Central and Northern California Ocean Observing System (CeNCOOS)
Southern California Coastal Ocean Observing System (SCCOOS)
Joint Strategic Advisory Committee Meeting
9 June 2010
Dana Point, CA

NOTES

Committee Members and Additional Attendees
Daniel Addison, *Naval Air Systems Command (NAVAIR)*
Deborah Aseltine-Neilson, *California Department of Fish and Game*
Dave Caron, *University of Southern California*
Melissa Carter, *Scripps Institution of Oceanography, UCSD*
Mike Clancy, *Fleet Numerical Meteorology and Oceanography Center*
Reid Crispino, *Marine Exchange of Southern California*
Jeff Crooks, *Tijuana River National Estuarine Research Reserve*
Linda Duguay, *USC Sea Grant*
Dave Easter, *Integrated Ocean Observing System (IOOS)*
Laura Engeman, *Ocean Protection Council (OPC)*
Toby Garfield, *San Francisco State University/Romberg Tiburon Center*
Dominic Gregorio, *State Water Resources Control Board*
Bob Guza, *Scripps Institution of Oceanography, UCSD*
Sam Iacobellis, *Scripps Institution of Oceanography, UCSD*
Sam Johnson, *US Geological Survey*
Burt Jones, *University of Southern California*
Raphe Kudela, *University of California, Santa Cruz*
Skyli McAfee, *California Ocean Science Trust (OST)*
Sam McClatchie, *NOAA Southwest Fisheries Science Center*
Susan Ming, *US Army Corps of Engineers*
Dave Panzer, *Minerals Management Service*
Holly Price, *Synthesis for Coastal Ocean Observing Products*
Cheri Recchia, *Ocean Science Trust Monitoring Enterprise*
George Robertson, *Central Bight Water Quality Working Group*
Ivory Small, *NOAA National Weather Service*
Rebecca Smyth, *NOAA Coastal Services Center*
William Sydeman, *Farallon Institute for Advanced Ecosystem Research*
Libe Washburn, *University of California, Santa Barbara*
Kathy Weldon, *City of Encinitas*
Zdenka Willis, *Integrated Ocean Observing System (IOOS)*
Brock Woodson, *Center for Ocean Solutions*

Staff
Chris Cohen, *SCCOOS Public and Government Relations Coordinator*
Amanda Dillon, *SCCOOS Program Assistant*
Lisa Hazard, *SCCOOS Information Management*
Heather Kerkering, *CeNCOOS Program Coordinator*
Steve Ramp, *CeNCOOS Program Director*
Julie Thomas, *SCCOOS Executive Director*

1. **Welcome** – *Julie Thomas & Steve Ramp*
   Meeting Logistics – *Sue Magdziarz*

2. **Welcome from the State of California** –*Laura Engeman*

Laura Engeman, California Ocean Protection Council (OPC) Project Manager, provided a welcome on behalf of the State of California. She summarized the Coastal Ocean Currents Monitoring Program (COCMP) and noted that the request for high frequency (HF) radar funding has been submitted to the House Appropriations Committee. She introduced the Synthesis for Coastal Ocean Observing Products (SCOOP) project funded by the OPC and provided an update on the collaborative California Seafloor Mapping Project. By the end of the year, the entire California coastal sea floor will be mapped and available online: http://seafloor.csumb.edu/csmp/csmp.html

The next OPC meeting is in Santa Barbara on June 24-25 and there is a request to the Board for LIDAR funding. The OPC Science Advisory Team produced a consensus statement in support of ocean observing. Laura introduced Skyli McAfee, the new Executive Director of the California Ocean Science Trust. She closed with an update on the state budget.

3. **Introductions**

4. **Connecting IOOS and Decision Makers** – *Zdenka Willis*

Zdenka Willis, Integrated Ocean Observing System (IOOS) Director, introduced IOOS and summarized the program history. The Integrated Coastal and Ocean Observation System Act of 2009 established IOOS as a federal, regional, and private-sector partnership with NOAA as the lead federal agency. In addition, the Interagency Ocean Policy Task Force and soon to be released National Ocean Policy integrated federal and non-federal ocean observing on a national level and recommended a framework for effective coastal and marine spatial planning.

The IOOS data management and communications (DMAC) strategy is to make programmatic data easy to access by decision makers and produce a registered catalog and visualizations. For example, NANOOS recently created a visualization for the web and launched an iPhone app. The Education and Outreach Committee is working on interactive exhibits, using data to educate students and inspire a better understanding of ocean environment.

HF radar is a unique ocean observing asset. California was the leader in establishing the network. The Mid-Atlantic region has integrated surface currents into the operational system for the U.S. Coast Guard in a program that will be rolled out nationally.

Interagency partnerships include the Ocean Observatories Initiative (OOI), an initiative to build a cyber-infrastructure for oceanographic data. IOOS is working closely with OOI, sharing Principal Investigators and data. IOOS is also working with the National Water Quality Network to provide discrete water sampling and regional studies. Linda Lillycrop is coordinating the Army Corps of Engineers with the IOOS Regional Associations on the federal level.

The IOOS community has been assisting the Gulf of Mexico oil spill response with coordinated efforts within the Unified Command and Incident Command structure. Sam Walker from the IOOS office was dispatched to the Gulf. Sam's GIS experience has benefitted the multitude of questions such as: Is there a subsurface oil plume? Who is conducting sampling? As a result, a subsurface team was formed and is now codified in the Incident Command structure. It has been an interagency, academic, and IOOS effort. Next steps include longer-term joint analysis. There

are many areas that still require ocean observations. How many additional assets are needed? There is work to refine sampling and study the effects of the loop current. IOOS has received a positive response because of the coordinated effort including HF radar, glider data and the academic modeling efforts.

Since every discharger has a monitoring program, what is the national effort to integrate regional discharger data? In the past, IOOS has not worked with the Environmental Protection Agency (EPA) as much. There will be a focus on the EPA and the National Water Quality Monitoring Network.

Is the focus on Capitol Hill on ocean observations for the Gulf Oil Spill or on larger ocean observing efforts? The focus is on the response effort now but there is already discussion of post-analysis such as at the American Geophysical Union (AGU) meeting in the fall. There is an understanding that the effects on the ecosystem are going to continue for years. IOOS is a national endeavor and partnership. The regional structure encourages unification and collaboration on regional and national assets and data needs. IOOS has brought new technologies to the table, but integrating data continues to be a high priority. We have to position ourselves as a priority for this administration and their ocean observing efforts.

5. Synthesis for Coastal Ocean Observing Products (SCOOP) Project – *Holly Price*

The goal of the SCOOP Project is to develop a detailed vision for how ocean observing systems in California can better support decision-making in ocean management. The project is near its beginning because it was delayed by the bond freeze. The consultant team has completed the first step of summarizing the priority topics of water quality, off-shore renewable energy and salmon recovery. The team is currently compiling an interview list of decision-makers from approximately 90 agencies and organizations. The interviews will allow the team to compare information from agencies against ocean observing system capabilities and conduct a gap analysis. Then the team will identify priorities for products and refine recommendations, with structured evaluation criteria, to figure out what is feasible and can be funded. The project will produce a final report for the Coastal Conservancy. The team will provide updates to the JSAC, continue to coordinate with CeNCOOS, SCCOOS, and the JSAC members affiliated with water quality, salmon recovery, and ocean energy.

6. The California-Nevada Applications Program and NOAA's Regional Integrated Sciences and Assessments: Providing Climate Information for California's Decision Makers – *Sam Iacobellis*

The Regional Integrated Sciences and Assessments (RISA) program supports climate research used to inform decision-makers and policy planners at a regional level. RISAs are NOAA-supported university teams working to bridge the gap between gathering data and producing products for decision-makers. The California Program recently included Nevada and also has a wide variety of regional and federal partners. The goal of the program is to make climate data available and package it for decision-makers. Data includes precipitation maps and dynamic and statistical models for precipitation. In California, RISA researchers are studying the impact that precipitation and climate warming will have on sea level rise, flooding, and water supply. Climate information is used to predict high water events. Inundation and extreme storm events are lasting longer and are much more difficult to deal with. The marine stratus is a dominant feature along coastal California and has a significant impact on temperature. Using high resolution satellite data, researchers are trying to apply the solar heat flux and show a reduced solar input due to persistent marine stratus. The RISAs can use ocean observing data as ground

truth to validate atmospheric models. The California- Nevada Applications Program is working on a coastal inundation project with SCCOOS and plans to submit a collaborative proposal to NOAA.

7. Presentations – Applying Ocean Observing Information to JSAC Focus Areas:

I. Ecosystem and Climate Trends

a.) *Sam McClatchie, NOAA Southwest Fisheries Science Center*

How do we use ocean observations to better understand environmentally-driven fluctuations in fisheries? What are the limitations of existing indices of environmental variability? To understand the mechanisms by which environment affects variability in recruitment or biomass, what spatial and temporal scales do we need to resolve?

The California Cooperative Oceanic Fisheries Investigations (CalCOFI) program measures fish egg sampling at high spatial resolutions. But there are no surveys of the pre-recruits that would provide the most information about the abundance of sardines in the next year. There are a series of power plants along the coast that heat the water and trap fish. When the trapped fish were counted, lots of pre-recruits were found. It is important to understand recruitment in order to set harvest levels. The fourteen-year time series of fish eggs from NOAA cruises can be overlaid with sea surface temperature to show anomalies, warm and cold years, and a tremendous spatial variability. What are the limits of existing indices of environmental variability? The existing index that goes into regulating the sardine harvest is Scripps Pier temperature. Analysis shows a spurious correlation between temperature and recruitment. There is a very high spatial variability on all scales for eggs, larvae and adult fish and squid. Spatial and temporal variability are key to understanding recruitment.

The CalCOFI station grid samples spatial variability at low resolution and cannot resolve small-scale biological or physical variability. Nevertheless, the long time series is immensely valuable. The California Current, sampling cruises, and sardines spawning occurs far off shore. The high variability means that measurements need to be obtained at both large and small scales, both spatially and temporally. Gliders could be used to resolve physical variability and then be compared to fish egg and acoustic data. The limitations of the environmental index currently used in sardine assessment are severe enough that it should be abandoned. Ocean observing can be used to collect data and measurements for new indices, particularly with the application of gliders, but pre-recruit surveys are still a critical gap in the data.

b.) *Bill Sydeman, Farallon Institute for Advanced Ecosystem Research*

Ocean Observing, Climate Variability and Ecosystem Change

The global warming upwelling intensification hypothesis, Bakun 1990 and 2010, proposes that global warming increases wind stress and higher pressure offshore to cause coastal upwelling that in turn affects the ecosystem and fish production. What evidence do we have of upwelling intensification? When intensification is combined with the annual cycle, it results in low periods in upwelling. Studies of upwelling at eight different areas showed modulation in all time series. With the evidence of intensification, what is the effect on ecosystems and marine life? In three locations, Sacramento, Klamath Ocean and the Russian River, there were differences in the salmon populations but consistent downward patterns.

Models of upwelling are used to predict predator abundance. Data from ocean observing systems could improve models and forecasts. Both physical and biological measurements are needed to

accurately predict and forecast ecosystem variability. The upwelling index gives an indication of wind patterns affect on nutrient input, which can be integrated with stratification and thermocline depth. Ocean observations and HF radar surface currents show the interaction with mid-tropic levels and the effect on reproduction and fisheries. There are oceanographic data and time series available online, but they are difficult to access.

II. Water Quality and HABS

Dominic Gregorio, State Water Resources Control Board
The mission of the State Water Resources Control Board is to protect and restore beneficial uses of California's water resources, including marine aquatic life, human health, seafood consumption. The State Water Board sets statewide water quality standards and the state invested in HF radar with a focus on water quality. There have been a series of useful ocean observing system demonstration projects in the past, such as the Huntington Beach transport of pollutants and City of Los Angeles outfall discharge diversion. The projects were very important and received good publicity within the management community. There is a continued need for plume tracking; surface current data and the ROMS model are used for particle tracking from the point of discharge.

A recent focus has been on Areas of Special Biological Significance (ASBS) and Marine Managed Areas, places where discharges are not allowed and cannot affect the natural water quality. In tracking the trajectory of the plume from the Los Peñasquitos discharge on the ASBS in La Jolla, and working on regulating direct discharges from pipes, other sources have been found to affect the area and have to regulate additional areas to really protect the region. This is one example of ocean observing that will be brought to the Water Board, and it shows that they have to take a much larger view of the influences on protected areas.

The Water Board is concerned with ocean water quality throughout coastal ocean, including outfalls and discharges. The CeNCOOS particle tracking approach has been used to track the San Francisco outfall. Some outfalls are in federal waters, regulated by the EPA, but the chance of outfalls entering state waters is great and it must be ensured that pollution levels in state waters are not harmful. The State needs to know the fate and transport of pollutants along the coast, tracking bacteria and pathogens influence marine life and recreation as well as the economy and tourism. The rapid indicators program led by the Southern California Coastal Water Research Project (SCCWRP) is making huge progress and ocean observations are important in protecting beach water quality. The use of gliders is valuable in showing the vertical condition of water column for water quality and oil spills. Ocean acidification is becoming a great concern, the State has been requested to list the ocean waters that are not meeting pH levels but there is not enough data.

Ocean observing systems have connected with regional modeling efforts, the Bight '08 program, ASBS project, and harmful algal blooms (HABS) nutrient inventory. Ocean observations could also be an important component for implementing and monitoring marine protected areas (MPAs). The transport of marine debris, from the watershed to the ocean garbage patch, is another critical issue where ocean observations could be very valuable. The State is working on a series of portals to make water quality information available to the public.

III. Coastal Hazards

Kathy Weldon, City of Encinitas
California's beaches are important to the community and have great economic value. The City of Encinitas conducted a shoreline protection study to document sea level rise and collect data for regional beach sand projects. Sand from construction projects has been used to replenish local beaches. The City of Encinitas has worked with the Army Corps of Engineers and Coastal Data Information Program (CDIP) to measure and document coastal erosion and the migration of sand. Encinitas is a hot spot for coastal erosion, although the sand is sticking around the lagoons, there was serious erosion this year as a result of the El Niño. The CDIP data have proved useful as they show the shoreline change. The CDIP LIDAR surveys help show erosion hot spots. It would be helpful to have Coastal Frontiers data combined with CDIP data. Did this year's El Niño indicate a continuing trend? For the first time in nine years, the waves overtopped Highway 101 in Encinitas and undermined the highway. In addition to erosion and sand replenishment, inundation mapping and forecasting are very important to city planning for infrastructure and highways.

Ocean Observing Project Updates

8. Harmful Algal Bloom Monitoring and Alert Program (HABMAP) – *Raphe Kudela*
HABMAP was formed to improve communication among researchers and scientists, based on volunteer participation. There is an active listserv with ongoing updates on water conditions and marine mammal strandings. The California HABMAP Steering Committee is in its second year and is evaluating success. The Committee includes representatives from Ocean Observing Systems, NOAA, OPC, stakeholders, and scientists. The Committee is focused on meetings and workshops, such as the Alliance for Coastal Technology National Workshop on cell and toxin detection, 2010 end user workshop (July 22), 2009 West Coast Regional HAB Summit and California World Ocean session on HABs and water quality. Projects include the Bight '08 (now 2010), Sea Grant, OPC, and federal ECOHAB (Ecology and Oceanography of Harmful Algal Blooms) and MERHAB (Monitoring and Event Response for Harmful Algal Blooms). HABMAP scientists are developing forecasting models to predict HAB events for closures to shellfish and recreational harvesters.

9. Ocean Observing and the Gulf of Mexico Oil Spill Response – *Toby Garfield*
This is Day 51 of the DeepWater Horizon Oil Spill. The incident occurred on 20 April. By 24 April, the University of South Florida HF radar systems were online through the Coastal Observing Research and Development Center (CORDC) at Scripps Institution of Oceanography. On 1 May, the University of Southern Mississippi systems were online. Previous collaboration allowed for a quick response and the surface current coverage available was submitted to the U.S. Coast Guard. The chain of command for ocean incidents makes the Coast Guard the lead federal agency and the NOAA Office of Response and Restoration (OR&R) provides environmental data.

Led by NOAA, the Safe Seas 2006 Emergency Response Exercise was the first collaborative effort between CeNCOOS and the OR&R HAZMAT. The data format netCDF was standardized and drives the GNOME (General NOAA Operational Modeling Environment) oil spill trajectory model. The 2007 Cosco Busan incident used HF radar in spill predications. HF radar data are available as a portable KML file for emergency responders.

The Fleet Numerical Meteorology and Oceanography Center (FNMOC) runs the global numerical predictions model and the Naval Research Laboratory's Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) winds drive coastal models. High resolution COAMPS winds are used to drive the oceanographic model in NAVOCEAN and the Navy Coastal Ocean Model (NCOM) is also forced by winds. MODIS satellite is showing the extent of the spill. An active hurricane season is predicted. The Navy has run cyclone forecasting models, because it is likely that tropical storms are going to be a factor this summer. FNMOC is providing support through the Naval Oceanographic Office. The Command Center in Louisiana has products provided by the Navy, NOAA and U.S. Geological Survey. A daily chart of the oil spill is using HF radar to create maps but it only covers a small area of spill.

IOOS and the Regional Associations have developed a web portal, maintained by Rutgers University, in a collaborative effort to show what assets are available and the real-time IOOS glider fleet positions: http://rucool.marine.rutgers.edu/deepwater/.

An article in the New York Times described the importance of ocean observations but focused upon the fact that the Regional Associations have failed to convince legislators that long-term funding is necessary for observations and monitoring: http://www.nytimes.com/gwire/2010/06/03/03greenwire-federal-funding-cuts-leave-oceanographers-spil-74436.html?pagewanted=all

The Minerals Management Service (MMS) will be changing its structure and taking extra regulatory precautions. The regulatory MMS will be split into three parts: revenue, leasing, and safety and enforcement. The MMS will be evaluating all the platforms and facilities off the California coast and will be greatly enhancing inspections. Could an oil spill happen at the platforms in California? There will be an increased focus on alternative energy and ocean observations will be highly valuable to alternative energy siting and evaluation.

10. Focus Group Breakout Sessions

Ecosystem & Climate Trends: ***Libe Washburn & Steve Ramp***

The group discussed how to make observing efforts more relevant to biological and ecosystem efforts, including MPA management. Current issues and challenges include the scale of observations – some MPAs are quite small, while observations are obtained at a coarser resolution – as well as the uncertainty of models based on those observations. Managers need high enough confidence in models and ocean observation products to be able to make ecosystem management decisions, especially regarding MPAs. For example, after a five-year assessment period, will we have the right observations and enough observations to be able to know what happened to the overall study area as well as to individual MPAs? Real-time observations are not as important in this context.

Ocean observations should be able to provide relevant information to be incorporated into forecasting models used for salmonid management for the Russian and Sacramento rivers. Models like this are under development. Like MPAs, having enough of the right ocean observations is the issue.

Regarding Coastal and Marine Spatial Planning in California, roles and responsibilities are still to be determined. Who will provide the information used in making decisions? Who will control what information in included? Who will make the decisions based on that information? The Ocean Observing Systems in California would like to provide relevant ocean information for use

in this system rather than having a role in controlling the system. It remains to be seen how certain ocean information will be used in such a system.

The following items were priorities for the group:

- More biological sampling using gliders and new technology: additional glider lines with the right sensors will inform a variety of ecosystem and climate issues.
- Better understanding fate and transport on the surface, subsurface, and nearshore - and linking these together - will be useful for larval dispersal in particular. It hard to know how valuable this is for larvae that "behave" and may influence their own transport over a 9 month period, for example.
- Address questions of uncertainty: adding error bars on products and models (connectivity maps, for example) would add quality and utility.
- Address issues of spatial resolution between observations and areas of management.
- Focus on persistent physical features like fronts and upwelling that impact ecosystems.

Obtain the right balance between retrospective analysis, which will be useful for better understanding the observations that have already been collected, and continued observations.

Water Quality: ***Burt Jones & Raphe Kudela***
Increase capability of Shore Stations: add pH, O2, and make the data available via the same mechanisms (shore stations & HABs).

Gliders: increase shallow water lines within Northern California, continue large scale (along CalCOFI lines), and continue coastal lines that are more specific.

Modeling: assimilate the glider data into the models, validate and extend surfzone modeling for discharges, and create probability maps for where the discharge could go under varying conditions for different areas and varying dilution ratios.

Trajectories: create sub-surface trajectories for drop-in drifters from 3D drifter models output and create near real-time trajectories in specific areas based on HF radar data.

Trainings: education and outreach is a high priority. Make it simple and easy to find. Include tools such as oil spill tool and sub-surface tool.

Suggestions:

- Attend existing meetings (beach water quality meetings, Regional or State board)
- 1 or 2 day trainings where you invite everyone who wants to come
- Hazardous materials investigators association - strike force (statewide) meet every April for a two day training (cops, fire)
- Sector LA – Fall
- Emails to external contact lists
- 1991 American Trader oil spill - health risk assessment
- Have a response scenario where users and stakeholders tell us what they want (along the lines of an NPREP)
- Coordinate with State Water Resource Control Board web portals

Harmful Algal Blooms (HABs): coordinate with State effort

- Data to California Department of Health Services Environmental Management (Gregg Langlois)

- Integrate HAB data with State system (California Department of Public Health) or add link to web page

Future projects: link ocean to watersheds and continue upstream (create those relationships and links), include more offshore stations, use weather and rainfall data to validate the NEXRAD (Next Generation Radar) that measures precipitation and wind.

Marine Operations: *Heather Kerkering & Toby Garfield*
Wind and wave data are important for marine operations users, but ocean currents don't have quite the same priority. NAVAIR uses HF radar to identify objects adrift, debris, test ranges, and for Search and Rescue. Point data streams (direction of swell and combination of sea state), one stop shopping, and that the websites aid in providing higher resolution, more localized data. The value of HF radar became clear when surface currents in the area proved to be different than previously thought.

Requested:
- High resolution winds (sensors placed on boats and broadcast the data via AIS). High resolution wave information for Point Mugu operations.
- Personal, informal product trainings are useful, a formalized training mechanism is not necessary.
- Developing indicies to use as decision making tools such as the State's "Safe to Swim" web portal or "day@the beach" would help integrate multiple products into useful decision tools.

At the previous JSAC meeting, it was recommended that delivering information to the public was important. Kiosks are one delivery system: the Regional Associations need to work with agencies and outreach organizations to deliver more information in accessible formats. Target smart phones and iPads as important delivery platforms. There was some discussion on how to convey vector information to the public.

Products that would benefit operational users include climatologies developed from both observations and models. A number of high-resolution climatology products (wind, waves, currents) could be produced. In terms of observations, consider the Shark wave glider (Liquid Robotics) to replace moorings: www.liquidr.com/products.aspx. Determine which observations are "core" and show priorities for the proposals.

Additional needs: sustained wind speeds, combined sea state, and extended forecasts.

Coastal Hazards: *Bob Guza & Julie Thomas*
California needs complete LIDAR maps to document storms and inundation along the coast. Southern California is famous for its sandy beaches and beach tourism brings in more revenue than commercial and recreational fishing combined. In San Diego's North County, more than 40% of the beach wall is armored and dams cut off the beach sand. Measurements of high tides and waves, with nowcasts and forecasts, can be used to forecast flooding and issue warnings. There is no historical documentation of data or conditions to build a long time series record of flooding or sand levels through history. Flood warnings should go to the Department of Public Works (DPW) and lifeguards. Check on how the DPW is notified.

The U.S. Geographical Survey provides scientific information. A catalogue of flooding and storm events is needed. It might take a decade of data to show trends. Predictions have to be

guided by observations and models. Inundation and erosion have to be documented. The U.S. Army Corps of Engineers considers sea level rise in the planning process for structure construction. IOOS can provide data for Army Corps of Engineers' Emergency Response Control Center and for the Federal Emergency Management Agency (FEMA) flood control.

Requested:

- Validate inundation warnings with data, make warnings higher quality and more effective
- Build a database/catalogue of extreme storm events
- Provide warnings for Army Corps of Engineers' Emergency Response
- Provide inundation warnings and validation for City of Encinitas

11. Plenary Session: Focus Group recommendations, Action Items, Next Steps…