don't seem appropriate for the Science Plan. But they want to take into account what the reviewers said and consider which part gets addressed as the review goes on.

They met last week with Julie from IMBER to discuss how this goes on. They formed a joint review team with a lead person from GLOBEC and a lead person from IMBER. Seven of the ten requested reviews are in. They point to some things that were pretty strong but not appropriate for the science program. Cisco doesn't think there will be a problem. They want to make sure to transmit the reviews in the next three weeks.

Cisco and a few others are taking the first few reviews and are summarizing the points to address and will send with a cover letter to their executive committee to review. Once it goes past the executive, they will pass it to Eileen and Eugene for consideration.

He then showed a calendar of activities with those events that have happened and the new ones to come. He highlighted the main meetings they have on the synthesis schedule for GLOBEC International. They noted that two programs were to be in Spain.

Cabell asked about the end of the International GLOBEC program. Cisco said the International GLOBEC Program Office (IPO) will lock their doors in March 2010. Most of the activities will end at the end of calendar in 2009, following the Open Science Conference in Paris. They are using "open science conference" as opposed to referring to the third open science conference because of the transition to IMBER

Cisco announced that Ian Perry will be the new chair of GLOBEC International as of 1 January 2008. Ian and others are hosting a conference with a goal to begin to look at the marine socio-ecological impacts of marine ecosystems. It's an outgrowth of the four working groups and it is trying to bridge the natural science and social science efforts. It will be held at FAO in Rome in summer 2008. Cisco suggested that SCS members think about going to this conference as they think about transitioning science into social systems.

Next he showed a slide on the final book. There are four sections.

- 1) Climate and Human Impacts
- 2) How ecosystems work
- 3) The Human Dimensions of Marine Ecosystems Change
- 4) Looking Forward

They have agreed with Oxford University Press and the first draft was due 1 November 2007. Each chapter is about 30 pages. They are hoping to have it done by their Open Science Meeting in May 2009.

Next he showed a slide and talked about the Open Science Meeting. The exact dates are not set because IOC will not accept room reservations before 18 months in advance of the date. As a result they have to reserve the space day by day. They want to go as late in May 2009 as possible for various reasons.

The final structure is to be determined. They will possibly follow a PICES model with targeted two-day workshops before the meeting, which tend to be productive because they involve more people. The sessions would focus on GLOBEC achievements and celebratory things. There will be sessions that will highlight the new programs -- CLIOTOP, ESSAS and ICED. Next they will then talk about the transition task team and the transition into IMBER and what happens next. This is why it's not being called the "Final" Open Science Conference because they want to make sure there is a continuity of questions and ideas left over from GLOBEC going on into the next program. There are no sessions proposed yet.

Cisco then showed a timeline slide showing when GLOBEC International started in 1999 on into the integration phase and moving toward the merger with IMBER. He said they have formed a joint GLOBEC-IMBER transition task team. This is sponsored by IGBP and SCOR. John Field of South Africa will chair the eight-member team. They tried to have representation of disciplines, countries, programs, gender etc. Members are: Eileen Hofmann from ICED; Roger Harris, Olivia Mari from CLIOTOP, Ken Drinkwater from ESSAS, Mike Roman, and Kei Cheng Ten from China and others. They will be tasked to develop a supplement to the IMBER science plan implementation strategy to then be folded into the last five years of IMBER. IMBER goes to 2014 and they want to make sure that transition team captures what the science plan should have, in addition to what it had to properly handle the questions that were left over from the GLOBEC community.

Cabell asked if there are any GLOBEC-type people on IMBER. Cisco mentioned Colleen Maloney. Dennis thought perhaps Ann Bucklin was on it but Mike Roman replaced her. Cisco said GLOBEC and IMBER are constantly in touch and they have representatives sit in at each other's meetings.

Transition Update and Discussion

As **Dale** told the Executive Committee members yesterday, this is the last meeting of the Scientific Steering Committee in its recent configuration. The SSC is going to morph into the Standing Committee for Synthesis (SCS), sort of a downscaled version of the SSC that will have the job for looking at and ensuring the success of the synthesis phase in its final three years. The concept has been that members of the SSC who were scheduled to rotate off the SSC this year will do so, reducing the membership by two in this case. The remaining members of the SSC after 2007 will compose the SCS.

Dale then showed a chart of the continuing members. They are: Dale, Mike, Jennifer, Jon Hare, Dennis, Art, David, Elizabeth, Kenny, and John Steele. Ex-officio members will continue to be welcome at future meetings of the SCS. That includes seven people. The further concept is to reduce the number of formal SCS meetings to one per year. This is

the last year in which the two per year schedule will be maintained. The concept, subject to discussion, is to have one formal meeting a year in the spring and an opportunity again to get together for those who take part in the fall Pan Regional Synthesis Workshops. The idea is to have a PRSW in each of the two coming falls, 2008 and 2009. Those workshops would be attended and participated in by the PIs and others associated in the funded Pan Regional Synthesis projects. That workshop would afford an opportunity for some or all of the SCS to meet in the fall of each year.

Dale said they have already identified several high priority areas for activities. At least two of those have identified subcommittees, subsets of members to take part in those activities.

He then showed a slide with the two subcommittees. One is the Model Inter-comparison Subcommittee with Enrique as the chair. During intercession, David Mountain has given thought to formation of an outreach subcommittee which he would chair. He has spoken with a group of people to be members of that committee. TO date, they include Nick, Dale, Eileen and Art.

There will be need for additional subcommittees. One needed is a small team of people to work on the final symposium. Thinking on that began in earnest among the Executive Committee yesterday. There is a lot of detail and legwork to be done to promote and carry off a successful symposium. Dale said there will be more about that this afternoon when they discuss prioritization and what they want to accomplish in the next three years and who will do what.

Personnel at the national office who stand ready to help in these areas include Dale, Enrique and Linda. The office has a little bit of support for our web person and enhancement of the US GLOBEC website is a high priority as well. Part of the thinking behind the discussion of prioritization is keeping in mind that the office has finite resources and needs to be sure that what the group commits ourselves to doing is achievable given the levels of support available.

Dale had one addendum to that description of our office personnel. David Mountain will hopefully be joining the national office in a more formal capacity to look after our interests in the direction of ecosystem based management and education.

Outreach and Education

David Mountain said the initial thinking has been in two primary areas.

- Ecosystem-based Management (EBM) in collaboration with NMFS.
- Education in collaboration with COSEE.

He first talked about EBM. The primary outcome would be to have three or more GLOBEC capabilities/models transition to NMFS for testing/demonstration/application. Dales asked if this was something from each of the three study regions. David hoped there would be something from each of the primary regions.

EBM is in development within NMFS. David said he talked with Ned Cyr at NMFS for starters. Ned and John Boreman said they would be interested. This gives the connections to other NMFS groups in the different regions. On David's slide he indicated just what the proposed approach would or could be:

- Workshop 1 (summer '08)
NMFS approach to EBM, GLOBEC possibilities,
international examples of success
- Workshop 2 (spring '09)
NMFS and GLOBEC identify specific capabilities to
transition and pick the lead persons on each side
- Presentations at final Symposium (spring '10)

This is something, at least from the NMFS side, that is evolving. And, internationally this is evolving. There has been a lot of documentation and written reports about basic ideas on how to do it.

Ken mentioned that in the Gulf of Mexico there have been two workshops. Billy Christiansen and Carl Walters have come into sessions where they did an eco-path, eco-space approach. Ken offered to get the web site so David can know what is going on. They looked at some issues that are relevant down there. Shrimp by-catch effects on red snapper and that kind of stuff. David recalled that Beth had mentioned the town hall to be held at the Ocean Sciences meetings and the WHOI Ocean Life institute meeting next spring. Ken said the Gulf effort was unique because it was driven by the Gulf Council. Ken said he is a member of an ecosystem SSC for the Gulf of Mexico.

Dennis suggested making some connections with harmful algal blooms forecasting initiatives that have been developed around the country. One that is operational at the moment is led by Rick Stumpf at NOAA for the Gulf of Mexico west Florida shelf that recently expanded into the Texas part of the Gulf of Mexico coast and will now expand into the Great Lakes. They have in mind a few other regions to address in the future. The potential information they might share will be at a very general level as they are targeting user community rather than a management council per se.

Ken said there is a difference between ecosystem-based management and ecosystem-based fisheries management. Art asked the difference. Ken said that one is looking at how you manage fisheries, taking into account all the other critters out there. And the other asks how you manage the entire ecosystem based on some concept that perhaps the best outcome might be no fishing. It's more than semantics. There is a philosophical difference. He said we were doing ecosystem-based fisheries management.

David said that in this case we've been thinking more of fisheries management with NOAA. Cabell mentioned that there is a huge web presence at the Duke Lab, if you look at ecosystem-based management. There is an effort to consolidate everything and it is huge. He thought it might be worth checking out their web site.

Pam DiBona from COSEE wondered if COMPASS had come up yet. Cabell said that the group that formed that was one of the first groups to sort of define what ecosystem-based management would be. Andy Rosenberg was part of that group of scientists.

It was suggested that Beth Fulton from Australia be added. She's remarkably active. And the FAO has published technical paper number 477 that would be worth looking at for models and approaches.

Dale asked about the size of the workshop and the financial planning behind them. David responded that he thought they would be small and focused. There may be a dozen people at each one with appropriate representatives from the different sides. This is trying to be very targeted at getting a product transitioned at the end. Each would be about a day and a half long so you could keep people focused; probably not more than two days.

That's the first area for outreach. Dale asked what's next in order to move forward. David said NMFS has indicated that they will write a letter of support on collaboration to pave their way for their investigators to attend. The GLOBEC National Office will pay for all others.

Dale proposed to proceed in this direction as outlined. There were no objections. Ken commented that it should be done but that there have been past efforts. He reminded all that it's much harder than it looks. If it results in one good example, that would be a significant advance. Dennis added that there was a workshop a few years ago that Beth Turner had organized and there was one tool on the use of particle tracking techniques that was used to make informed decisions in respect to the closed areas in the scallop industry. That is one nice, shiny example already in place.

Beth asked Cabell how this related to the workshop he is having on the Gulf of Maine. Cabell said they would like to transition some of the biological-physical modeling work that they've developed through GLOBEC NWA into operational tools that managers can use, not just for fisheries, but for all the things related to nutrients, the whole ecosystem, and the physical model itself. They want to tie this in with an observation system for the GB/GoM area. There's already the ORION shelf break NSF-funded project for the observing system. And there's IOOS putting money into observing systems. There's a lot of independent activity going on and they want to pull these people together with potential end-users and stakeholders. There is a lot of groundwork to do before then so there can be a productive one or two-day workshop. The Ocean Life Institute is putting in some money to get this together and to help catalyze this. It's going to become clearer after the scoping session at the end of this month.

Dale commented that this is an important activity but might not qualify as the lowest hanging fruit. It's perhaps a medium term goal. Cabell responded that one of things they need to do right away is the observation system simulation experiments. People are building this hardware out in the ocean without having done the synthetic assessment of the best structural design for the observing systems using our available modeling tools.

The example he gave was GM wouldn't build a car without modeling it first. For example, what's the best arrangement of time and space for these samples?

Dale said that NOAA is also hosting an ocean forecasting workshop in January 2008 in the DC area. There are three workshops on the table here, and probably more. There is the one David is proposing; the one Cabell is referring to; and the one NOAA has already put together so there is a need to make sure they are synergistic.

Ken noted that there is a difference between spin-offs from the various tools that have been produced and influencing fisheries or ecosystem management. There may even be a little overlap. To him this was a different angle than a search and rescue. When he hears ecosystem-based fisheries management it is very specific in his mind, although it may not agree with anyone else's. Cabell said this is broader than the regional area.

David said the GLOBEC outreach may be broader because it's more national. But it also may be more focused in that NMFS is under the gun to start initiating EBM activities, demonstrations, whatever. Each region has been given a million bucks to start to do some of these things. This is to try to bring together what they have in their minds with what those in the sciences have developed to start moving toward applications in EBM. This will be a path into application. If not immediately implemented operationally, it can be seen coming.

Ken said the more you get into this the more you get ingrained into the process. All stock assessments are done in a uniform way. There is a data workshop, stock assessment workshop, and a review workshop, which is interesting because the review workshop comes last and there is no way to cycle back. That is the process.

Cabell said one of the terms of the OOI funded workshop will be to get the different agencies together, too.

The next slide presented dealt with the second area of Education and Outreach in collaboration with COSEE. There would be two basic types of outcomes.

Outcomes:

- Three or more GLOBEC results and/or investigators involved in COSEE activities/events

- Report how large programs like GLOBEC could do better at education outreach and interaction with COSEE

In doing this, David contacted Susan Cook of the COSEE Central Coordinating Office. She contacted three other COSEE council members: Pam, Janice McDonald at Rutgers and Gail Scocroft at URI, who support the collaboration.

Approach:

- GLOBEC outreach coordinator & COSEE CCO play match-maker to pair GLOBEC investigators and one of the COSEE's

- Workshop (winter '09)
Attendees from GLOBEC, other large programs and COSEE (or other educators)
- Presentations at final Symposium (spring '10)

The Outreach Subcommittee names were shown on a slide. David said there wasn't too much arm twisting in getting individuals to say yes to serving on this committee. The committee members are: David Mountain (chair), Dale Haidvogel, Michael Fogarty, Nick Bond, Art Miller, and Eileen Hoffman

This concluded David's presentation.

Art said that serendipitously he is serving on an advisory panel for the Birch Aquarium that gives advice on possible future exhibits at Scripps. Conceivably there could be a GLOBEC exhibit set up. If the SSC would be supportive of that, it would need to have seven or eight or nine good ideas for some themed thing to do -- either to look at or play with for kids and/or that shows the work GLOBEC has done. They have a person at Scripps that decides if that would be practical. It might be limited to something like five components to a GLOBEC exhibit.

Dale wanted to know how often they rotate these around. Art replied that it takes about two years to develop this so it would stay for at least six months to a year. Dale commented that in two or three years the SCS will be closing things out so if there could be a nice exhibit at the Scripps Aquarium that would be terrific. Art added that if they thought it was really good enough they might pass it along to another museum. Everything there is done on a shoe-string so if there was any small amount of financial contribution to help build this exhibit, whatever that might be, even small amounts of money would be helpful. Dale said that falls within the purview of the outreach committee but that it would be a high payoff.

Dale asked for further questions for David. There were none.

Guest Speaker Presentation

Pam DiBona, an executive council member of COSEE, spoke about her perspective on where the partnership between US GLOBEC and COSEE might best be developed.

Pam, manager of COSEE New England, started by handing out the spring issue of *Current Magazine*. There are several items in the magazine on different aspects of COSEE. She then presented her PowerPoint presentation, beginning with the title slide explaining COSEE Stands for Centers for Ocean Sciences Education Excellence.

Next she showed how and when COSEE was set up.

Originally there were just six centers funded. Currently there are eleven centers. She mentioned that Rutgers and WHOI are thematic centers on observing systems.

- Since 2002
- NSF-initiated, NSF- and NOAA-funded
- Eleven thematic and regional Centers
- Informal-formal-research partnerships

There are several different nicely packaged projects at these centers. Each center is made up of an informal education institution, a formal education institution, and a research institution. So they start from the point of view that there's good to be had by matching up scientists and educators.

Dale asked how long the centers last. Pam said the first round was five years. There was another of three years. You can reapply. COSEE New England was not upped this time around. They were going for five years so they'll be carrying on some aspects of what they were doing. She'll talk about this a little later. There's a program review in 2010 with NSF program officers in the Ocean Sciences in the education directorate. There's a real push on now to try and show some good results.

Cabell asked who the target audience is and if it is K-12. Pam said it is really K through college and even graduate students. She also said it is even the general public when you are talking about informal science education institutions as well. She included places like the New England Aquarium or Scripps or the Sea Coast Science Center or the Monterey Bay Aquarium. The Lawrence Hall of Science is one of the partners in COSEE West. The idea is that you're getting a lot of bang for your buck by having everyone sitting at the table together.

She said the 11 centers have an overarching network. The mission for this overarching network is to spark and nurture collaborations among scientists and educators to advance ocean discovery and make known the vital role of the ocean. Having this central mission is important as these 11 centers each have their own PIs, their own programs, their own advisory boards. A couple of times a year they meet as a network with a governing council. This is directly relevant to what GLOBEC is talking about doing. The network is going through some gyrations on how it is staffed. What's happened is that the centers have decided it would be useful to pull a little more in the same direction.

The network has been coordinated by this central coordinating office that sits at CORE in Washington until February. Sue Cook is the PI and this month there should be another RFP from NSF for a new, central coordinating office. Pam said that she is part of an interim coordination team that's trying to bridge COSEE -- the network -- between CORE and what will come next. She's been asked to keep track of and build more networking among other organizations, nationally and regionally. She is to help the regional and thematic COSEEs do more in terms of partnerships outside of their own PI make up.

The next slide showed the COSEE network blueprint. The slide listed the following points.

- Five Strategic Goals
- Two- and five-year objectives
- Intended impacts
- Measures of success

She also referred to page three of what she handed out. She said they put together a plan that has five strategic goals with short and long-term objectives. They are looking at Network Goal Number Two in terms of doing more collaboration with additional scientists. The goal is to better integrate the ocean research and science education enterprises. NSF's whole idea is to get scientists better at working within the whole education field.

Next Pam talked about connections. She presented a slide with the following points on it.

- Individual Centers
- Regional partnerships
- Intra-Network collaborations
- Inter-Network partnerships

The blueprint is from the network level, but all of the centers have signed on. The centers will be going at the goals from their own directions. There may be individual centers that come up with the best programs ever and export it. There might be regional partnerships. At COSEE New England they've started up a New England Ocean Science education collaborative. This is a larger regional effort than just COSEE New England. Now they have 20 organizations that have signed on with this collaboration and are moving ahead toward these goals.

Pam also is trying to get more of the centers to work with each other and really build on what each other is doing. They also haven't done a lot in terms of inter-network partnerships. As a COSEE network they haven't teamed up with any other large networks. GLOBEC would be a pretty fruitful initial effort to team up with another network that's aiming for the same thing.

On the next slide she had listed categories of innovation for broader impacts.

- K-12, higher ed hands-on curricula
- Exhibits
- Mentoring/career guidance for youth
- Joint workshops
- Guide to EPO for scientists

Pam then gave examples of projects they've done already. She said COSEE has worked really hard to have scientists sitting at the table with educators to develop curricula. It is a hands-on curricula for K-12 and in higher education for undergraduate and graduate students. It is such a thing as communicating ocean science. Undergraduate and graduate students in ocean science have gone through a four-credit course that talks about how you

communicate what you're doing to the public, whether it's the general public or its students when going into a classroom. They've also developed some of the regular curricula you might have in middle school where you take kids out in the research vessel or just on a regular old boat to get the kids excited about ocean science in particular and science in general.

She said COSEE has a great exhibit at the Sea Coast Science Center in Rye, NH. It was a joint project with NH Sea Grant. It is a hands-on exhibit where people can come in and look at real time data from ocean observing systems out off the coast of NH. They can talk about what that's all about and why you need to have real-time data. So COSEE has come up with a model of how scientists can work with informal educators to get from an idea to an exhibit, how to fund it, and all of that.

She said they've done some mentoring programs, matching up scientists or researchers at New England Aquarium with teens who have shown some interest in science. It is a real workplace career-mentoring process. They've come up with joint workshops with educators and scientists on what a scientist is going to talk about when they come to the classroom and what kind of story will really grab the kids. They're putting together a sort of train the trainer thing so they can spread this model around.

She presented a guide for scientists on how to do education and public outreach. They've had several curricula published in the *National Science Teacher Association* Journal that scientists have developed. They've had joint presentations at ASLO meetings and others. There's been a lot of cross-communication and real, mutual understanding of what each other is doing day-to-day that is gratifying.

Jennifer asked if COSEE is linked to the ARMATA program. Gail Scocroft at URI is bringing the ARMATA project to the table as part of this interim team. Jenn explained that ARMATA is a mentoring program that brings teachers into research. Researchers do some training so the teachers can then go back to the classroom to teach science better to their students. You can put ARMATA into your project and get some funding so teachers can go out on the cruises and come back and better explain the science.

Pam then initiated a discussion of how GLOBEC and COSEE might be able to do this cross-collaboration. She said they could talk about lessons learned, timelines involved, and perhaps have a brainstorming session.

David commented that it may be as long as ten years ago that there was a quasi-GLOBEC entry into the New England Aquarium with an exhibit on Georges Bank. Ari Epstein, who did his PhD under Beardsley, developed the GB exhibit. The exhibit is long gone. Pam agreed. Pam mentioned there will be several COSEE presentations at the Ocean Sciences in March. David sees that as a chance to interact then.

Nick asked if there are interactions with universities directly. He knows that U of Washington got some support under this diversity initiative. Conceivably there could be some interactions there that could be exploited. Pam said that there is a COSEE based

there, the Ocean Learning Communities. She said that you'll find just about anywhere you are there will be a COSEE connection. In many cases, the formal education institution unit is a college or university partnership.

Jennifer asked how they deal with those who are not near a COSEE site and interested in participating. For example, the nearest one to Jenn is in California. Pam said there is a new COSEE in Alaska, but their funding isn't official yet. She thought it would be in Anchorage but Jenn thought it would be in Fairbanks. Not all the information on it is out yet.

Even if not near one, the thematic COSEES are supposed to be national in scope. For example COSEE Ocean Systems based in Maine is really based on the web. They are doing a lot of concept mapping, connecting the smallest corner a researcher is working on with all the larger ocean literacy principles.

David mentioned that one of the areas GLOBEC scientists could bring to the table might have to do with climate change. How do you go about it? The various projects here might put some reality or data on it. One of the things is how you go about studying climate change, as it's not something that is obvious. What do you do when you get up Monday morning in order to go do that? Another one is where the scientific method is taught. When dealing like GLOBEC does with natural systems, you don't necessarily control anything. You're doing science from an observational point of view as opposed to a strict experimental point of view. There are experiments, perhaps, but they're not in a controlled sense.

Dale asked for specific examples of activities that would advance Goal #2 that would involve GLOBEC. Pam said there is a whole list of two- year and five year targets, but that this was put together in a vacuum, sitting in a meeting in DC. She mentioned the exhibit as an example. She thinks that's a really great hands-on way for scientists to get this idea across. You can sit down with an informal educator to help you figure this out. Together you can think about how to communicate this idea so people will understand it.

Pam said that at the National Marine Educator's conference there was a researcher and a teacher who co-presented. The researcher is an underwater photographer who was so inspired by what he was seeing down there that he went back to get his Ph.D. Now he's using the photography to do his research. He discovered the florescence by shining specific wave lengths of light. In the deep he sees new things and whole new patterns. He was able to sit down with the teacher and say that this is a new way of investigating the world. It really gives kids a new way of looking at what's happening just by taking this research tool he's come up with.

David mentioned an example in Maine. He said there is a teacher who was working with Mike Sieracki or someone at Bigelow. They have a thing called "What's for Lunch"? They're taking satellite imagery and they're trying to predict. It's dealing with the spring bloom. It's taking data from off GoMOOS and from satellite and having the kids learn about how spring blooms happen and the research that's gone along there. And then they

are making forecasts about when the spring bloom is going to happen. They can see by the end of the school year how well they're doing. It's getting good press at least but sounds like it could be very successful and useful in the school. Kids in Kansas could do it as well since it's coming off the web.

Pam said they're also working on ways of evaluating how it's really impacting the students and the scientists. Not all scientists are into talking to particular audiences so there is a lot of facilitation that has to happen to figure out matches. One of the things they tried at Woods Hole was a registry of volunteers, the ROV. The idea didn't work very well. The idea was that the scientists were to go on line and put what they were working on and could help the teachers with. The teacher could go online and see something that might be interesting. It didn't work because even if the scientist would put something up, the teacher might be too intimidated to call. It needs somebody who knows both pieces of it. It needs a lot of follow through and facilitation.

David commented that there is so much available on the web that it is overkill. Teachers are so hemmed in that they are teaching to the test, especially in Massachusetts. COSEE has tried to get ocean science in there. Pam mentioned Rob Stevens and his doing a whole lesson on waves. They are teaching physics using ocean science. They're sneaking in the ocean message and meeting the teacher's need to do something with physics.

Dale wanted to know if any of the COSEE sites are specifically involved in curriculum development. Pam said a lot are. Each site has what their strengths are depending who their partners are. In COSEE New England they have an Ocean Science Education Institute where they bring the scientists and the teachers together for two different workshops. At the end of the workshop they come up with a curriculum that can be shared. That's one thing this partnership would need to have and that is a contact person between GLOBEC and COSEE.

Dale said he always thought that GLOBEC as a program would be a great source for curriculum for an overview course in marine science. Examples could be drawn directly from GLOBEC because it spans all of those disciplines. If wanting to proceed toward a graduate curriculum grounded in GLOBEC, which COSEE partners would be most appropriate? Pam said there aren't too many focusing on graduate curriculum. Dale suggested it could be undergraduate as well.

Pam suggested that they figure they have the system down for teaching graduates and undergraduates about ocean sciences. It could be that something about EBM would be what GLOBEC would want to contribute to that puzzle. It could be something that isn't already in the curriculum for students and that isn't easily developed by staff that is already at the university.

Dale asked Pam if the prevailing feeling is that they know how to teach marine sciences to graduates and undergraduates effectively. Pam said they could bring that up with the group when she goes to her next council meeting at the end of this month. She's on the agenda to talk about what happened here at the SSC meeting.

Cabell said it seems that COSEE is more about recruiting students into the science and educating the general public. Once the students are at the graduate level it seems removed from what COSEE is all about. Pam agreed that COSEE's interest might be more how to snag these budding scientists to be future partners with educators. Cabell said that GLOBEC is all about how climate change affects ecosystems and populations. How does GLOBEC get that message out to the general public and to K-12 at a level they will grasp and be entertained with?

Pam said that COSEE Ocean Systems, Annette deCharon at University of Maine, has chosen climate change as the first concept she will focus on. Each center will have its own focus so it can figure out which ones are working in earnest on that issue and match GLOBEC up.

David said one of the things in EBM coming out of programs like GLOBEC that's somewhat new is the sophistication of models and the visualization of things that are connected through physics on through to biology. The models can be overwhelming. Can those types of modeling capabilities be put into some way that can be used in an educational form?

Pam referred everyone to page 26 in the *Current Magazine* that showed a chart to help everyone think about how they communicate with different audiences based on ocean observing systems. This sort of thing can be applied to the models. There are a lot of lessons COSEE's learned that they're happy to share and they can match GLOBEC up with people who are already doing things and to learn how they went about it.

Dale said that the ball is in our court to come up with possible suggestions on projects and then engage in a dialog with Pam on who the best partners are. Pam said she imagines that if she had an educator come and sit with this group, the person would know exactly how to go about setting up that project with GLOBEC research.

David said that one of his ideas is to have COSEE recommending who best to recommend to GLOBEC to engage in this discussion. Pam said she was pretty sure she could come up with a list of three or four people from the network that would have a good sense of the type of things that would work.

Cabell said that we are divided into regions of the GoM and then the Southern Ocean. There is this pan-regional approach. COSEE is regional and then there is the thematic area which says COSEE Ocean Systems. It could be more pan-regional. Dale said the concept of working with someone in the broad sense to cover all of the GLOBEC study sites would be attractive.

Pam mentioned that since this magazine was published a couple of different thematic study sites have come up. She referred to a page about each of the ones still here. She noted that COSEE Ocean Systems is mentioned and that's one of the ones she would put in discussion with GLOBEC.

She said if we go to COSEE.net that is the network website which is being revamped to be more useful. There also is a COSEE search where you can enter in a particular topic and it will search all of the sites. She's not sure how refined that list gets.

Dale said the next step is to get a small group from each side talking. David said that the sub-committee represents each of the different programs. He then suggested that we work with Pam to identify the right people to talk to on the COSEE network side. David said this isn't limited to GLOBECians in the final phase of synthesis. Dale agreed.

AFTERNOON SESSION

Dale welcomed everyone back after lunch and stated that the rest of the meeting is available to talk about priorities for special projects in which the national office would be involved, possibly with other groups, on a case by case basis. The SSC has talked about several of these already. The idea is to have a roadmap all can follow for where we want to be in three years in terms of what kinds of special projects, deliverables, and impacts we want to have by the end of the program in 2010. There is a need to identify who's going to take the lead on the projects and in what order of priority they stand relative to each other. The program time is finite and shouldn't get involved in so many things that nothing gets done by the end of the program.

He showed a slide of a table with some of the special projects. The slide showed the following as high-priority projects:

- Web Site (National Office)
- Publication Database
- EBM Transitions
- GLOBEC Datasets
- Final Symposium

(Note: Mike Alexander joined in on the conference call at this point.)

There are some special projects that in Dale's view are essential. There are five such items on that list as it stands now. Dale said a few words about where we stand on each.

1) The web site is static and hasn't been redesigned or tinkered with in a long time. It isn't very engaging. That will be the next big project that the national office is engaged in following this meeting. That will involve others who have interest in web design. Principally this would be the national office working with David Robertson, the IT guy who would actually do the web work. There are several different kinds of ideas what we might add to the web site other than more color and an engaging format.

One idea from Beth was to have a portion of the web site devoted to contributions from US GLOBEC. What has GLOBEC contributed that sort of highlights in a very engaging, accessible style as to what accomplishments have come forth from the program? Another possibility which mimics web content at many of our institutions is perhaps a GLOBEC

scientist highlight feature or GLOBEC scientist in the news kind of feature. Dale presumed that if we were in touch enough with people in the program that one or another must wind up in the news, hopefully in a positive way, fairly often.

2) The NCO wanted to make sure that the publications database was as effective and up to date as possible. NCO spent some time in the intercession looking at the publications database. Dale forgets how many papers are there now, however, there are some for which the information is clearly not complete. Several papers for which we are missing contact information for the senior author, some who clearly must have been published by now or not. It's a relatively small fraction of the papers. Most of them are in good shape.

Art asked if allowed to put the PDF of the papers on the web site. Dale thought it would depend on the journal. Dale continued on that it would be nice to press a button and actually view them if that is allowable by the publisher. He said they started off by trying to backfill information for publications with information that was clearly out of date or incomplete. They formed a list of publications with missing contact information and will try to fill that in. For most missing contact information we at least one or more of the authors is known so it will be relatively straightforward to reestablish contacts in each of those cases. Once done with that, they will flag publications for which the information appears to be out of date. Ongoing will be the effort to make sure that all the information in the publications database is as current as possible. Next will be to enhance it in ways that are efficient and that lead to greater appreciation of the publications that are coming out with GLOBEC contribution numbers. One thing, which is fairly straightforward, is to once a week to send out a message to those who are subscribed to the service that informs them of new GLOBEC publications that have come out that week. Art's idea of making PDFs accessible for those for which it's legal is a great idea, too. The notification could be accompanied by an indication that PDFs for some or all of them were available by clicking here or something to that effect. That's essentially underway. There's probably more that could be done. What we certainly want coming out of GLOBEC is to have an up-to-date complete database, to make the entries in that database --the papers-- effectively available, and to let people know on a regular basis that more papers are coming out. Certainly both the website and the publications database and other things on this high priority list want to be available into the future. The need for them won't disappear in 2010. Certainly they should be in a form that can be curated in an effective and efficient manner.

3) Final Symposium. Dale said the SSC talked about that and alluded to it here this morning. The Executive Committee had a good start on a conversation about the final symposium and he'll come back to that in a minute.

4) David introduced some ideas, which were discussed earlier, about a process that could begin the transitions from U.S GLOBEC to uses of EB/fisheries management. This will be overseen by the Outreach Subcommittee and they have a blueprint on how to proceed that was talked about this morning and endorsed as a committee.

5) A high priority is the preservation and availability of GLOBEC datasets. That

has been the purview of the Woods Hole Data Office which now has a much larger mandate, including GLOBEC and other datasets as well.

It now has another name as well. It's BCO-DMO. Phil Taylor told the group that stands for Biological Chemical Oceanography Data Management Office. Dale commented that they have been doing a great job. They have people from the various regional programs making sure that the final data sets that have been collected under GoM GLOBEC do, in fact, reach the Woods Hole Office. Hal and others in the regional programs are making sure that happens. The Woods Hole office will continue to preserve and make available the GLOBEC data so that's all in good hands.

Enrique said it might worth mentioning that this data office is interfacing with other similar efforts of different ilk that are emerging in the community such as OBIS. NCAR now is also developing a data office for some oceanographic data as well. There is a cross-pollination of ideas. The technical people are talking to each other so that you will be able to access GLOBEC data from other portals such as OBIS. This reminded Dale to ask Enrique what's happening not just with the observational datasets but with the modeling data sets for which we want to have a certain amount of curation in future as well.

Enrique said the model data is a little more difficult to serve because of size and it's hard to move around. What Enrique is trying to do at Rutgers, at least with his datasets, is to set up--and Frank Schwing's group has been helping out with this-- something called the threads server. Once the model simulation is decent enough they can put it out there and people will be able to grab that auto lab code as they wish. You can write your little Mat Lab script and tell it to open some web address. It will operate locally on remote data so you only sub-sample what you want. This is slowly being brought to Rutgers. It's a matter of going out and buying some more disk space. Enrique said he just got some more numbers yesterday on what it is going to cost to do this. On top of that they are trying to establish a live access server for model data so people can take a quick look at it. There are some similar efforts going on at PMEL. He said he is talking about tens of terabytes of data that's been coming on line for the last few years.

Dale suggested they come back to it. The issue is about how coordinated we want to become about making sure that model generated products are available from each of the three regional programs and the modeling teams. Enrique is obviously coming from the point of view of someone who does NEP modeling and generates ten terabytes but there's Chen and company and Avijit and other people in the North Atlantic that generate an equal amount of data and John Klink and company in the Southern Ocean. It may not rise to the level of high priority to have an integrated pan-regional approach to model data availability. Or, it may. That conversation needs to happen. Enrique said that's actually a really good point, which he hadn't thought about too much.

He said that if they take the example of the data datasets, the nice development of something like OBIS is that the data is and can be distributed. Maybe all should start thinking even for the model data on how to set up an interface. The user itself doesn't

really care whether the model data sits at Rutgers or Old Dominion or where the data is sitting. But, the user may be able to access through one common portal for all of it. The technology is out there to do it. It's just a matter of organizing it and putting it all together.

Dale commented that there are some common themes between observational data sets and model data sets. The latter probably suffers a little more from an uncertainty associated with which models which data come from because there might be some glossy datasets out there that were generated by ROMS or FVCOM. Enrique said that even with the observational data, if you look at some of these portals, the Metadata is an integral part of what you see. You know who collected, what the cruise was, and the date. All that data is available and comes up as you find out. That's becoming an important part of the observational data survey as well. The model data would have to be the same. Dale added it would be a reasonably substantial step beyond a piecemeal availability of data and beyond Enrique's wanting to do it for the NEP. It's a pretty big step. Enrique agreed but said the technology is there.

Some wondered if there has there been money put in by IOOS for looking at being able to do the same type of thing. Enrique said that in ORION there was talk about having some model money available but he doesn't know where that effort ended. Cisco said that right now anything to do with modeling is off the table. Dale added the project to the list but said he would come back to it.

Pointing at the slide showing the projects, Dale said here are the five sort of underway high priority special projects. He asked if anyone wants to weigh in with any ideas or comment on any of those. Other than the Final Symposium, which he wants to spend some time on for sure, is there anything anyone wants to talk about? He pretty much already told everyone where we were headed in the other areas: web; publications; EBM; and GLOBEC observational datasets.

Cisco reminded everyone that if we need anything from the international site to go to their web page. They also have an alphabetical listing. It may help in order to track some information down that US GLOBEC may not have in the database. You can sort it and whether it was refereed or not refereed, country, etc. Dale asked what the expectations are about publications being on one or both sites. Cisco responded he thought they should be on both. Dale pointed out that have two different numbering systems. Cisco said they don't number them. They only include them if they make reference to a GLOBEC program in the acknowledgments or something or in the text of the paper. All of the GLOBEC publications should have a number and should be on the international web page as well as there is a subset of publications coming out of International GLOBEC.

Cisco asked if in order to be on the US GLOBEC web site a number needs to have been assigned. Dale said yes and explained that there is an automatic tool. You put in the authors and the title and request a contribution number. It's vetted by the national office and the approval button is hit and you get the next number. It's automated. But there probably has not been a systematic attempt to make sure that all of our publications have

made it to your list. Cisco was more worried about people who have written GLOBEC papers who have not requested a number.

That reminded Dale to add another bullet under the project heading of publications. He said that we need to beat the bushes a little bit more for the undoubted number of publications out there that should be on the publications database but haven't made it yet. Cisco wanted to know if we would be asking only for refereed publications and what about cruise reports and things like that. Dale said that's not there at the moment, only the major publications and not the cruise reports or the technical reports. (Cruise reports are on the WHOI site.)

Dale then posed the question: Do we want to come out of this program knowing as much as possible everything that was produced even if it was not reviewed? Do we want a list of all the tech reports? The cruise reports are available and listed on the Woods Hole site. There are probably other classes of written material that may not be on either. Cisco said that if they were done with partial or full support by GLOBEC we should keep track of that. Dale agreed that in principle we'd like to know about it.

Referring back to the web site, Dale asked that if anyone had specific suggestions on how to jazz up the web site or to suggest web sites that are particularly attractive or useful to please send those as background for the research and redesign efforts on this.

Final Symposium Discussion

Dale told the committee that this was talked about for half an hour or an hour yesterday at the executive meeting. Exec. still had imagined that the final symposium would be held in the springtime in the Washington, D.C. area in 2010. Exec. talked a bit about the type of symposium it should be and how it should be organized and focused. It was again generally agreed by the exec. committee that it be very celebratory, that it not be staid, but attractive to people who have been in the GLOBEC program since the beginning to attend in the sense of a reunion. It should be a getting together at the end of the program, celebrating a successful conclusion with speakers who are senior in the field and recognizable and who have not necessarily been inside GLOBEC, but who can comment in a positive way on the legacy of GLOBEC and how it influenced the field. Some of the SSC thinking was very similar to some of the elements that were in Cisco's presentation and in Cisco's draft agenda [for the international final symposium]. Speakers perhaps commenting on the legacy that GLOBEC has contributed to new programs that are emerging was a theme. Generally speaking, it would be a really high profile, reunion-oriented event, well covered by the press, attended by senior people in the field and also from the Washington, D.C. area.

At yesterday's meeting they talked a bit about potential venues in Washington and, specifically, about three: The National Academy, the AAAS, and the Natural History Museum. All three have large auditoriums. The Academy and the Natural History Museum have auditoriums that hold 500 or 600 people. It was at the National Academy that the JGOFS closing meeting was held. The AAAS auditorium is somewhat smaller. It holds about 250 people and is not located on the Mall. It's a little farther out than the

Academy and the Natural History Museum. Exec. talked a bit about the potential size of the symposium, Using JGOFS as a guide, and probably this applies to the WOCE final conference, too, if GLOBEC does a good job of getting things set up and getting people interested in attending, there will probably be several hundred people there. That's a target to use loosely in talking to venues specifically about the possibility of using them for the symposium.

Cisco wanted to know the dates. Dale said that dates had not been set and would depend a bit on the availability, which we can begin to assess immediately after this meeting. We'll have a discussion here about other possible venues in the D.C. area and then begin to look to them as to availability and cost, etc. Dale said he has no concept of what these venues cost and that we have not built large amounts of dollars into the real budget for the national office for the symposium. He thinks a couple of tens of thousands of dollars were put in there to bring invited international participants in, so that's in the bank. Depending on the costs, funding mechanisms need to be found.

Nick said one thing that came up yesterday is that the funding will have long expired for many of the rank and file that will be there. It has to be an attractive enough meeting that they'll want to come on their own dime. If it's going to be that many, the GLOBEC Office can't support travel for hundreds. Dale said he was not involved in the financial details in either the WOCE or the JGOFS final meeting. Phil has agreed that he'll investigate how the JGOFS final science meeting was handled financially so we can get an idea about at least one of the past examples of a very successful final conference.

Dale said that the length of the meeting came up in exec. yesterday and they had in mind a pithy but exciting and relatively short two-day meeting. They went to the JGOFS web site and looked at what their experience had been and found they had a four and a half day session. He thinks WOCE was a three or four or five day session, too. The length of this seems less clear. He'd appreciate others opinions on this. Cisco said four days seems alright. Three and a half or four, responded Dale. He said we've all been to meetings that go on all week and they take a lot of energy out of you by the third or fourth day.

Beth interjected that in scoping out the length that it would help us to think about the types of presentations that we might want to have at this type of thing and see how many days that will take. Yes, that's exactly right added Dale.

What the Final Symposium Sub-committee, TBA, needs to do is to filter some ideas about what types of presentations we want to have there and can't do without. Dale likes the concept that a lot of interaction in outreach education will happen maybe with COSEE and that there will be a session on that. Hopefully, what can be highlighted in this final symposium are the respects in which we have done outreach education and made contacts with ecosystem-based management to a greater degree than previous programs, and more successfully, perhaps, than previous programs. The idea that there would be a talk or talks highlighting the fact that there have been some real accomplishments coming up through pan- regional synthesis that have made EBM transitions a reality and have made real strong contacts with education at various levels is

appealing. Dale agrees with Beth that in short order there be a list of the types of presentations and materials that we really want to come out at the symposium.

Ken asked if it there had been thought about ending it with the new programs that are coming up. Dale said that is an element in the draft agenda. Dale said there is the issue of not wanting to reinvent or duplicate any presentations that have occurred about a year before in Paris. He doesn't know if that is a significant worry or not. They should coordinate to the extent necessary between the two final symposiums. It was pointed out in exec. committee that given that one is in Paris and the other is going to be in Washington , D.C., of the 600 hundred or so on each side, 500 or however many will be different. So if both of them had a segment that remarked on how GLOBEC has impacted and led to new programs coming on line, that would be fine because the clientele will be different at the two meetings. Ken added that one expression to use is "Standing on the shoulders of giants."

Art said you may consider that if there is an evening dinner or something to have an anecdotal type of talk where people show movies. An example was stellar sea lions chasing people while they're trying to collect data and things like that. All laughed about the "Director's cut GLOBEC." Dale then said that clearly the idea here isn't to have a monotonous parade of science talks but to have something that is both uplifting yet fun so people will want to come. In large measure they'll wind up paying for it so they'll have to want to attend.

Dale asked for any more thoughts on how to get started. It would be good to have, probably essential to have, a small subcommittee in charge of brainstorming and making sure the final symposium comes off. The NCO staff would either be on that subcommittee or available to it. Dale would like some extra volunteers from people here or on the phone to be a part of that subcommittee to help brainstorm, think about, construct and, hopefully, execute the final symposium. Enrique raised his hand but Dale said he would be part of it anyway. Jennifer wriggled her fingers. Dale said he will take Jennifer's interest as genuine. Dale will be contacting others to assess the interest. He said too many others on the subcommittee aren't needed but that it would be helpful to have a little extra brainpower going into that.

Dale wrapped up the discussion by asking if there was anything else on the final symposium or on dates? He said the comment Cisco made about school year, etc .is equally applicable to a symposium for GLOBEC. It would be helpful if schools were out of session and more people were available and not in the middle of final exams. This probably argues for after mid-May anyway. Nick added that there is a window there before the tourists come and mom and dad march the kids across country. Dale asked about cherry blossom time and Beth said it was in late March or early April. Between May 15th and early June suggested Dale and all concurred. He summed up that it should be after the school year but before the tourists descend en masse.

Cisco mentioned other meetings going on at the same time. IMBER doesn't want to have open science conferences but they want to have something called *imbezos*. So they aren't

going to call them open science conferences but there will be **imbezos**. Next year's will be in Miami. Possibly the next one will be in 2010. He didn't think there would be a conflict. He just brought this up to be aware of as they are not really scheduled yet. He added that the one in Miami might be in October 2008. Dale suggested that one might imagine that if they are going to happen again it will be in the fall.

Dale bought them back to the final symposium itself. He said that we'll get together a small subcommittee and brainstorm a bit about the presentations and other activities that we'd really like to see happen. We'll use that as a starting point for thinking about duration. Dale said he doesn't see any particular reason to have a full week-long meeting unless we need it. Everyone agreed. Nick said that there seemed to be an agreement yesterday on no parallel sessions. Maybe some posters he said, and some focused science talks of conceivably a day or day and a half, but no parallel sessions.

Cisco said they will have parallel sessions. They will have morning plenaries and parallel afternoon sessions at the one in Paris. The reason for this is that there were too many new activities going on at this one. That reminded Dale to ask Cisco about one of the other elements incorporated in the Paris meeting and that was a workshop in advance of it. Cisco said PICES does this all the time. So there could be a set of workshops, such as one on downscaling scenarios. Basically you sit there and people come and contribute talks and you'd have a discussion on how you do it. Dale asked if this was the weekend before. Cisco said yes. Then there would be a report by the leaders of those breakouts or those workshops during the meeting. It just involves people more actively. Not everyone can come for the full week.

Dale thought that sounded like a viable idea. He wanted to know if the organizing committee identified topics for the workshops in advance or asked for suggestions from others. Cisco replied that in their case for the Paris meeting they would probably have to do with the transition to IMBER. What are the key questions that need to go forward? Some of those will emerge from the meetings of the transition task team who will then identify some of the science issues to go into the supplement of the IMBER science plan, but then invite people to start working on them right there. Dale asked how many they expect. Cisco thought six, probably be three per day, having two days of parallel workshops. This would impact the facilities required because you would not only need a big plenary auditorium but also three smaller sized but still reasonably large breakout areas.

Cisco said it depends on how you want to construct this one.. In the international one it made sense because they didn't want to give a sense of finality but show things are still going on and moving on. Dale said that was helpful to know the thinking on their side.

Pam asked if it might be helpful, whether it is a wrap-up meeting or the end is the beginning type of thing, to have some sort of culminating product. It might help with media coverage she said if you have something that you were presenting at the same time. One of these products could be something that you could put together to present at the final symposium. Dale said he didn't know if this matches her thinking, but he would

think that in several instances, maybe in the transitions and education areas, we would want to highlight those as products. Pam said she actually has a list of links related to all the stuff that's going on that she's going to send to Dale.

One of the things she is going to send along has to do with Google Ocean. There's this company in France that has put together a way with Google Ocean to put datasets in. You could maybe set up your model data and your cruise reports and all of that into a giant Google Ocean that you could present as the final product. It could be something big and splashy she added. Dale said he likes big and splashy but what form it would best take is what we're thinking about. As a general concept Dale likes it. Something to grab attention is what Pam is saying.

Ken suggested getting Gore to give the opening talk Dale said his name came up already. Cabell mentioned that they talked about it yesterday. Cost is a factor.

Dale reiterated that between yesterday and today a lot of good ideas have been floated so we can move ahead on thinking about and planning for the final symposium. Things are underway that we really need to see happen and reach a level of fruition by the end of the program. But there are some other ideas, some of which we undoubtedly want to follow up on.

Project Listing

Dale showed another slide of projects. He would go down each of these and talk about them, how valuable it would be, who is going to work on them and so on.

1.) Database of Participants.

Dale said it's been discussed many times that in analogy to our publication database that it would be useful to have a GLOBEC database of participants. Jenn added it would be important to have students on that list. Dale said yes, students and post-docs, technicians so you could make a longer list. The documentation for this, the historical record for this, exists at NSF and NOAA and perhaps other places so with some personal commitment of time this could be done. That's doable with some archaeology.

2) Model Evaluation. Project

All from Dennis this morning on the pending successful conclusion of the Skill Assessment Project take one. The form of which was a 16 or so paper collection for publication in a special volume of *Journal of Marine Systems*. The second phase that people have given some thought to is a model evaluation project that would specifically advance issues associated with coupled biological-physical modeling within GLOBEC. Dale said they'll come back to this and Enrique will share a few of his thoughts on a potential form that project can take.

3) Scripps Aquarium Project

Dale said he likes this a lot. Art is a mole for us at the Scripps Aquarium. With some commitment we might engage them in a GLOBEC-related exhibit. Enrique said that if anyone is ever in New York at the Natural History Museum there has a Hall of Planet Earth that is actually a fabulous place. You can actually see there are model simulations that they got from ENSO and places like that. But there's a few

oceanography and climate-related exhibits there that are very well put together. If anyone is ever there and needs some ideas, it would be worth stopping in.

Pam said the timeline would work out pretty well to say that you are going to launch a traveling exhibit at the final symposium. Work with Scripps and or the New England Aquarium. Or the WHOI Exhibit Center added Dennis. There are a lot of places we could go. Dale said we've got a lot of contacts, that we've got moles everywhere. It's additionally attractive to think that it might be a traveling tribute to the GLOBEC program. Then it could go to Woods Hole for a while, Scripps for a while, then to Boston for a while. That would probably be one of the outreach highlights of the program if able to do it.

Dale went back to the project list. He said that these are in no particular order.

4) Skill Assessment Volume #2

Dale said he was talking with Dennis over the lunch hour and said since he's got the skill assessment volume coming out or to come out in *Journal of Marine Systems*, what about two years from now? Do you think there will be follow-on, and not with workshops? People, by virtue of the workshops, have built their partnerships and talked with each other, established terminology, directions and so on. There wouldn't necessarily be a need for any monetary support but would need the commitment of an editorial staff to solicit papers for another skill volume and to shepherd the review process through. That was an idea Dale said he suggested to Dennis, who didn't immediately respond that it was a bad idea. It seems that on an extended list it might be a good thing to do a second skill assessment volume. Two years from now we'll have learned a lot more, explored a lot more, validated a lot more of our models. It's an ongoing thing.

Cisco asked if Dale if he sees this as a separate entity from the model evaluation project. Dale said they certainly overlap. Whether MEP is a theme for skill volume number two or whether it's a paper contributed to the skill volume number, Dale didn't know.

Ken added that if you're looking for a direction to go, there's another direction that he thinks would be interesting. But that may be an area where GLOBEC did not go as far as ideally they would have. That's completing the loop with fish in models. One way, maybe, to address that is to have a collection of papers on how people have done it. It's not really GLOBECian but at least it's covering the topic. Dale wondered how we include higher trophic. Ken said it's easy for him to suggest it and Dale asked him if he wanted to be an editor. Ken said that's a topic that he thinks is a timely topic. Dale said that Eileen would like that, too, and he would be in touch. That's actually a very good suggestion, he continued. It wouldn't be assessing skill in just the ways you might be using models that was discussed in the first skill modeling volume but it's nonetheless a type of modeling where validation would be important.

6) Newsletters

Cisco reminded them that NCO will be preparing an article on pan-regional synthesis in GLOBEC for the spring International GLOBEC newsletter. It's also true that the National Office has not in some time put out its own newsletter. Should the office

ought to be putting out regular newsletters of its own? Certainly that's a potentially worthwhile thing to do and the SSC can talk about where on the list of priorities it stands. Dale personally thinks he would not rank this as high as some other things on the list, but it is definitely a potentially valuable thing to do if they can get to it.

Nick said he thinks it would be one way to promote the symposium. Cabell said fliers might be better because of spam. Nick said that stuff that actually arrives in his mailbox he'll at least flip through. Dale asked for a show of hands as to who reads the newsletters they now get. Several raised their hand saying they look at them. Nick concurred. Dale appreciated the suggestion that it might be an effective way to lead up to the final symposium and get people's energies flowing. Nick added that a year before the symposium is about the right time.

Dale said we could say (we still have to assess liability) that the U.S Office should aim to put out a newsletter once a year in the final three years or two years, '08 and '09. It would be a vehicle for A) highlighting what's been going on in the synthesis phase but B) also importantly for getting people enthusiastic and hearing about the final symposium. That's not a bad argument for putting in the effort to actually do it. It was asked how much manpower goes into putting an International GLOBEC newsletter together.

Cisco said it's a two-person operation with Manuel and Dawn. He's not sure how much time physically they spend on it. Of course they have to work with the different groups to submit it. There are a couple of announcements requesting contributions. Dawn probably puts in a good month or two right before. But it only comes out three times a year or perhaps twice..

Several people suggested advertising in the international newsletter.

Dale said that with mutual agreement we could say that at least once or twice a year, or every other issue, that there would be something about US GLOBEC. NCO could commit not to a full newsletter but to something in the international newsletter. It's not the same thing but it involves a lot less people time and that is where the crunch is. Basically Linda is half time and when you look at the list here, many of these items involve her activity directly and that's one of the things we have to keep in mind.

Dale appreciates the suggestion that it would be one advertising vehicle for the final symposium. That would be helpful. David said might not some of the items being thought of for the webpage such as people in the news, etc. also be used in the newsletter. Or if the web page would be done with those updates, might it be emailed to people, he suggested.

Dale questioned how easy it would be. He has to ask David Robertson how hard it would be on the redesigned web page to build in a button you could push for a printable newsletter type version. What about that?

Nick said it would save a lot on time and production costs. The question is how much bang for your buck do you get by printing them in a hard copy version. David said the

nice thing about getting a PDF is you get that and then can save it to look at when you have the time.

Dale said if it were easy enough to do, it's not incompatible with sending out newsletters because once or twice a year you get the printable version button and tell your color printer to pump out 300 copies. Jennifer said the Sea Grant Alaska program sends out a newsletter called Fish Lines and all she gets is the email telling her Fish Lines is out and here is the link to the web page. You print it out right from the web page. She likes it because it doesn't clutter her inbox with large files and have graphics in the email. It doesn't require generating PDFs, although she can do that if she wants.

Dale said it's interesting to think that we're really all talking about various forms of the same information and how to make it most accessible and visible to people. We'll think more about that. He said that if there are ways to take the same information and to render it in multiple forms so if people like to read newsletters or like to download or whatever it will be equally effective, we'll do it that way.

Jennifer said another way that is effective comes from University of British Columbia. It's got a marine mammal newsletter that comes out. Every time it comes out it's got a little "what's going on." It's always got a link in a little blurb about one article that's recently come out in PDF and the PDF link is there for the published paper. It's usually a summary with a cool picture or two and then the link.

Art followed up and said the thing that makes it powerful though is that it's a very simple web page. It's got one picture, a title, a very short, two-sentence explanation saying more info here. He said that you get the idea immediately and decide if you want to look at the full web page, which might be much longer with more pictures. Then, at the very end it would have the full PDF of whatever that paper is. Andrew Trice does it. The website for this is marinemammal.org.

Art then said that UCSD does something that's a relatively longish webpage, more than what fits on the screen. But, it's just a little picture, a little title, a one to two sentence description and it moves down from topic to topic. You can skim it and see the ones that you really like and you can open it up and go to a bigger web page and still there could be another link to a PDF or something. That layered format is far more powerful than a PDF of a full newsletter. Making it layered and colorful and easily scanned is the key to disseminating it.

Dale agreed with the idea of several highlights with colorful graphic picture and more info to take you down to the next layer.

But, Nick said, just to be obstinate, there is a sort of a serendipity thing to it sometimes. He, too, likes the marine mammal website but sometimes when he gets the newsletters he's just flipping through it and something just kind of catches his eye and is interesting. So he can't plan what he's going to be interested in personally. He said you're going to

loose that. He said it's kind of like in the library. You don't get as many journals out on the shelves so you can't just thumb through them.

Dale summed it up by saying again what Nick is arguing for is that information be available to people in various formats, both in the layered format but also potentially in a more newsletter-like format, if possible. Again, it comes down to resources and how many different formats we can maintain simultaneously.

6) Books

Dale said they talked a bit in exec. about the issue of books again and came up with an idea that might potentially appeal and be accepted within two or all three of our regions. The idea is that multi-authored books by region be compiled. Cabell talked about such an idea that his exec.committee was going to talk about soon. Cabell said that he has to talk to the rest of the executive committee. He mentioned earlier this morning a special volume in *Progress in Oceanography*. The advantage of it is with the synthesis papers, something like six or seven synthesis papers with an intro and background to the GLOBEC NWA program. Dale said it would be a somewhat more coordinated set of papers than a regular special issue. Cabell said there would be something like a 120 page limit per paper in that volume. Cisco said it is 500 pages per issue. The idea would be to have each build on the other -- physics, phytoplankton, zooplankton, larval fish, and then some modeling synthesis and a wrap-up summary. It would be a nice, thick volume summarizing what's known about the NWA program, what the implications were and how it's helped us understand ecosystem dynamics and climate forcing on it. It could conceivably expand at a later date into a book if people had the time and interest and the money to do it. It was thought that would get the broadest readership.

Cabell then asked Cisco about the ability to have electronic media like animations and such at the journal web site and if that is something they have. Cisco said yes. Cabell said that would be much better than having what they viewed as a dead-end product, which is a book which goes on a shelf and never sees the light of day. He then told the story about his wife taking his mother to an antique book store last year where they found the Georges Bank book there that had a chapter in it he had written. He thought since his thesis is in an antique book store he must be ready to retire.

Dale led them back to the discussion. There's a concept on the table in the NWA program that will be discussed by the execo. The thinking yesterday in the executive committee discussion was that this concept of the multi-authored collection of papers somewhat more organized than just a regular special volume might be a concept that is acceptable to the investigators in the NEP who have been a little hesitant about a book. And further, if there were interest in the Northeast Pacific and possibly the Southern Ocean that some steps could be taken for some parallelism in the content and format of the books within each region. Dale liked the tentative title Cabell had and he asked Cabell to find it. Dale recalled that it was like "Something, something, and something: A Case Study in the Northwest Atlantic." Well, it could be "Something, something, something: A case study in the Northeast Pacific" or in the Southern Ocean. It would then have some parallelism in content and title, almost like a matched set.

Cabell recalled the title and said it was something like “Climate Forcing of a Tempered Green Ecosystem: A Case Study of the Georges Bank Off of Maine Region.” Dale said for NEP it could be “A Case Study in the Eastern Boundary Current in the California Current System.”

Dale reiterated that there is an idea circulating and this in play and awaits some discussion in the regional programs, certainly in two at least. There is a good idea here that is percolating. Nick asked Cabell if he had actually approached the journal about it. Cabell said he just did. Dale added that Cisco is the editor and he says it is a good idea.

7) Model Datasets

Dale added Model Datasets to the list after the discussion that Enrique got started relative to the issue of future availability and curatorship of simulated datasets, as opposed to the observational datasets that are being ably handled by the Woods Hole Office. Under consideration is how much effort we to put into making sure there is some sort of organized approach to model generated datasets that were produced within US GLOBEC. That would be a project if all wanted to do it in some uniform way across all of US GLOBEC.

Dale wanted to know if there is anything that has been left off this list in terms of special projects that need thinking about within the last three years of the program? It’s a pretty good list and needs to be kept in mind. He wants to come back and talk about these in more detail and build up a consensus on how high they stand in a list of priorities.

Following a short break, Dale suggested talking another hour or so about some of these items. There is one item where some further thought has been given but hasn’t been heard about yet today. Dale asked Enrique to give his thoughts on one possible form that would take.

Model Evaluation Project

Enrique said this is something that has been on his mind for some time and that recently some ideas have begun to gel and that some feedback would be great on this. He began by saying biological models don’t seem to have one underlying set of equations like a physics or more typical model comparison projects. How you put something like this together hasn’t been clear to him. There is the example from JGOFS that Margie **Friedrichs** has done. Those were 1D models or something simpler. But from both the ESSAS AND PICES meetings there seems to be an interest emerging in doing an ecological ensemble forecast of what things may be in a particular region. In those terms it might be a way of getting people excited to contribute to such a project. Other developments are that, at least in the Northeast Pacific, there are now at least three different ecosystem models that are built for that region that we can use as a starting point to do an internal model inter-comparison. We can bring in other groups to join that if they are interested. In talking to Dennis and Dale yesterday and today, Enrique said what this would take is one dedicated person to do this and, hopefully, other people in the community will see value and interest in this and contribute to it. Enrique suggested as an example that he could do the Northeast Pacific because that’s what he is more familiar with.

We have three different models he said. They're working with an underlying physical model or modeling environment such as ROMS, where it is relatively straightforward to add more ecosystem models (ecosystem, lower trophic levels) of a similar category. If people were interested, with relatively little effort, they could have more of them in there. That's a starting point for a discussion on whether people think it's worth pursuing that.

Another idea that Cisco said Dennis had suggested, is that maybe it could be available if people wanted to do this on their own and not necessarily work with somebody else. An underlying physical set-up could be available so they can make the grade of the forcing instead of whatever is running in the Northeast Pacific. People could download that and add their own ecosystem model on top of that if that's what they wanted to do. It's a more distributed effort that way.

So there are two possibilities. You can either say here's the physics and here are some of the models so take it and do with it something. Or, you can try to get a so-called hero to help, and this would have to be funded, to actually take charge of this and then get people to work with him or her to go forward with this. The idea that they may be able to ultimately do an ensemble forecast for a given region in an IPCC type sense might get people excited. Maybe that would be worth the price as well. They might be more willing to contribute to such an effort as more than just an inter-comparison. There might be more of a product that can come out of it that would get people to put some effort into it.

Of the two scenarios Enrique mentioned, Dale will simply favor one of them and say that one of the nice aspects of the work that Margie **Freidrichs** did was that it was all done consistently by her. Therefore, cross-comparison was made much easier, much more transparent. He's been in evaluation projects where somewhat different groups conducted their own version of the inter-comparison with some twists on it that seemed proper and best to them. But then, in the end, you really weren't able to draw clean conclusions about what was causing what and if any were doing a better job than the other and for what reasons.

Enrique agreed with that and the crucial point there was that she was funded for several years to do that. To add to that, Enrique thinks that's where the idea of perhaps doing an ensemble forecast with this model will take care of that problem a little bit. You're not really necessarily comparing it to the data that you're doing. You accept the variability that the model will have and are just sort of contributing to the final product you will use. It's much like the IPCC where you have models out of left field and you're just contributing to that.

Dale said it was a very interesting question which he's not sure was resolved. He then asked Dennis about the extent to which the concept of the average of an ensemble results being necessarily better and whether that applies equally well to biological models as it seems to work for physical models. The physical models at least have the virtue that you know the continuing equations. Yes, there are parameterizations and mixing schemes and so on. In the biological case you've got all of the above, plus the fact that you don't

know the equations as well. So is it absolutely clear that an ensemble of biological results has to be an improvement?

No, said Dennis. It's not clear at all that it's got to be an improvement. In fact, he would challenge Dale's assessment that it is an improvement in the physical realm. If you think of the hurricane forecasting example, they do an ensemble forecast and oftentimes the hurricane goes in the other direction. So all the models behaved similarly but they were all equally wrong.

Nick said that statistics show, at least in the weather game, that ensembles do outperform any single model. Dale added although perhaps not that much better. Dennis thinks it's absolutely true that even if the ensemble of biological models doesn't do better as it does in Nick's example that there's certainly information in the ensemble.

David added that he thinks there's more latitude in the biological model as to what you're going to choose as being more dominant or driving it more. Some people make some assumptions such as top-down or bottom-up, what species you've selected or whatever. And you can learn from it in turn what works better than others as in this category of model versus that category model.

Enrique thinks that it's a way of dealing with the variability in the design of this model.

Ken doesn't agree and thinks that it depends. If you want to put uncertainty around the forecasting area, then you want to include the modelers' decisions with their models. You don't want to divorce the two. You can call variables anything we want in the model. But they are what they are in the context of everything else in the model if you want a bound forecasting area. That's why the hurricane forecasting models are run independently of each other. The whole idea is the judgment of the modeler is part of the uncertainty of the forecast. So then you send them the driving variables and tell them to predict. If you want to say what structural differences in the formulation of the models influence predictions, then you have to standardize and remove the modelers' decisions from that comparison so it's just the mathematical differences in the governing equations that are driving the differences. That's a step towards much more standardization and typically a few people do the runs.

Ken continued that you can then go another step if you want. You take a single model and look at aggregation error, which is fundamentally what it is in these models. You systematically say that if you have one phytoplankton group here's what happens. You're going to break that into two and give them maximum photosynthesis rates and half saturation constants that are consistent so when they add up they should add up to the one. And you do that for the zooplankton. And you run the one model with different levels of aggregation. That's a test of aggregation error. To Ken it's fundamental which one, and they're using increasing effort, you really want to do. They are very different questions and it wasn't very clear to him when Enrique was describing it. The methods are very different across those in his opinion.

Enrique said the question is what's useful that can you do with that. Ken asked which one. Ken said he's done all three and there are different uses of the three. Are you interested in structural error and structural differences? Are you interested in aggregation differences where the formulations stay the same but the number state variables change? Or are you interested in forecasting uncertainty?

Enrique said he thinks the formulations are going to be different unless people started out with models specifically for this and he doesn't think that's going to happen. Ken said that to tell the truth every NPZ model he's seen generally has the same formulation. He doesn't think they are that different. They integrate light through depth, they have Michaelis-Menten nutrient uptake and throw in the magic B square term so it all stays stable. Again it depends what level you're calling different. Enrique said that have different number of boxes. To Ken that's not formulation, that's a state variable question. Having wrestled with these model comparisons in other contexts, and probably some to none of them successful, he said it's really important what questions you want to address, which could very well be purely a function of how much effort is available. There's different amount of effort. But they are not the same questions at all.

Ken said he found in one comparison that it was modeler judgment. A double blind was done, he said. They had modelers switch models and calibrate using the other person's model, where the first time it was done with their model. They found that the strongest signal of model difference was the modeler. Not how many state variables but the modeler. So, if you are doing forecasting uncertainty that's the one you want to capture, not get rid of it, and then say these models all agree in ensemble. When, in fact, if they were really done by the people who developed them they would be much different.

Ken said it's a great idea but that this is a place where you really have to decide the question or questions you want to answer and that dictates the methods.

Dale asked if Ken had said that in his prior experience these had not been uniformly successful. Ken said that, for example, he did an acid rain comparison of the models where they removed the modelers and actually mapped the input. So if you called it soil porosity in one model they made the other models use that value for soil porosity for example. In that case, it was fairly successful because then they did uncertainty analysis on the models. So each model had its own ensemble and they looked at how the ensembles overlapped. The cases where they had more problems were the more you take the models out of the modelers' hands, the harder it is to do because you run the risk of misinterpreting the model from the modeler. That's the one where the modelers were not so happy. Except the Friedrichs study suggested Enrique. Ken said did he think each of them calibrated. Dennis said no. There was a parameter optimization method built into the test bed frame work. So you got away from this problem of relying on the modeler, whether the inter-comparisons reflect how hard each individual modeler worked at tuning their model to the observations. The adjoint did all that for them so all you were really comparing was structures. The common physical frame work and the inclusion of the parameter optimization scheme allowed her to succeed in that enterprise where prior efforts didn't do as well.

Ken said when they did this it was a while ago and they probably weren't as sophisticated as now with parameter fitting. It was much more that the modelers sit there and say, "I'm tired and this looks pretty good." That's the old days, Ken said, and the way fish models are still calibrated. Enrique said that's maybe ideal but that's a much more dedicated effort for different models. Dale said you could prove the concept using the three models that are built into the ROMS now. There's an adjoint for one for which you might be able to build the adjoints for the others and then prove the concept with a small subset of models. You could put it on the shelf to make it available for other people who come afterward who want to follow up.

Cisco said that what Kenny said is right and it's a difficulty in asking the question. He wasn't sure if we wanted to talk about the discussion with George Hunt and what he wants to do. He wants to do a model inter-comparison exercise over the next couple of years with some funding. "For the Bering?," he was asked Cisco said it didn't have to be the Bering Sea. It's the Sub-Arctic Seas. Cisco said they met with some the Norwegian folks as well and there was interest. The idea would be to have a short workshop before engaging in all this to see if the question could be defined. They agreed that it would be important to have a group of five or six people get together and say what is it they want to see. Dale asked if it would be focused on ecosystem aspect. Cisco said yes. The undertone of all of this has been a physics immune system, where ecosystem includes physics. It's not just a straight NPZ model with no physics. There might be a way forward to hash out some of these in terms of an ability to have a way to think what should be done.

Enrique said the same issues they've been struggling with through the last year or so will come out in that group. How do you do this right? Do you fix the region and say you don't care about the physical models? Do you want to fix physical models, play with different ecosystem models, what complexity of models, all complexity of models, the hindcast forecast? Enrique said he is just trying to grasp onto something so that they can get beyond that and come up with a plan.

Dale said there would be virtue in bringing all interested parties together sooner rather than later to try and think about some of the questions that Kenny and others are raising. He asked if George's workshop is going to happen. Cisco said George was hoping that would happen before the end of spring. He thought that would be a reasonable time to start discussing over email some of the groundwork. Cisco said George said he'd take the lead in organizing and bringing people together to do it. In regard to funding, Cisco said he didn't know how much funding George had for that workshop. At least the concept of seeking funding was one that George did not shy away from and one, Cisco believes, that George may have discussed with some folks in Polar Programs at least.

Enrique wondered if he is thinking in terms of his forecast, like in IPCC, with an ensemble but with different models for his regions. Dale said yes. Dale likes the idea that in some areas of interest outside of US GLOBEC there are people who are willing to take the lead for their own parallel interests. Having George organize this workshop at

which these questions can be talked about and emerging from which there might be a communal plan to buy into is good. US GLOBEC doesn't have to go it alone.

Cisco added that Bern Megrey proposed a working group, which at this stage is a study group which is the predecessor of a working group, at PICES to do this as well. That doesn't necessarily mean funding. Ken thought that this was different. He said he thought this was comparing the ecosystems across different places, not comparing the models. Cisco said it's both. Ken said he thought he was doing ecopath type things across systems.

Enrique said there's the modeling group at ESSAS also, which in theory is also Bern. And Ken. There is a lot of interest in various groups. All of these different groups are struggling with the same issue: How do you make something that makes sense within this? So, this is special.

Dale it said it sounds like there's a ball in the air heading towards George or emanating from George. Let him take the next step if he's very serious in organizing the next workshop. Also, it sounds like they will be talking along these same lines. Cisco asked Enrique if he talked to George. Enrique said yes and that he's got his grand idea. They want to do model inter-comparisons and forecasts and IPCC scenarios. Cisco didn't get a sense that George thought about some of these details that Kennybrought up or even what the SSC has been talking about, such as how you make sense out of different models in different regions and how you put it together. Cisco said all this is why the two to three day brainstorming session with the small group was important. He wondered if the message from here would be to follow-up with George about this discussion.

Cisco then mentioned another workshop to be held 23-26 June 2008. There is a meeting in Plymouth, UK. This is the AMEMAR-Advances in Marine Ecosystem Modeling Research: Bridging the Gaps. These are four-day meetings with plenary sessions. He brought this up because some of these issues are on the topics that they will discuss. This could be just the place for a meeting either before or after as several people will be there making presentations.

PI Database

Dale said that during the break there was a little discussion on viability and effort involved in putting together a preliminary cut at a US GLOBEC PI, etc. database. Nick said that there is one at NEP, kept by Linda Hunn, of people who have participated in that program that goes back a ways. Cabell confirmed that it was '94 So Dale said apparently beginning to put such a list together would not be that difficult. Also, as Linda pointed out during the break, if you want to take it from there by finding the people who have dropped off the radar or who are no longer at the place where they were originally and so on, then a little detective work might be involved. Putting together existing lists and further communicating with people on that list whose whereabouts are known to find out missing names can be done. Going beyond that might involve more labor. Nick said you could do something like have the PI of every GLOBEC-funded project be responsible to check the list for the people that should be on it. They would probably even know the whereabouts of some of the people

who have dropped off the office radar screen said Dale. He then proposed to at least merge lists as it's something to do without a great deal of effort and see how it goes from there and report back at the spring meeting.

Whether a 99% complete list of people who were involved and their current whereabouts will come out so we can get in touch with them for the final symposium, which is what we would like to do, is not clear. At least it's a start.

Roving Aquarium Project – GLOBEC Exhibit Idea

David said that these kinds of exhibits aren't cheap to develop. If the aquariums are interested, it may take some other funding. It depends what it's like. Dale asked Art if he knows who pays for the exhibits at the aquariums. Art said they raise a lot of money through the admissions so that pays for a chunk of it. Other than that, he's not really sure. They have some budget. David said it depends on what constitutes the exhibit. If it's electronic that's one thing but if it's building a model for the exhibit that may be different. The one at the New England Aquarium on Georges Bank had a topographically realistic scale model of Georges Bank. Art said that sometimes they get foundations that are willing to give money so they get their name up on the wall next to the global warming exhibit or whatever. Dale asked what they think the next step would be to scope it out.

Art said he has another meeting on this in another two or three weeks, so he'll talk to them about it. Then the next thing would be to ask the key PIs in GLOBEC if they were going to put one thing on a wall that really exemplifies some new GLOBEC discovery that was accessible to the general public, not just the same old ocean science thing, what would be in the exhibit. Ask eight, or ten or 15 people individually and not as a blanket email. Collect a list of these and then Art can present them at his next aquarium meeting. Dale asked how often they meet. Art said about twice a quarter.

Pam suggested not restricting the researchers thinking by asking them what is accessible to the public. Ask instead, "What would be your favorite thing that came out of GLOBEC?" Then you're more likely to get a broader range of things and then you can play with it how you want.

Art said if we say a little bit of money might come from GLOBEC to support this it might make the difference, make it more tempting for them to make it one of the topics. Cabell asked who would actually build the exhibit. Art said they do that at the aquarium. They have people on staff. They talk to scientists to figure out what they should do and then they find the resources and find the money to do that. They're always looking for more funds to do that because they have to raise money. Ken added that one of the requirements is that if it's a traveling exhibit and you want the exhibit at your museum then you pay the travel costs. He has an in at the West Baton Rouge Museum as his wife is the director. Jenn added some additional suggestions and Dale commented that we have contacts at four or five museums so GLOBEC could have a real traveling road show.

Second Skill Volume

Dale told the committee that they don't need to do anything right now on a possible second Skill Volume. After the first one is laid to rest successfully they might want to let people know that there may be another one. So keep our fingers on the pulse of that idea and see whether it still seems timely about a year from now. Based on the suggestions earlier this morning about trying to get the GLOBEC community access to these papers sooner rather than later, it would help to infuse the new methodology described into the regional projects and pan-regional models as well. This is so it starts percolating up through the science papers and other applications. No immediate action on this item but will keep it active.

Newsletters and Website

US GLOBEC will be appearing in the spring issue of the GLOBEC International Newsletter. We have to write it, but we are committed to that. In terms of whether or not we want newsletters in hard copy form to be coming out on a yearly basis from the GLOBEC office and, in particular, whether that's an effective and useful way to hype or inform about the closing symposium, Dale doesn't have a strong opinion on this. He asked the SSC if any of them had deep feelings about US GLOBEC newsletters issued in hard copy form. Pam asked if he was talking about one a year. Dale said that was the number that he put out there. He said that the International GLOBEC, whose staff is larger than ours, does it two or three times a year. There was also the suggestion, which would require buy-in from International GLOBEC, that we be more routinely included in their newsletter with some frequency. Or, that we don't have hard copies but there be some web-based tool by which current information could be summarized in a format that could be downloaded as a PDF or something.

Pam didn't think that a once-a-year hard copy newsletter generally gets you very much. People would tend to forget about you during your one year intervals. Is the same audience getting the International GLOBEC newsletter? Dale asked Cisco if he knew how many US GLOBEC people are sent the international newsletter. Cisco said he didn't remember how many come to the US.

Pam said that it could be that just for the US ones you get a one page front and back insert. That way three times a year there is something that makes them open up the newsletter. Dale liked that idea. He also thinks that the answer to the previous question about how many of the International GLOBEC newsletters are going to the US is not to everyone we want to have see it if it means advertising the symposium.

Pam suggested that for the symposium you would want to hit every network you know. She didn't think we should depend on any single newsletter to get the word out. Dale agreed and added that it would need saturation advertising. But to the extent that we did a one-pager advertising the final symposium, he said, we would probably want it to go to more people than currently receive the international newsletter. Not to say we wouldn't want to do the latter, too, because we want some international participation at the US symposium. Dale said he is agreeing that we should do as many forms as we can.

The idea that we have an insert in the international newsletter is a good suggestion worth thinking about. Doing that three times a year would probably be about the same amount of effort as putting out a whole newsletter once a year.

Books

There is an action plan on the coordinated books by regions. Cabell and Nick are going to be working with their respective constituencies to build enthusiasm for that idea.

Model Data Sets.

Enrique has the tough one. Art said the question was should GLOBEC adopt a unified approach to serving model data. Dale said should there be some coordinated attempt to make sure as much model generated data is available as possible at the end of GLOBEC. Whether it's all in a unified format or something else is a subsidiary question perhaps. Do we want a simulated data policy. Art said JGOFS synthesis and modeling project had a simulated data policy that was modeled after the ocean data policy that the project owes the community the products of its research after a certain amount of time it takes to publish. Each of the JGOFS SMP investigators was expected to provide their model data to the project office and it was served on the JGOFS web site. Some people provided their data in such a way that it could be served from the PMEL live access server so you could go in and actually subset it with some nice graphical tools. Those who weren't inclined to do that could just send a TAR file with some sample model output and their model code in various aspects. The web link which he just sent to Dale and Enrique has some examples of that.

Enrique said the difficulty with that is the models nowadays are much more space intensive than those global models. There is just no way he could move dozens of terabytes around that easily. But there is the infrastructure and the technology nowadays to keep it distributed. It would just be more of a bind for the PIs to do that because now they have to have the space. They would need the expertise to set up the thread server or something of that sort. Dale said this would have to be centrally located if this is going to be a permanent archive because the PI may not have the money to set something up now, but the incentive to keep that going in the future will become less and less as time goes on. Enrique said they're talking about an investment of hundreds of thousands of dollars for data storage.

Dale wondered who is curating JGOFS. Dennis said it was the synthesis and modeling project office which was led by Scott Doney. That's been subsumed into NCO-DMO to some degree, said Dennis, although the JGOFS SMP results are archived on a web page and it's just maintained at what looks like just USjgofs@whoi.jgofs.edu. Dale wondered how big their simulated data archives is and if you can tell.

Dennis said a lot of the stuff is in the served and distributed mode like Enrique suggested, so it's not all right on the server itself. He said that the tenth of a degree North Atlantic simulation he did for the SMP is not on there. For example, they posted the animated results and some sample fields so you could look at the model and see what its characteristics were. But if you wanted to go and actually look at individual snapshots

from model output and have access to the raw stuff, the only place it lived was on the NCAR MAT store for the reason that Enrique described. But there is a lot of useful stuff you can serve that is short of the full model output.

Dale said that raises the question whether it would be useful to have a centralized description of the model carried out in US GLOBEC with pointers to who to contact and where you might get it. Enrique favors that approach. The hard part is that you inherit it from the observational people in the NEP GLOBEC. Once it slides out, they pull the plug on the hardware and use it for something else, and they don't have it anymore. On the other hand, Dale said, when he thinks about observational data you definitely want to always have that. But, today's models of Georges Bank or the CCS are going to be old news five years from now. You may still have access to them but they will be superseded by higher resolution, better physics, and ensembles, and data simulations and stuff like that. So it's less problematic that we don't have a plan that assures infinite duration accessibility. So maybe it's okay.

Enrique said that way really just requires a web site. He thinks Frank Schwing's group would help with that and help people set up thread servers and perhaps LAS servers if they're interested. Dennis said if some expectation requirement amongst the PIs is that there's going to be a model data policy in the same way that there's a regular data policy then you're going to invest some time in taking some subset of your model data results and making them available to the rest of the community.

Dale said there are at least two aspects to making this work. Well, three aspects. The model data policy has to be enunciated and agreed to. There probably should be a registration tool on the US GLOBEC web site, much as there is for publications, for registering the details of the numerical simulations that you've conducted and that may be available, and then the availability of guidance on how to set up an LAS. That sounds like something Frank could help with.

Enrique said ideally that the LAS would be nice but he thinks the threads would be so the people can actually take the raw model data and use it as they need to. By the time it gets to the LAS it's already massaged. Dale said so threads have a high level of capability of subsetting. Lower level or higher level, said Enrique. You can, instead of opening a file, you can say open a file and give it some sort of web address and it actually gets the raw data for you. It's much more useful. Once you set it up the goal is anybody can go in and get it themselves. It would be an initial investment but ultimately it would ease the people time necessary for this.

Dale that said it sounds like a prudent and achievable goal is to first make it known to people that they have a model data obligation and make some guidance available to them on how they might make the data available to the outside community; and to have on our web site an available list of the attributes of assimilations that are out there and where to get a hold of them if someone wants them. That's achievable. There's a fair bit of work involved even in this kind of minimal capability, but that's a place to start anyway.

Special Projects Summary

Dale summed it up by saying that what we've done is actually agree to some further steps in each of these special project areas and who is going to undertake to take those next steps. What ultimate form, if any, these take, at least some of them, clearly awaits further results of some intercessional activity. The model evaluation project, and we'll hear back from the aquarium project oversight committee. The skill volume we're going to just keep in mind but don't actually have to work on now. We'll iterate some concepts with international folks on the newsletters, and the coordination of books we've talked about in the regional programs that hopefully will fly. On model data sets we have a working agenda on which the national office will follow up.. Everything has a way to proceed. If we could come to the end of the program and have made significant progress in each of these areas we'd be doing very well.

Dales was going to ask Phil for some sage words from NSF but Phil had already left. He apologized as he completely skipped over an opportunity for our agency folks to tell us all the bad news, so maybe they are actually happier not to have that opportunity.

NOAA Update

Beth told the group that the latest rumor she heard was that because Bush wants to veto any spending bill that exceeds his limit, Congress made NOAA go on continuing resolution all year long again. As some recall we put some of the NOAA funding between fiscal years. It is still her top priority this year to make sure that funding gets reinstated to all the GLOBEC investigators. That's the first thing that's going to get funded out of her part of the budget. If NOAA is indeed on a continuing resolution, the first one expires November 18th. Congress recesses at that point for Thanksgiving so they will come up with something at that point. Whether they say NOAA is on a continuing resolution for another x number of weeks or that they're on a continuing resolution all year will determine how quickly the money can get out. If they say NOAA is on a continuing resolution for a certain amount of time and it's not the whole year then there will still be a wait. If they say it is for the whole year then Beth can probably start to figure out how to start moving the money. If they say they're going to take up more spending bills and send them to Bush so he can veto them, then they're really waiting around. It depends somewhat, but she should know soon because Congress is going to recess soon and they'll have to tell them something.

David said he saw something, as he is still on a NOAA email list that Congress was going to do a second CR through December 14. David said he got that this morning and it just prolongs the uncertainty. Beth said that's the outlook from NOAA.

Dale told Beth if we're under a continuing resolution for the whole year that he presumes that the seminar series is off. Beth said that was unclear. The reason it couldn't happen this early in the fiscal year is because under this particular continuing resolution they really restricted the travel. If they find out that they're in a continuing resolution all year, then they will free up however much was spent on travel last year. They will free up that amount this year. This really depends on her office and how much they traveled; how much other people in the office want to travel; and how much other people want to issue

invitational travel. That will have to be worked out. It doesn't mean necessarily that there are no travel funds if on a continuing resolution.

Cisco asked if there was anything that can be discussed on CAMEO. Beth asked if Phil was there today. He'd left for the day at this point. Dale said they talked a little bit about it at exec. committee

Beth said CAMEO is Comparative Analysis of Marine Ecosystem Organization. It is a new program that is supposed to be funded this year with \$5 million to NSF and \$5 million to NOAA coming down through NMFS through Steve Murawski. There has been an initial steering committee formed. Steve and Phil requested people to be on the committee. Half of them are GLOBECians. Cisco, Mike Fogarty and John Steele are on it. GLOBEC is well-represented. Beth is also on it. They've had two steering committee meetings and some wide ranging discussion about what it should be and how it should be structured. That is somewhat in flux. Although, the consensus is building around the ideas of focusing this on emergent properties like resilience and the productivity rather than properties like GLOBEC looks at such as population dynamic. There is also some consensus around the idea of using marine protected areas as part of the comparison with useful comparisons being made between marine protected areas and similar areas that are not protected in any way and to look at how ecosystems respond to those types of differences. The status of it right now is that Mike Sissenwine and Mike Reeve were brought in to function as the elder wisemen. They have drafted a sort of science paper which is circulating to the initial scientific steering committee for their comments. It outlines the ideas that have been talked about in these first two meetings. An RFP will be built out of that. The release of the RFP is probably going to come through NOAA, although that hasn't been completely decided yet.

Beth said there will be announcement coming out, probably through NMFS science and technology. The timing of that is questionable. She didn't think it would depend on getting an appropriation this year, but she doesn't know what Steve's plans are on that. What probably will happen is the announcement will come out and then there will be a proposal review. If the money comes down this year then they'll fund the proposals this year. If it doesn't, then they'll fund them as soon as there is an appropriation next fiscal year. That has to be worked out between Phil and Steve as to how they want to handle that. Right now the draft plan paper that the two Mikes wrote is circulating to the committee and they're just waiting on comments from them

David asked if it was still the expectation if it's a year-long CR that you can't start. Beth said she believes that it will not start on the NOAA side under a CR because Steve will not have any money. It is possible that Phil will have some money but she can't speak for him. The draft paper right now is sort of designed to be scalable. If there's very little money to start with then probably it will start with workshops and those sorts of activity. If there's a huge windfall to start with then it will probably jump right in with modeling and field study.

Dennis asked about the expected time horizon for the CAMEO program. He wanted to know if this is a one-shot deal or a ten-year program. She said it is supposed to be a five-year program. The way it has been requested is to have this \$10 million dollars every year for five years so it would be a substantial program. The phasing is really the question and whether they phase it in as beginning workshops and then scale into the larger scale modeling and real comparative type of activities. It is supposed to be a five-year program whenever it starts. If it doesn't start until fiscal year '09 then it will go five years from then.

She said this actually came out of the ocean research priorities plan. It was originally designed to be funded starting in '09, but the management budget examiners thought it should start in '08 to take advantage of all this momentum from the ocean research priorities plan. It actually was slated to start before the agency had thought. Now, with the continuing resolution, it is quite possible it won't start until '09 which actually gives a little more time for a more deliberative process. There is some concern that the spinning up of it was so fast it hasn't actually had time to gel with the community. If money comes through this year then it will probably start with the kind of scalable process that she described. It's not really well gelled yet so she can't give any real specifics on what the announcement will entail. Cisco has been in on all these conversations, too, so she wondered if he wanted to add anything.

He said that she said it right and that it's sort of a balance between GLOBEC and more ecological questions. There was a natural outgrowth from the GLOBEC research and also a very strong piece of the management element as well. Beth added management not just for fish stock management but for habitat management for important habitat, which is where the marine protected area ideas come in. He said initially it was focused on MPA but MPAs became just one of the management methods and not a goal in and of themselves. Beth agreed. She then said there was a lot of favorable comment in how GLOBEC has operated. Keep in mind that there are a lot of GLOBEC people on the committee so it is heavily weighted. But the committee was quite enthusiastic about continuing in the way that GLOBEC operated both at the agency level, in the way the proposals were evaluated, and also in the way that academic and federal scientists could collaborate on the same proposal and on the same project. She thinks that will certainly be continued in this project. Cisco added that it was not viewed as a negative that the calls for proposals for pan synthesis and the possible RFP for CAMEO would be close enough and overlap on projects. It was viewed as possibly synergistic and good that these things would happen.

Next Meeting

Dale said that at the last meeting they had set preferred dates: the week of May 12th and May 26th. Art reminded the group that these dates sandwich the meeting in Spain. Dale said it's always a balancing act as at least 12 workshops were talked about at today's meeting. Keep those two weeks as possible. The SCS probably will not need three days but probably a day and a half. He asked if people prefer the week before or after Spain and they said before as there is another meeting after. The week of May 12th is

preferred. Linda said all three previously suggested locations -- the Monterey area, Portland and New Orleans were all doable.

It's a question of preferences. Monterey and the Pacific coast would be the toughest because of the airports. She said they can get space at GMRI or at the University of Maine. The Portland airport is right there and there are a few hotels right in Portland.

She said Frank Schwing has space for the committee at the Pacific Grove Lab but that the closest airport on a good day is about an hour and a half away. Members could also fly into Monterey but that increases the cost quite a bit. Renting cars would be necessary, which adds to the cost. There is one hotel that would be within walking distance. Linda also contacted Jim Estes at University of Santa Cruz and he had space at the marine lab there. That's about 35 miles from the San Jose airport. He said there's no hotel within walking distance and that they would need cars to get to the lab.

Dale suggested that by default Portland be the choice. Dale said he wanted people to articulate their preference. Linda reminded the SSC that originally they wanted to alternate coasts. Obviously this meeting in Chicago isn't typical, but the last one was in Alaska. Ken said there is a third coast that people sometimes forget.

Cisco said that he and Eileen will probably be in South Africa at the IGBP congress for the early date. Dale said that the weeks the SSC came up with were probably by elimination of all the other workshops.

Not hearing any great preference, Dale said they should probably do Portland and to keep in mind that there will be a couple more meetings. He would like to get to New Orleans and maybe even the Great Lakes area as alternate locations.

Dale said that there will also be the Pan-Regional Workshops in the fall where they want to be centrally located. He said the odds on favorite location will be NCAR because of their central location and GLOBEC gets some freebies in terms of their facilities.

Linda confirmed that the week to look at is May 12th in Portland for a day and a half. Dale said there are a couple of ways to do it. The committee could have a day and a half starting at noon the first day and going half day the second day or going a whole day the first day and half day the second. David reminded everyone that Sunday was Mother's Day so there was comment on starting on Tuesday or Wednesday. Dale said that even if it was half day Monday that some people would be traveling on Sunday for sure. Art suggested that it be at the end of the week.

Dale then said that for some it might look attractive to have it at the end of the week in Portland, Maine so people going east could just continue to go east and go for it. Linda asked which day half day and which day for all day. Dale said probably all day Thursday and half day Friday so people have time for connections or whatever they need to do to go on. It was confirmed that the next meeting will be Thursday and Friday, 15 and 16

May 2008 in Portland, Maine, immediately followed by other meetings in Spain, followed by the Canary Islands for some committee members.

That was the last bit of business on Dale's agenda. He asked if anyone had anything to add or to discuss. Ken announced that there is a new journal coming out from the American Fisheries Society that has some title like *Marine and Estuarine Fisheries and Ecosystem Science*. He thinks he is on the editorial board but he's not sure yet. But it is a very good avenue, particularly as you work up through the rest of the ecosystem. That's really the goal; to look at fisheries in the context of the ecosystem. Jim Cowan at LSU was just named editor-in-chief.

Dale thanked everyone for a very productive and effective set of discussions.

The meeting adjourned at 1700.