

53rd Meeting of the NOAA Science Advisory Board
3-4 August, 2015

Location: NOAA Southwest Fisheries Science Center
8901 La Jolla Shores Drive
La Jolla, CA 92037-1508

Presentations for this meeting have been posted on the Science Advisory Board (SAB) website:
http://www.sab.noaa.gov/Meetings/2015/August/August_3_4_15.html

SAB members in attendance:

Ms. P. Lynn Scarlett, Managing Director for Public Policy, The Nature Conservancy (Chair); Dr. Susan Avery, President Emeritus, Woods Hole Oceanographic Institution ; Dr. Michael Donahue, Vice President, Water Resources and Environmental Services, URS Corporation; Mr. J. Walter Faulconer, President, Strategic Space Solutions; ; Dr. Jeremy Jackson, Senior Scientist Emeritus, Smithsonian Institution; Dr. Jennifer A. Logan, Retired (Harvard University); Dr. Molly Maucauley, Vice-President for Research, Resources for the Future; ; Ms. Jean May- Brett, Retired (STEM Partnership Coordinator, Louisiana Department of Education); Dr. Stephen Polasky, Professor, University of Minnesota; Dr. Jerry Schubel President and CEO, Aquarium of the Pacific; Mr. Robert S. Winokur, Retired (NOAA, Navy); and Dr. Dawn Wright, Chief Scientist, Environmental Systems Research Institute.

NOAA senior management and Line Office representatives in attendance:

Dr. Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere; Dr. Rick Spinrad, NOAA Chief Scientist; VADM Manson Brown, Assistant Secretary for Environmental Observation and Prediction; VADM Michael Devany, Deputy Under Secretary for Operations; Dr. Russell Callender, Acting Assistant Administrator, NOAA National Ocean Service; Dr. Steven Fine, Deputy Assistant Administrator, NOAA Office of Oceanic and Atmospheric Research; Ms. Laura Furgione, Deputy Assistant Administrator, NOAA National Weather Service; Ms. Eileen Sobek, Assistant Administrator, NOAA National Marine Fisheries Service; Dr. Stephen Volz, Assistant Administrator, National Environmental Satellite and Data Information Service; and RADM David Score, Director, Office of Marine and Aircraft Operations

Staff for the Science Advisory Board in attendance: Dr. Elizabeth Turner, Acting Executive Director; Dr. Bridget Seegers; and Mary Anne Whitcomb.

Monday, 3 August

Opening Statement of the Chair and SAB Consent Calendar
Lynn Scarlett, The Nature Conservancy and Chair, NOAA SAB

Lynn Scarlett called meeting to order and Cisco Werner, Director of the Southwest Fisheries Science Center (SWFSC) welcomed the SAB to the SWFSC.

Ms. Scarlett asked for acceptance of the items on the consent calendar: the April 2015 minutes and Working Group status reports. The items on the consent calendar were accepted.

NOAA Update

Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

Summary

At the last meeting Dr. Sullivan gave an update on NOAA priorities; at this meeting she will provide a progress report on each of the four strategic priorities.

Update: Observational Infrastructure

NOAA's global observing systems are the foundation of the Environmental Intelligence we provide and are the first priority in this update. A camera on our DSCOVR satellite returned its first view of the entire sunlit side of Earth from one million miles away, marking the first full-disk Earth image since the Apollo era. When it becomes operational in the Fall, DSCOVR will maintain the nation's real-time solar wind monitoring capabilities critical for accuracy and lead time of NOAA's space weather alerts and forecasts. Without these timely and accurate warnings, space weather events like the geomagnetic storms caused by changes in solar wind have the potential to disrupt nearly every major public infrastructure system, including power grids, telecommunications, aviation, and GPS.

Dr Sullivan also provided an update on the newest satellite in a series designed to maintain long-term satellite altimetry observations of global sea surface height, the Jason-3. NOAA is preparing to launch the Jason-3 Ocean Surface Topography Mission satellite later this year in partnership with the National Aeronautics and Space Administration (NASA) and our European partners, Centre Nationale d'etudes spatiales (CNES) the French space agency and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). As many of you now, the data from this satellite will provide critical ocean information that forecasters need to predict devastating hurricanes and severe weather before they arrive onshore. Once operational, JASON 3 will provide data for detailed predictions of hurricanes, sea level rise and atmosphere-ocean interface when operational. The JASON 3 launch is currently being delayed due to the SPACEX launch failure.

Update: Arctic

NOAA investments in observational infrastructure are increasingly being focused on the Arctic region. In July 2015, NOAA's newest research ship, the *Reuben Lasker* departed for its first scientific mission that included surveying gray whales along the West Coast and right whales in the Gulf of Alaska, among the most rare and endangered whales on Earth. As discussed at other meetings, the *Lasker* is engineered to operate more quietly than other similar ships, minimizing disturbance to the fish or marine mammals it is studying, and carries the latest navigation and acoustic technology for tracking and assessing fish and marine mammal populations. This expedition is collaboration between the Southwest Fisheries Science Center in La Jolla, California, and Alaska Fisheries Science Center in Seattle, Washington. This was a great opportunity for both science centers to make use of this new ship to answer some important questions about different species of whales.

NOAA also just finished, at the end of July 2015, an expedition in partnership with the US Coast Guard (USCG) aboard the vessel *USCGC Healy*, a mission to demonstrate and evaluate new technologies that can improve Coast Guard mission performance in the Arctic and help scientists better understand the implications of changes in the region. NOAA and the USCG conducted two successful tests using a Puma unmanned aircraft system (UAS) including a successful demonstration of net capture of a Puma UAS demonstrating the ability to conduct operations without the need for a flight deck or launch a cutter boat for recovery. This interagency demonstration of operational concepts strengthens NOAA's potential applications of UAS for missions such as marine mammal surveys, sea ice mapping, and marine debris surveys. Successful deployments of innovative technologies included:

Deployment of two wave gliders:

- 1) A Carbon Wave Glider that will examine variables that contribute to air-sea exchange of CO₂ in the arctic, and
- 2) An Ecosystem Wave Glider that will examine seasonal changes in upper water heat and salt, as well as ecosystem response to these changes.

A buoy with 3 new technologies:

- 1) A next generation Prawler (profiler+crawler) that crawls up and down the mooring line using wave power making CTD measurements and sending back the data in near real-time;
- 2) Lab-On-a-Chip prototype nitrate analyzer that conducts chemical measurements on a microplate—measurements that would otherwise require a shipboard laboratory (provided for testing by the U.K.'s National Oceanography Centre); and
- 3) A radiometer package for collecting climate quality measurements on a moving platform.

Update on DART 4G technology

NOAA also has some exciting updates with our Deep-ocean Assessment and Reporting of Tsunamis (DART) system in the way of our new 4G technology being transitioned into operations. NOAA's existing DART program feeds information about waves after a tsunami into numerical models to help provide accurate wave arrival times and heights for coastal communities around the world. The new 4th generation system is an enhanced version of the DART Easy-to-Deploy technology that incorporates an improved pressure sensor and algorithm allowing the separation of the tsunami signal from the earthquake "noise." These updates allow the system to be placed closer to the actual earthquake source and can detect a tsunami within 5 minutes of an earthquake event, compared to an hour or more with the traditional DART systems. In earthquake prone areas such as the U.S. West Coast, these early warnings could save countless lives. The Pacific Marine Environmental Laboratory (PMEL) is working to transition the DART 4G technology to SAIC before the end of the fiscal year, making it the 3rd DART we will have transferred for commercial purchasing and manufacturing purposes.

NOAA study showing no recent slowdown in global warming

A recent NOAA study published in the journal *Science* suggests there has been no slowdown or "hiatus" of global warming in recent years. Many of you know that the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report, released in stages between September 2013 and November 2014, concluded that the upward global surface temperature trend from 1998 to 2012 was markedly lower than the trend from 1951 to 2012. But our new NOAA study, which used improved versions of both sea surface temperature and land surface air temperature

datasets, refutes the notion of a hiatus. Based on NOAA's new analysis of the global surface temperature record, our scientists determined that the rate of global warming has been just as fast over the past 15 as over the previous 50 years. This research was published in June of this year, the warmest June since record keeping began in 1880 and the sixth straight month of record breaking temperatures around the world.

This research has drawn attention the Chairman of the House Committee on Science, Space, and Technology and NOAA is working diligently to ensure that the public is given open access to the data that led to the conclusions in this report.

Update: Big data

We know open data is already giving rise to hundreds of entrepreneurial businesses and helping established companies to segment markets, define new products and services, and improve the efficiency and effectiveness of operations.

Several months ago, NOAA committed to a new initiative designed to make even more of the information we collect each day more readily available to the public; taking the 20 terabytes of data collected by NOAA each day -- from radar systems, weather satellites, buoys, real time weather stations, ships, aircraft, and other sources -- and working with the private sector to make this information accessible to the masses. To help get this information packaged and into the hands of people hungry for it, NOAA is partnering with Amazon, Google, IBM, Microsoft, and the Open Cloud Consortium to create open platforms where private industry, academia and individual innovators can access our data on a completely new scale.

The possibilities are truly incredible; a true testament to the close relationship between collaboration and innovation.

Keeling Curve as a National Historic Chemical Landmark & Wendy Schmidt Ocean Health XPRIZE

NOAA staff were excited that The American Chemical Society designated the Keeling Curve as a National Historic Chemical Landmark at NOAA's Mauna Loa Observatory in Hawaii in May. As many of you know, Charles Keeling worked with U.S. Weather Bureau and then NOAA scientists to create an iconic record that continues to show how man is changing the Earth. The measurements of carbon dioxide in the atmosphere that began on Mauna Loa in 1958 have shown a steady rise in this potent greenhouse gas linked to the warming of the planet. Charles Keeling's visionary research has been an instrumental tool in our ability to monitor, observe, and record the rise of carbon dioxide in our planet's atmosphere and the implications that has on the Earth's overall health.

Wendy Schmidt of the Schmidt Ocean Institute has been making considerable investments in ocean research, including in the form of a series of X Prizes.

NOAA PMEL scientists and scientists from the Joint Institute for the Study of the Atmosphere and the Ocean (JISAO) appreciated the opportunity to serve on the Science Advisory Board and the validation team for the most recent X Prize competition, recognizing a company last month that created pH sensor technology to affordably, accurately, and efficiently measure ocean

chemistry from its shallowest waters to its deepest depths. Certainly, this new technology is a significant advancement in the way of ocean acidification observing. We are optimistic that NOAA scientists will remain engaged with the Schmidt Ocean Institute as it continues to create opportunities for further ocean research.

Update: Resilience

NOAA continues to provide businesses and communities with the EI needed to be resilient to extreme events. Deepwater Horizon Settlement British Petroleum (BP) announced on July 2 it would pay the US \$18.7 billion over 18 years to settle civil lawsuits related to the 2010

Deepwater Horizon oil spill, under a tentative settlement with US state and federal governments -- the largest settlement with a corporation in US history, which covers most legal claims arising from the disaster.

Dr. Sullivan thanked all those who participated in the Gulf Coast Ecosystem Restoration Science Program Advisory Working Group (RSPAWG), which has advised this group on matters relating to the NOAA RESTORE Act Science Program. This group met in June and discussed (1) the Science Program's plans for coordination across the Gulf region with other science and restoration programs and (2) the Science Program's plans for performance management (i.e., performance metrics). NOAA anticipates getting feedback from the SAB on both of those topics in the next few months to help shape our programming related to rebuilding this part of our country, including an extension of the NOAA RESTORE Act Science Program (derived from funds deposited into the Gulf Coast Restoration Trust Fund as part of the settlement with Transocean) beyond its original funding lifecycle of seven to ten years. Funding will be distributed using peer-reviewed competitive approaches (e.g., federal funding opportunities) to advance the Program's long-term research priorities and rely most heavily on grants and/or cooperative agreements when making awards.

Resilience Discussions

Since the last SAB meeting, NOAA has worked to generate new thinking about our resilience priority among our federal partners and across the private sector, NGO, and academic communities.

Dr. Sullivan participated in the first two of a series of high-level roundtable events -- at the Center for American Progress and National Academy of Science -- on the topic of resilience, both of which have included productive conversations with the goal of reaching new audiences and fostering new opportunities for collaboration. NOAA is working with the Wharton Risk Management and Decision Processes Center to apply risk communications and behavior research to NOAA products and services. We are optimistic that this collaboration will enable us to incorporate best practices for communicating uncertainty into NOAA watches, warnings, and forecasts, all of which builds off of recommendations from a cross-line research team synthesizing risk communications and behavior literature.

California 2014 Drought Service Assessment

After soliciting feedback from more than 100 stakeholders and employees, NOAA released a service assessment in May that identifies tactics and strategies the agency can take to better

provide California decision makers with the scientific data and tools they need to lessen the impacts of extreme drought.

Top findings include a need to:

- Improve seasonal prediction given that even a “low confidence” seasonal forecast for the total precipitation in those areas could go a long way.
- Build “full natural flow” water resources modeling to enable water managers and users to better track the state of water resources.
- Enhance NOAA internal coordination of drought services given that most stakeholders accessed NOAA’s drought-related services through local NWS field offices, such as Weather Forecast Office or River Forecast Center.
- Design environmental monitoring projects on sub-regional or watershed-specific scales, such as the successful Russian River Habitat Blueprint project where our forecasting talent and fisheries management expertise infuses with that of local scientists and organizations to implement stewardship goals that promote sustainable use of water resources.

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National Integrated Heat Health Information System

NOAA collaborated with the White House in June to announce plans to work with the Centers for Disease Control to build a new National Integrated Heat Health Information System (NIHHIS) to provide a suite of data, forecasts, vulnerability and risk assessment information that better serve public health needs to prepare and respond. This effort comes from our recognition that 2015 will likely be the hottest year on record and that heat waves in parts of Europe, India and Pakistan have already claimed over 3000 lives, as well as recent memory of heat waves in our country that will likely repeat themselves, like that which hit Chicago in 1995 that led to over 700 heat-related deaths. Findings from a report published by the Risky Business Project, a non-partisan initiative chaired by Hank Paulson, Michael R. Bloomberg, and Tom Steyer, suggest these trends will only continue. According to the report, if current climate patterns persist, there will be an additional 27 to 50 days over 95 degrees Fahrenheit each year on average in 2050, which is two to three times more than what has been experienced in the U.S. in the past 30 years. These extreme weather conditions can reduce labor productivity of outdoor workers by as much as 3% or even lead to fatal heat strokes.

The NIHHIS will serve as an integrated information system, providing more advanced warnings and decision support services to help the public better prepare for, and respond to extreme events. Our partnership with the CDC and state or local health department will create new access to tightly held health data, critical in our analysis of various heat prediction parameters in relation to target populations and in a particular geographic setting. Further, engagement with CDC and our health partners puts our NOAA data, tools, and forecast products in context with other critical information on population vulnerability, social context, and communication networks. In total, this effort will identify and harmonize existing capabilities and define and deliver the research, observations, prediction, vulnerability assessments, and other information needed to reduce loss from heat waves.

Grants to benefit U.S. fisheries, fishermen and coastal communities

This June, NOAA announced more than \$25 million in recommended funding for 88 projects under the 2014-2015 Saltonstall-Kennedy (S-K) Grant Program; the most significant amount of

funding ever granted by NOAA under this decades-old program. Through S-K grants, NOAA funds projects that address the needs of fishing communities, optimizes economic benefits and resilience by building and maintaining sustainable fisheries, and increase other opportunities to keep working waterfronts viable.

We know that communities across the country differ in their goals and needs and that each can bring something unique to the table in terms of their approach to research and project development. These awards will create jobs, increase economic opportunities for fishing communities, improve the kinds of data and observations we collect about the health of our nation's fisheries and oceans, and make sound investments in mitigating future risk.

Update: Evolve the National Weather Service

NOAA is working diligently to build a Weather-Ready Nation by ensuring America has a weather service that is second to none. That's why we're evolving the National Weather Service to build a Weather-Ready Nation, where communities, and our economy, become ready, responsive, and resilient to extreme weather, water, and climate-related events.

Obama visit to the National Hurricane Center

We were delighted to welcome President Obama to the National Hurricane Center (NHC) in the days leading up to the beginning of Atlantic hurricane season on June 1st. During the visit, he toured the facility, offered some brief remarks to media about the upcoming hurricane season, helped issue a hurricane advisory, and held a Twitter question and answer session with the public on climate change. In his remarks, the President emphasized that the direct efforts of federal agencies like the Federal Emergency Management (FEMA) and NOAA are shining examples of the excellent, hands-on work that the government can do for the people of this country.

Upgraded hurricane forecasts & UASs

In May, we announced plans to upgrade weather forecast models and conduct research with unmanned air and water craft to improve hurricane track and intensity prediction. A highlight this season is the upgrade of the operational Hurricane Weather Research and Forecast system (HWRF) -- which has increased the resolution from 3 to 2 kilometers -- and will use tail Doppler radar data collected from the NOAA P-3 and G-IV hurricane hunter aircraft to improve the storm representation within the model. With each upgrade to a higher resolution, the model helps improve predictions of hurricane intensity because we're able to more closely model features, like clouds, that can significantly affect storm intensity.

Our Hurricane Research Division and Unmanned Aircraft Program will be working with NOAA's Environmental Monitoring Center to transition the G-IV Tail Doppler Radar and NOAA dropsonde data collected by the NASA Global Hawk into operational use. From our perspective, flying the Global Hawk with weather observing sensors above a storm is like putting the storm under a microscope. We can gather high resolution data to see more clearly inside the storm and better capture changes in wind speed and intensity.

NOAA also successfully deployed an unmanned aircraft, the Coyote, from a hurricane hunter into the eye of Hurricane Edouard last season -allowing us to make very low-altitude

observations within the storm. We will expand the use of this small unmanned aircraft this hurricane season.

Planned flights timed to hurricanes will measure the regions of strongest winds at low altitudes in hurricanes and send that data in real-time to forecasters at NOAA's National Hurricane Center.

New version of Hurricane Local Statement

For the 2015 tropical cyclone season, we have a number of new developments in the ways we communicate hurricanes warnings designed to spur action that can mitigate storm damage. A Hurricane Local Statement is issued by NWS local forecast offices to emphasize local impacts based on the forecast from the National Hurricane Center and provides pertinent WFO-wide tropical hazard impacts to the local public. NOAA staff took a close look at this process and walked away with a more complete understanding of the various needs of different users groups and a recognition that we needed to better standardize the way we presented warnings. NOAA's Global Systems Division developed a new version of the Hurricane Local Statement along with a new nearly-automated WFO Tropical Cyclone VTEC (TCV) product in collaboration with the NWS Tropical Team who created the requirements for improved WFO tropical hazard messaging. This retooled version is more concise, easier to understand, and also is more quickly produced by NWS forecasters. It is geared towards 1) the media who need a summary of impacts for the storm, 2) emergency managers who need more detailed and localized meteorological and threat information, and 3) the public at large. It allows for a more timely dissemination of information as well as a well-collaborated safety message.

mPING

Meteorological Phenomena Identification Near the Ground (mPING) is a crowd-sourced citizen science initiative to collect data on cold-season precipitation type as well as warm-season hail occurrence and hail size. Citizen Scientists submit reports using their "smart" mobile devices (phones and tablets) and mPING has proven quite popular, with over 895,000 reports submitted by the public since the December 19, 2012, the official start date of mPING.

NOAA staff are using these data to generate better algorithms for better depictions of precipitation type at the surface using the dual-polarization NEXRAD weather radars, and to help National Weather Service forecasters make better forecasts of precipitation type at the surface. Knowing the precipitation type at (or very near) the surface helps managers better assign resources for transportation and utility infrastructure maintenance in winter weather.

National Water Center

In May Dr. Sullivan travelled to Tuscaloosa with Secretary Pritzker to celebrate the opening of our new National Water Center located at the University of Alabama. The legislation that created the funding for the National Water Center charged us with building an institution to address the pressing water issues facing our country -- too much, too little, wrong place, and poor quality -- with areas of focus including coastal impacts, living marine resources, in-land flooding, drought, and water availability. The Center is a state-of-the-art facility, poised to improve federal coordination in the water sector to address 21st century water challenges. NOAA has just begun to outline how the Center can be best positioned to develop those solutions capable of bolstering

water-related resilience and is working with extramural partners to develop a roadmap for the Center grounded in user needs and community interests.

Update: Organizational Excellence

Each day, NOAA's employees strive to promote organizational excellence and execute our mission with discipline and consistency. It's the reason why one key focus is driving systemic improvements in our research enterprise, much of which I'll reserve for Dr. Spinrad to update you on.

But to give you a preview:

- We have reinvigorated the research council
- The CI21 process is really under way
- At the October meeting we'll have the first ever Strategic Research Guidance Memo (SRGM), an example of our continued efforts to transform the research to operations and applications process, what we're calling R2X.

Collaboration with PBS

As NOAA continues our efforts to address our aging workforce, we're extremely focused on marketing our organization to the next generation of NOAA scientists however starting our recruiting at the post-doc level is a mistake. For this reason NOAA is focusing on expanding our outreach and training programs to K-5 classrooms across the country. NOAA has recently signed a no-cost agreement with the Public Broadcasting Service (PBS) to encourage the network to incorporate much of our online scientific content into their award-winning educational materials. NOAA will be providing content specifically for their Learning Media initiative, which provides an innovative, digital solution for over 1.6 million educators looking to leverage media in 21st century classrooms. While the agreement enables them to expand their content to ensure that their content is full of the latest scientific information from a trusted provider, the organization's outstanding reputation and large-scale distribution network provides a fantastic marketing opportunity for NOAA. Our work with PBS is a terrific example of how we can utilize the information developed in our programs to demonstrate the value of NOAA science to society.

Discussion

Lynn Scarlett asked how NOAA priorities look in terms of the budget process on the Hill. The House went on Recess last week Senate this week. Then they will have 3 weeks time before new FY so will likely have a CR-details remain to be seen, turbulent first quarter given uncertainty. On FY 16 markup there are differences between both House and Senate-deeper cuts in Climate on House side, better funding totals overall in Senate.

Molly Macauley asked about incorporation of drones, UAVs and crowdsourcing. Is there a push back from aerospace companies as they built them? Dr. Sullivan said there has been no pushback yet; some of these companies are players now and -it is still a bit nascent. When you will start to see they push back is if NOAA found themselves positioned to say we won't need P3 aircraft, we need drones and if it would start to impact contracting. However NOAA is not the market-maker, the Department of Defense and NASA are. Like many things the superficial label will generate excitement but the costs can still be high to staff these platforms.

NOAA Chief Scientist Update

Richard Spinrad, NOAA Chief Scientist

Dr. Spinrad stated that the Office of the Chief Scientist has taken on the important goal of building a robust portfolio logic for NOAA's research enterprise that is mission optimized and provides clear guidance. NOAA lacked a clear strategic set of guidance and that gap inspired the Strategic Research Guidance Memorandum (SRGM). SRGM uses NOAA priorities to guide research priorities. SRGM contains two parts; the Framework of Principles and Specific Research Priorities. The Framework of Principles is designed to be a stable and rarely changing section of the SRGM covering the topics of mission alignment, R&D transitioning, research balance (between natural and social science, basic and applied, risk tolerance), partnerships, (internal across LOs and extramural), facilities and infrastructure, workforce excellence, and finally scientific integrity and accountability. The second section is annual Research Priorities, which are specific elements of focus to help direct or redirect resources. NOAA Research Priorities for 2015 are integrated Earth system modeling, observing system optimization, decision science, risk analysis and risk communication, data science, water prediction, and the Arctic.

The SRGM will help with current budgetary challenges related to the offset in budget deadlines and formal guidance given by OMB/OSTP, which is released annually after NOAA must submit a budget.

Dr. Spinrad requested that SAB members send SRGM questions, comments and edits to the SAB Acting Executive Director, Beth Turner, by August 18, 2015.

The next topic was the transition of research to application/operations (R2X). Dr. Spinrad mentioned that process, resources, and culture are all key pieces to accelerate R2X and a broad array of research needs and requirements must be considered in the R2X process. NOAA is adopting readiness levels (RLs) to keep track of project progress. It is important during product development to demonstrate that the end user will actually use the product. There is a draft NOAA Administrative Order (NAO) on a policy for Research and Development Transition. NOAA will develop a handbook based on the NAO. The expected outcomes include accelerated transitions with an established process that clearly lays out authorities and responsibilities. NOAA is planning to have dedicated resources for transition to improve mission performance.

CI21, which is NOAA's ongoing effort to restructuring CIs to best meet NOAA's and partners' needs, has been continuing. The CI21 Summit in June 2015 included representatives from CIs, Cooperative Science centers, Cooperative Ecosystem Studies Units (CESUs), and NOAA representatives. Topics included mission alignment, workforce development, finance and management, and private sector involvement. The next step is having set of recommendations for NOAA Administrator by end of the calendar year, which will include how CIs are assessed and reviewed in the future.

Dr. Spinrad commented that the Office of the Federal Coordinator for Meteorology (OFCM) is looking for a new director and will be rethinking that position and will find someone to lead senior level engagement across the government.

NOAA is looking for ways to increase the recognition of scientists. The PECASE award has been increased from providing a stipend of \$25,000 for 3 years to now giving \$50,000 for five years. Also, the NOAA Research Council is working to create a centralized webpage that will have all professional award sites identified to help encourage nominations.

The OSTP Committee on Environment, Natural Resources and Sustainability (CENRS) has been focusing on the nexus of food, water, and energy security. The Committee on Science has been focused on reproducibility in research.

NOAA is also actively supporting the New Blue Economy. This is an effort to build out commercial ocean services that is based on NOAA information.

Discussion

Dr. Spinrad stated that SRGM gives internal guidance to aim research towards mission. However, SRGM will be useful for external communications to clearly explain why NOAA has selected certain research efforts, the scope of the research, the importance of that research portfolio and the rationale behind the research. He added there is a lot of interest on the Hill and at OSTP in what NOAA is doing.

There was discussion about CI21 and the balance of mission alignment with innovation that can help NOAA see beyond the traditional approach. Dr. Spinrad said that CI21 is keeping in mind the need to focus on NOAA and CI expectations and also on the flexibility for CIs. Dr. Sullivan added that there is a tendency to tightly link mission alignment with intention to dictate results, but that is not the intent with CIs. The effort with CIs and mission alignment is to help ensure NOAA needs are being best met.

It was asked how NOAA is integrating opportunities that new observation technologies and strategies are making possible. Dr. Sullivan stated that NOAA knows there is a need to be engaged with external partners to stay in touch with emerging changes that will support NOAA's mission and allow NOAA to better execute its mission.

NOAA Response to the SAB Ecosystem-Based Fisheries Management Report

Richard Merrick, NMFS Chief Scientist

Summary

Richard Merrick presented the NOAA response to a report by the SAB Ecosystem Sciences and Management Working Group; this report is a follow-up on the earlier ESMWG report on Integrated Ecosystem Assessments.

In the past, fisheries science was done on single species, in the last decade, ecosystem information was added but they still did single stock assessments. Now there are fisheries ecosystem assessments and plans; EBFM is much larger. He is grateful to the ESMWG for these recommendations. They have worked with Fishery Management Councils in making these

changes and the National Marine Fisheries Service (NMFS) has hired three senior scientists who have played major roles in moving things forward.

The recommendations are a set of principles on how to do EBFM and they have made a lot of progress in implementing these.

Recommendation 1: Support Council processes for ecosystem science

NOAA understands and supports this recommendation. NMFS is implementing a new NOAA Fisheries policy on EBFM and will follow this with a “Road Map” for further implementation of EBFM. NMFS is surveying all the Fishery Management Plans (FMPs) and how they incorporate EBFM. After these actions are completed, there will be a national meeting with Councils on implementing EBFM.

Recommendation 2: Invest to understand fishery management as a coupled socioecological system.

NOAA agrees that a greater understanding of the interaction between the human dimensions of fisheries and the ecological system can lead to improved management outcomes. Now the ESMWG is finishing up a report on Ecosystem Services Valuation as well as one on traditional ecosystem knowledge. These reviews will address this issue.

Recommendation 3: Facilitate cross-regional and Council interactions

NOAA supports national-level meetings aimed at facilitating interaction between science and strategy. NMFS is developing a national science Ecosystem Based Fishery Management policy that they are rolling out in September 2015 to be followed by face-to-face meetings with each Council.

Recommendation 4: Invest in tools for assessing tradeoffs.

NOAA agrees that investments in tools to assess trade-off options are important and will continue to support Management Strategy Evaluations as part of its process to generate Integrated Ecosystem Analyses. NOAA will also reprogram funds to increase the amount of funding available to support EBFM.

Recommendation 5: Assess and implement best practices for coordinating and integrating ecosystem science.

NOAA concurs that the provision of the best scientific advice on ecosystems requires the activities in multiple scientific disciplines originating in many parts of NOAA. Ecosystem status reports are being developed; they are a set of indicators Fishery Management Councils can use in setting quotas. There are also climate vulnerability assessments being rolled out now; these can help in evaluating impacts of climate change and capacity building for long-term EBFM.

Recommendation 6: Develop training and capacity building for long-term EBFM.

New communications tools have been developed to visualize and illustrate aspects of EBFM. There are additional PhD support programs with Sea Grant on Ecosystem Dynamics and Social Sciences that can help develop a cadre of new, young scientists that are EBFM savvy.

Recommendation 7: Continue to Lead International efforts to use EBFM.

NOAA is at the center of many international conferences on EBFM and will continue to support international efforts.

While informational, this NOAA report does not require a SAB response however NOAA looks forward to continued discussion with EBFM. There is a draft EBFM policy that will be finalized by the end of the year. [Note: subsequent to the SAB meeting, Dr. Merrick circulated a draft of the EBFM Policy to the SAB for individual comments]

Discussion

David Fluharty said this has been an ongoing dialogue between the ESMWG and NOAA; this response helps to make sure that the ESMWG makes good recommendations in the future. He commends the responsiveness and moving ahead; there are things that are highly responsive to the recommendations.

Lynn Scarlett thanked Richard Merrick for the presentation and asked to what degree does NOAA coordinate its ecosystem services valuation work with the broader Council of Environmental Quality (CEQ) efforts? NOAA is reaching across to other federal agencies on these efforts; the issue with the Office of Management and Budget is non-market valuation. Their expectation is that the ESMWG Ecosystem Services Valuation (ESV) subcommittee can serve as an expert panel.

David Fluharty said there are three economists on the ESV subcommittee who worked with the Environmental Protection Agency on this issue and also helped write the CEQ ESV guidelines. NOAA is doing a lot on ecosystem services; how do you move from unquantifiable areas by adding ESV? He knows NOAA is working beyond valuation to human wellbeing. Richard Merrick said the Lenfest Ocean Program is a non-governmental organization that is working to take a pragmatic approach to work with Fishery Management Councils to develop tools including tools for ESV.

Susan Avery said sometimes ecosystem approach defined by humans is for humans but not for ecosystem health. She did not hear about elements for healthy ecosystems-how do you get to ecosystem assessments to see if you have resilient ecosystems. Richard Merrick said the goal of Integrated Ecosystem Assessments (IEAs) is to manage the process. In Puget Sound, the focus is the health of Puget Sound; there are no universal indicators, as these will vary by region. Susan Avery said some new research could help to identify appropriate indicators of ecosystem health. Richard Merrick said a goal was to have healthy ecosystems.

Jeremy said this step still needs to be done as we now have indicators are for status of fish stock and not for how the ecosystem is working. There is more coupling in the thinking; could you comment on how these indicators could be expanded. Richard said that in today's IEA presentation you will hear indicators of these metrics.

Data Access and Archive Requirements Working Group (DAARWG) Report on Geostationary Operational Environment Satellite Series R (GOES-R) Level 0 Data
Christopher Lenhardt, Renaissance Computing Institute and Chair, DAARWG

Summary

DAARWG was concerned that in planning for the GOES-R satellite that the decision was made not to archive Level 0 data. They understood it was a factor in the way the satellite specification was conducted. Level 0 is unprocessed data will be kept for 2 years then discarded in a first in, first out way. The data that will be saved is the Level 1 b that has the first initial set of parameters.

DAARWG said commonly accepted best practice is to save the data that is the least processed so you can go back to it. DAARWG endorses the digital data curation standard practice of archiving the lowest-level satellite data possible for potential future reprocessing, in addition to archiving derived products.

DAARWG encourages - NOAA to ensure that all future (after GOES-R) satellite development efforts consider data archiving requirements for both unprocessed data and derived products at the beginning and throughout the development process.

DAARWG recommends - NOAA utilize the interim period of two to three years before the first round of GOES-R L0 data is slated to be discarded to host a workshop to invite the relevant communities, e.g. scientists and others, to examine in more detail the utility of maintaining a copy of the L0 data for the long term. The output of this workshop should influence NOAA's policy regarding the archiving of GOES-R L0 data.

There are new technological opportunities such as the NOAA big data program which could be used. While there has been no demand for Level 0 data, if the community does not know it exists you can't determine demand.

Discussion

There is no way to roll back 1b data to level 0 data. When it comes to GOES satellites Level 0 is an adequate level of data to hold. Steve Volz asked about approach of other agencies and UMET SAT-They are saving Level 1A which is raw data with some information appended. Steve Volz said the idea of a workshop is acceptable to NESDIS and they will follow through. Dawn Wright said the workshop is a no-brainer, and she strongly encourages the dialogue; also given the capability and storage and bandwidth, this is perfect fodder for big data products. Advantage of Level 0 data is it takes up almost no space-Mike Kalb. There are some constituents for Level 0 data archiving-Space Science and Engineering Center at Wisconsin is planning to archive the Level 0 data.

A motion was made to accept the report by Bob Winokur and seconded by Susan Avery. The motion passed with one abstention.

Action 1: The SAB approved the report and will transmit it to NOAA.

Some Fish Like It Hot: A Novel Form of Endothermy in the Opah, *Lampris Guttatis*
Dr. Nicolas Wegner, NOAA Southwest Fisheries Science Center

Summary

The opah, *Lampris guttatus*, is a large mesopelagic predatory fish with a circumglobal distribution and is an important species in some commercial fisheries. However, little is known about its biology, and over the past several years increased interactions with opah in fisheries surveys conducted by the Southwest Fisheries Science Center has provided the opportunity to learn more about this poorly-studied species. This research has shown that the opah exhibits a unique whole-body form of endothermy, in which internal body heat appears to be primarily produced by the constant “flapping” of wing-like pectoral fins. Heat loss to the environment is minimized by layers of insulating adipose tissue and a unique series of counter-current heat exchangers located within the gill arches. Unlike other fishes, the unique placement of these countercurrent exchangers within the gills allows for warm blood to be distributed throughout the body including to the heart, viscera, and cranial region thereby enhancing physiological performance and buffering internal organ function while the opah forages in cold waters below the surface.

Using Small UAS to Include Measures of Individual Condition in Whale Assessment

Dr. Wayne Perryman, NOAA Southwest Fisheries Science Center

Dr. John Durban, NOAA Southwest Fisheries Science Center

Summary

Throughout the wildlife sciences, manned aircraft play a major role in the collection of data on the abundance, distribution and condition of targeted populations. However, manned platforms are expensive to operate, they are not available in all regions, their noise can disturb the animals being sampled, and there are legitimate safety concerns about flying at low altitudes in remote locations. As the development of small UAS systems began to mature, scientists at the Southwest Fisheries Science Center (SWFSC) began a program designed to develop a small unmanned aerial system that could be safely operated by scientists in remote locations to provide aerial photographic support in areas where it was previously unavailable.

The system we selected is the APH-22 hexacopter designed and constructed by Aerial Imaging Solutions in Old Lyme, CT. This aircraft has proven to be very reliable and the quality of images we now collect from this platform has exceeded our expectations. Scientists have now flown the aircraft for 4 seasons in the Antarctic, completing over 100 missions, without a field failure. The system is now our standard for collecting data on the number of penguins in large colonies, the number of pups in Antarctic Fur Seal rookeries, and for measuring size and shape of leopard seals.

In 2015, with support from OMAO, we developed a marine version of the APH-22 and this system has proven to be a remarkable breakthrough in the study of condition of cetaceans. We have now flown over 600 missions sampling blue and humpback whales and both northern and southern resident populations of killer whales. These new small UAS allow us to collect better data, for less cost, with no disturbance to the animals sampled and without the risks associated with flying in small aircraft at low altitudes. These systems are a real game changer. Success in the development of these systems was only possible through the support of NOAA Fisheries Office of Science and Technology and the Office of Marine and Aircraft Operations.

Discussion

Bob Winokur asked if there was intent to use larger UAS to measure other environmental parameters. The answer is they are keeping the system small so they can put these in hands of scientists; if they are bigger, they are more dangerous to handle.

Richard Merrick said NMFS is using larger UAS to replace the Twin Otter aircraft in surveys next year.

Jeremy Jackson asked if they can post the images for public view; people won't see them and they are quite extraordinary. They are making an effort to get things out on their website but they need to do more.

Kathy Sullivan agreed but there is a counter pressure involving safety and possibly harassing animals. Jeremy said NOAA could lead and establish guidelines in this area.

NOAA's California Current Integrated Ecosystem Assessment; IEA: the engine behind EBM and EBFM

Toby Garfield, Director, Environmental Research Division, SWFSC

Summary

The California Current Integrated Ecosystem Assessment (CCIEA) has completed two rounds of identifying and analyzing environmental and human-dimension indicators that document stressors and variability in the California Current Large Marine Ecosystem. These two extensive compilations (each over 700 pages), while excellent resources, are unwieldy for up-to-date input into management decisions. For the third round, the report will rely on dynamic web pages and concise syntheses to supply the necessary information in a timely manner. This dynamic approach to updating information allows the CCIEA to report conditions in near real time, a critical capability to report the unprecedented atmospheric and oceanic variability experienced during the last two years. To date, the CCIEA team has made three annual presentations to the Pacific Fishery Management Council and is now engaged with the Council's Ecosystem Subcommittee to define indices to include in their Fishery Ecosystem Plan. This is a critical step in developing Ecosystem Based Fishery Management (EBFM) and ultimately Ecosystem Based Management (EBM). The CCIEA is also working with the five west coast National Marine Sanctuaries by providing indices and data for their Condition Reports.

Discussion

Susan Avery asked if this work has extended to the Great Lakes. No, NOAA does not do Great Lakes, Fish and Wildlife does.

Lynn Scarlett said putting a management hat on, it is difficult to manage to 199 indices, is the idea that managers draw on a subset of indices? They do a number of iterations of indices and the managers can see options.

Jeremy Jackson said as ecologists and fisheries biologists we do know a lot but could have a wish list of things that they know are important and not worry about others so number would drop down to 30-40. Is there any effort to move in that direction? The report they give to the Council is much more select and only provides indices that would be most useful.

Strategy Session

Panel Discussion with Invited Speakers

Nancy Knowlton, Sant Chair for Marine Science, Smithsonian Institution

Bill Gail, Chief Technology Officer, Global Weather Corporation

Opening Comments

Ms. Scarlett reminded everyone that Dr. Sullivan asked the SAB to give advice to help prepare NOAA for a changing world. The goal is not a traditional SAB report. It is just to give awareness and not necessarily to give formal recommendations.

Dr. Sullivan added that the original goal of these discussions was to re-position and re-design the role of the SAB and determine appropriate issues, questions, and bigger tasks for the SAB. In addition the discussions were to determine more nimble SAB reporting option that would result in NOAA getting a higher degree of value from the SAB.

Dr. Spinrad added that the NOAA mission does not fundamentally change over time, but there are transformative events like 9/11, Japan Tsunami, Super Storm Sandy, Deep Water Horizon that NOAA must respond to and change its focus. The question for the SAB is how should NOAA position itself to best prepare to deal with these types of events.

Nancy Knowlton

Sant Chair for Marine Science, Smithsonian Institution

Dr. Knowlton began by reminding everyone that she was not a trained professional communicator, but a coral reef scientist that felt the need to communicate coral risks and solutions to the public. It was clear that solving the problem required the engagement of the public and therefore the need to clearly communicate. She has learned much through the years including that you can't scare people into caring. She recently co-launched the Ocean Optimism effort.

She stated that NOAA must determine the goals of any communication effort and then develop next steps from the goals. Potential communication goals for NOAA are 1) Build public literacy and awareness of how the planet works 2) Show the value of NOAA's actions 3) Show outcomes of NOAA actions 4) Inspire people to do their part, because scientists can't solve the problems alone.

Operating principles and steps to success

- 1) Know NOAA's audiences. NOAA should not try to reach the public generally, but develop more tailored communication efforts instead.
 - a. Tools for success depending on audience and include analogies, pop culture, humor, and video games.
 - b. Must reach "Science-phobic" individuals. Consider the effort moving from Science, Technology, Engineering, and Math (STEM) to STEAM, which brings in art.
 - c. Use a variety of platforms: Facebook, Twitter, the web

2) Tell Stories

- a. Story telling in science communication. When telling a story use the “And, But, Therefore” (ABT) structure, which is simple and powerful. Suggest books “Don’t be Such a Scientist” and “Houston, We Have a Narrative” by Randy Olson.
- b. Focus on people, on citizens who benefit, and on the scientists as people. Citizens can be seen as partners, as scientists and as communicators.
- c. The stories have to be shareable. That’s how things spread. Sharable stories respond to needs and appeal to emotions, awe, hope, dreams, etc., but not to sadness. Sharable stories do not use jargon.
- d. Mobile first. Think of a phone as the first communication platform and determine how to best communicate on that platform.
- e. Use visuals. Videos should be interesting even without the words.
- f. Actionable.
- g. Use partnerships to tell the stories.

3) Be likeable

- a. Messages must be likeable. Add good news/ solutions to bad news announcements.
- b. As a messenger NOAA is competent and trustworthy. NOAA should consider a centralized “voice of NOAA.” Currently, NOAA has same information in multiple places, which tends to create competition across NOAA’s own sites.
- c. NOAA needs some branding. People might know the stories, but people don’t know it is a NOAA story. NOAA needs to add a tag line.

4) Make communication a priority

- a. Companies make huge investments in communication.
- b. Communications change very quickly and therefore needs lots of attention to optimize.
- c. Bring in outsiders.
- d. Train staff to communicate.
- e. Invest, experiment, and evaluate.

Discussion

The need to measure success was discussed along with the development of proper metrics to measure outcomes and ideally behavioral changes. Dr. Knowlton responded that you can get indirect measurers of behavior on the web, which is a start. It is difficult to measure how people actual respond to the information. #OceanOptimism is tracked at a basic level and in the broad community of professional marine researchers more people are talking about optimism, which reflects a change and the realization of the need to get beyond the doom and gloom.

Dr. Sullivan asked if the reduced rate of sharing sad stories is related to the social stigma of not sharing personal sadness.

Dr. Knowlton responded that it may not be necessary or possible to fully avoid sadness, because certain stories are intrinsically sad and need to be told, but sadness without any hope reduces the odds of sharing the story. Others added that at times people do respond to sadness embedded in aspects of stories by genuinely listening.

Collaborative short stories were mentioned as a powerful tool. Then, there was a question about bottom vs. top down and the importance of a unified element from above.

Dr. Knowlton said there is a happy medium. NOAA needs to be recognized for its contributions, but needs to ensure flexibility for people to participate at different levels. The book *Orbiting the Giant Hairball* by Gordon MacKenzie was suggested to explore having both the unified messages and creative bottom-up approaches. Dr. Knowlton stated that social change happens from the bottom up. If NOAA wants big things to happen it must be communicating to nurture the bottom up efforts. It is critical to the long term success of NOAA's goals. She quoted Bill Gates "We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."

Bill Gail
Chief Technology Officer, Global Weather Corporation

Bill Gail started by stating that successful communication requires taking some risks to get people thinking of something new.

The world is changing quickly and we are currently experiencing an Environmental Intelligence Revolution, which is a culmination of a 50-yr revolution that started with satellites, followed by modeling, and then the dissemination of information through internet and mobile. Over next decade, the number of people with access to quality information will grow by more than an order of magnitude. Phones, cars, appliances can all use environmental information and 73% of world population has access to mobile phones. He suggested reading Mary Meeker's Internet Trends Report.

One must anticipate what will be perceived as success in the future. Look ahead to what success will be when the success is being talked about and keep in mind that success is really a perception and not a fact.

Success requires an emotional sense of integrity, innovation, impact, effectiveness, and culture – all bound together. It should be remembered that success is external and is in the eye of the beholder. What NOAA's users & supporters think about NOAA it is not necessarily what NOAA wants to be nor what NOAA wants others to think it is.

Success can at times look like failure. For example, if success is too routine, people think it looks easy and solving problems always gets more attention than preventing them e.g. Y2K avoidance. A goal for NOAA is figuring how to get credit for what it does to avoid problems. Success requires creative thinking ahead and not just focusing on current problems to avoid the Innovator's Dilemma

NOAA's communication of success must consider the progression of NOAA's operations-driven success that has slow and steady progress. Also, NOAA's research and developments (R&D) drive success that can lead to rapid growth, but also has more ups and downs. There needs to be a balance.

NOAA needs to communicate success in the current environment, which includes the public perception that government is falling behind, increasingly governed by rules, bureaucracy, budget and public apathy. NOAA can navigate this environment by presenting NOAA as an innovator, by resetting the risk-rewards balance, by not prioritizing the meeting of all obligations before NOAA begins to innovate. NOAA can be the leader of the enterprise, which seeds and embraces commercial success. NOAA can harness WFOs as innovation centers and encourage and manage them towards that goal. Also, NOAA could leverage Commerce Data Advisory Committee which implies DoC leadership support for new approaches and NOAA should learn from the commercial sector.

Appropriate goals should be identified by NOAA allowing for the development of correct success criteria. Progress and innovation might be explicit goals on par with reliability. NOAA providing enterprise leadership could also be an explicit goal. NOAA should be innovators of appropriate metrics using tools such as comparative values, service denial models, and user effectiveness surveys, which determine the impact of information on users.

Communication needs a short feedback loop, monthly or quarterly, not yearly, because things change too quickly. Feedback loops are also necessary in the iterative development process.

NOAA should invest in future success and environmental intelligence can be a cornerstone of NOAA establishing NOAA as information revolution leader.

Discussion

The difficulty of long time scales was discussed. Weather, climate, and sea level rise take a long time to develop. Success might result because of decisions made decades before. It is time to start taking actions now for many long term goals. Dr. Gail responded that smaller project success should be embedded in the big picture of success. And when a success is realized NOAA should communicate that NOAA had a successful project because that is what is expected from NOAA and once again NOAA demonstrated its competency.

The discussion moved to focus on why NOAA is trying to communicate success. It seemed necessary to have an understanding of the motivation to try and communicate success. Dr. Sullivan stated that NOAA has the mission to understand earth processes well enough to provide useful information for service and stewardship, to protect public safety and the viability of US economy and therefore NOAA needs to understand what content information is most effective. NOAA's information is critical to important economic decision making and coastal development, but NOAA needs to better connect its products to individual and societal economic decision making. NOAA wants to inform and persuade leading to actions that protect and preserve living marine resources. Therefore the SAB should look at the discussion of success and communication through the lens of those missions.

The responses included that although there is no communication mandate for NOAA, communicating would increase the likelihood of mission success. For example, communicating why research is mission critical helps ensure that funding continues to support it. There is also a need to communicate both long-term and short-term success e.g., getting people out of town because there's a hurricane versus relocating the town, because of sea level rise. It was pointed

out that there are places within NOAA where communication is not secondary, but it is a clear goal e.g., NOS using narrative story maps full of stories from science. Society needs public safety, sustainable resource management, long-term resilience and none of those can be delivered well without communication. People are worried about issues that NOAA addresses and many people are nervous about the future and looking for trusted advice. Giving people good information could be a constructive way for NOAA to shine. Also, NOAA's mission of stewardship is the nexus between humans, nature and conservation and often leads to situations with trade-offs. These difficult tradeoffs can lead to trust issues. One solution to develop transparency and trust is to jointly define problems with stakeholders and use collaborative adaptive management. Communication challenges include the processes of dialogue and engagement.

During the Superstorm Sandy event NOAA gave good warnings, but nonetheless there was lots of destruction. Now is the time to communicate how sea-level rise will impinge on human safety and economics in the next few decades and adding those details to sea level rise will make the event very real. It is not enough to simply say that the sea will be rising instead it must be tied to what people value. Dr. Sullivan stated that even when science is communicated clearly it still must deal with human behavior and asked is it really NOAA's mission to change people's behavior. She wondered if NOAA could connect scientific information to other communication avenues, because simply more science communication may not be effective. Ms. Scarlett said that behavioral changes may not depend on NOAA communicating science better, but NOAA could participate in the discussions to ensure that its environmental intelligence is being used as a tool.

Dr. Gail said there needs to be a distinction between communicating NOAA's success and communicating information. He added that much of what NOAA does goes through third parties and NOAA could get partners to simply start saying NOAA is the best source of environmental intelligence and perhaps that would be enough for NOAA to be a success. Dr. Sullivan asked why doesn't NOAA get that representation in the private sector, because wouldn't it be good for the private sector to help ensure NOAA receives funding. Dr. Gail said it might be a simply a practical reason that they get info from a variety of sources and perhaps it would be overwhelming to acknowledge all sources. There is no question that all of the private sector should be standing up for NOAA, because NOAA allows them to be successful. Intel co-funded all the "intel inside" ad campaigns. He suggested it would be great to have some sort of business strategy that gets everyone to acknowledge NOAA. NOAA needs congress and the public to recognize its importance.

The SAB responses included the acknowledgement that even many informed Americans do not really know what NOAA is or what NOAA is doing and that demonstrates NOAA poor job of communicating its success to the public. Information is an odd commodity to communicate, but resilience is a product of NOAA's environmental intelligence. NOAA is a unique agency and just needs to be NOAA and communicate its activities in a more unified and cohesive manner. NOAA can be the conversation and not just part of the conversation.

There was discussion about how much NOAA should worry about getting the credit of certain activities and how important credit is compared to the success of the mission. Credit is important in the long term, because Congress needs to understand that NOAA is at the base of many

successes. Additionally, if people are working at NOAA they would like the credit. However, the credit may not be necessary for mission success. Funding requires some credit getting given. Is it better for NOAA to invest in “branding” or should those familiar with NOAA successes be communicating the importance of NOAA? There was a request to attempt to state NOAA’s broad mission in an easy way for branding, but that proved quite difficult. It was stated that regardless of NOAA branding a key for NOAA is trust and credibility.

Dr. Sullivan re-directed the conversation to the question about the value of the information that NOAA provides and wondered what role the answer to that question would play in communicating NOAA’s success. Dr. Gail responded that people get value without understanding the value of what they are getting. He stated that Dr. Sullivan personally has been a great success in getting information to the private sector. The down side of that effort is NOAA loses its brand, but the upside is the multiplied impacts of NOAA information. NOAA does a good job hanging onto important the most important forecasts like hurricanes and tornadoes warnings.

Ms. Scarlett added that for much of NOAA’s mission there is the challenge to motivate the use of relevant knowledge. That isn’t just about the messenger or even about the message, but also about the relationships and the idea of mutual learning. If one considers resilience, resource management, and public safety these issues are all much more complicated than relevant knowledge and is about dialogue. The relational context is important.

Public Comment

There was no public comment

Tuesday, August 4, 2015

Recap of Previous Day’s Strategy Session

It was acknowledged that the previous day’s discussions did not come to a conclusion and there were 3 broad strands of conversation on the previous day

- Why communicate? 1) branding 2) helping others value science 3) science communication to create action
- Metrics to assess communication success.
- Tools for communication including social media and decision support tools to incorporate scientific knowledge.

There are challenges in the communication realm including the political environment and the tensions between regulators and stakeholders. NOAA must decide how to remain a trusted information provider even on difficult topics and the SAB is to provide advice for success.

Discussion

A major communication challenge is delivering information in a way that non-scientists can gain insights and have an informed opinion. Scientists are at times accused of being advocates. However, information is not advocacy even though people may be unhappy with the implications of the information. Currently, there is a huge hunger for information, because people want to know what the future will hold and they are concerned and curious. NOAA should simplify

people getting good information perhaps by providing simple informational fact sheets on the biggest issues.

Dr. Sullivan responded that NOAA collects data and turning data into information that a non-scientist can use requires a translation. The stories and themes necessary for effective communication tend to bring into play values and “loaded” language. And that’s often when people start to call it advocacy.

The response focused on the example of sea level rise and it was suggested to start with the facts and start moving into implications. Currently it is difficult for people to find any good basic information and people don’t know who to believe. NOAA could fill that need. Most people want information not data. Information is data with relevance and purpose and can help answer a question or deliver a message. There is a social learning within families that has a ripple effect. In the context of science and communications there is great importance in the traceability of a statement to a solid foundation and uncertainties must be expressed in a meaningful way.

Documents like the IPCC report should not just be posted on line, but should be combined with online tools that are user friendly and engaging. There are communication principles that can help reduce the “fraughtness” of certain topics like climate. When developing decision support tools include the trade-offs of different options and use joint fact finding approaches and collaborative adaptive management to help clarify what data people need. Also, NOAA needs to keep in mind that the public has different windows on reality and different sources of information they view as credible. It was pointed out that social science has research on knowledge and information management that could be helpful.

Dr. Gail added that the topic communicating success is a deep issue that won’t be solved in one conversation and the SAB could structure ongoing conversations to be increasingly productive to answer the what, why, who, and how of successful communication. The “what” success will be is different for each part of the agency. The “why” NOAA needs to be successful at communicating success includes maintaining funding, letting people know NOAA provides good information, and better implementation of management tools. The “who” to communicate to needs to be narrowed. Finally, NOAA needs to determine the tactical “how.”

Dr. Knowlton added that communicating controversial issues is tricky and that is why communicating success is so important, because everyone likes stories of success and success is not partisan. It can allow NOAA to talk about its efforts and minimize risk of losing sources of support. It would strengthen NOAA at numerous levels from grassroots to Congress. It would be useful to determine what efforts are currently being done across NOAA and it may be that resources could be redirected. It was suggested that NOAA review the *Engaging NOAA’s Constituents Report* from the SAB. NOAA has a lot of tools to connect with much larger groups of people that can deliver the NOAA story for NOAA. Several partners would like to help NOAA. NOAA should let it be known how important it is to other agencies such as FEMA, USGS, NGOs and private sector success and not let other groups steal all the lime light. NOAA secures human wellbeing and natural wealth for today and for the future. NOAA supports critical science. NOAA is unique and distinctive and needs to let others know. The book *Your Strategy Needs a Strategy* by Martin Reeves was suggested.

It is important to avoid the pitfall of communicating performance instead of success. How transparent does NOAA want to be when communicating success or performance? It is key to think about the changing nature of the way science is done with the integration of large volumes of data. Science publications are changing and incorporating instant access to data allowing for aggressive re-evaluation.

The SAB was asked to pay attention to the work the NOAA Observing Council has done with the US Group on Earth Observations (USGEO) on mapping societal benefits.

A critical challenge is the on-going concerns about congressional thought. Determine how to enhance collaboration across agencies, academia, public and private that link back to NOAA's mission and its success. It is beyond marketing and getting credit, but also the success of the mission. This strategic effort is to go beyond the current efforts of NOAA and really think about the fundamentally strategic approach to communication.

Dr. Sullivan stated that next steps will be that NOAA leadership along with Ms. Scarlett and Dr. Polasky will try to pull together a recap for the SAB that captures the robustness of the conversation with clarity and meaningful content before the fall meeting. The conversations thus far can help guide the next deeper explorations for the SAB. Her personal hope is that SAB reports in the future will focus on the evolving vital needs for NOAA's mission resulting from the changing world and how NOAA can gain the necessary capabilities for continual success. The SAB reports should guide NOAA on where to head, so NOAA can think about how to get there.

SAB members were requested to flag useful documents that have already been developed, so the SAB is not reinventing the wheel, but instead pushing things forward.

It was added that the goal is not recommendations, but the identification of opportunities and challenges. The conversation itself is a great product. It was suggested that for the next meeting that the SAB look to public health, finance, etc. for additional perspectives on the topics.

There was agreement that there should be a discussion about an ideal format for the SAB discussions and reports.

Review Report for the Cooperative Institute on Marine Resource Studies (CIMRS)

David Lodge, University of Notre Dame, SAB Member and Chair, CIMRS review

Summary

David Lodge provided an overview of the review panel, an overview of the CIMRS and NOAA collaboration through the Cooperative Institute (CI); and the CIMRS research themes of marine bioacoustics, seafloor processes, marine ecosystems and habitat and protection and restoration of marine restoration.

Findings and recommendations

While there is strong research and accomplishments being done in all four research themes, the review of panel had recommendations for improvement in strategic planning, science, education and outreach and science management.

Strategic Plan recommendations

- CIMRS should produce a more formal strategic plan
- Director should embrace his role as the primary representative and spokesperson for CIMRS
- Recommendation for NOAA: To help CIMRS to be able to look forward; leadership of NOAA partner agencies should provide guidance and consultation to CIMRS at the earliest stages of discussion and long-range planning

Lynn Scarlett asked how NOAA guidance happens now. There is a quarterly meeting with NOAA leads at Hatfield Marine Science Center. Michael Banks said what would be useful if he could be involved when decisions made on research priorities; a format for interacting with budget decisions at a planning level rather than at a responsive level would be helpful. Open communications and a welcome to NOAA strategic planning would be useful. He serves on CI Executive Committee and they meet with OAR Research Council but have not met with AFSC and NMFS. Lynn Scarlett said under federal law and budgeting processes it is not possible to engage nonfederal agencies in deliberative priority processes. Rick Spinrad said NOAA has recognized input from cooperative research activities and we turn to CI Executive Committee for general perspectives on research and the CI 21 initiative to get this dialogue going earlier in the process.

Dawn Wright asked about the formal strategic plan would it be helpful to look at the strategic plan of the College of Earth, Ocean and Atmospheric Sciences at Oregon State University. Michael Banks agreed and said they should also work with Oregon State.

David Lodge said both NOAA and the university have much to gain by strategic plan and early discussion.

Science Recommendations

- Plan potential for commercialization of intellectual proposes
- CIMRS should foster research depth in strong, unique research themes
- Education and Outreach Recommendations
- A stronger, more visible partnership should be created between CIMRS and Oregon State University
- Create stronger undergraduate student, graduate student and postdoctoral participation in CIMRS
- Plan to engage traditionally underrepresented groups in CIMRS.

Lynn Scarlett asked if there are existing mechanisms for Cooperative Institutes (CIs) jointly to develop strategies for enhancing diverse participation.

Dawn Wright said increasing diversity is particularly challenging in Oregon; she wondered if there were plans to interact with Oregon Sea Grant and cultural centers on Oregon campuses; the Living Marine Resources Cooperative Science Center has a node at Oregon State. Michael will follow up on Dawn's suggestions; he is aware of the Cooperative Science Center (CSC) and it is

only beginning to yield success. Three of the eight students in poster session were from underrepresented groups and supported by CSC. The NSF- funded project focus is to bring underrepresented groups in as well; typically one or two of these students will be mentored. They are remotely located from underrepresented groups so it will take time.

Science Management Recommendations

- Increased attention needed to strategic management, implementation, and marketing/communications
- Foster more cohesion and collaboration within research themes.
- Recommendation for NOAA: Increase Task 1 funding to at least the level originally identified in the request for proposals, so that OSU can become more of a genuine partner and not merely a contractor.

Other Recommendation

- Recommendation for NOAA: Finalize new instructions to review panels to allow more nuanced and detailed evaluations of the various components of Cis

The review panel gave CIMRS an overall rating of “Outstanding.”

Discussion

Rick Spinrad said NOAA is working to improve review format and will bring these to the SAB Fall meeting.

Steve Fine said Task 1 funding increases are being phased in over time.

Michael Banks thanked the panel for their observations and recommendations. He liked having the report for growing CIMRS and doing work most effectively.

Action 2: The SAB voted to accept the CIMRS report and will transmit it to NOAA.

Working Group Issues for Discussion

Each Working Group (WG) had an opportunity to present to the SAB.

Environmental Information Services Working Group (EISWG) Summary

Walt Dabberdt provided an update on the weather legislation in congress. There are three bills in the Congress:

1. House HR1561 which is an update of a bill passed in the previous Congress-Weather and Research Innovation Act of 2014 (check bill title) which promotes weather research, analyses techniques. It has items to increase tornado lead time, hurricane track prediction, and high performance computing, commercial acquisition of weather data, primarily around satellite systems.

Senate has two bills out of committee:

2. S1331 Seasonal Forecast Improvement Act seeks to improve forecasts from 2 weeks to 2 years. Updates authorization USWRP, satellite design aspects. Provision for a Weather Commission, it is not the same weather commission being discussed earlier. This commission would look at NOAA weather forecasts and forecast products.

3. S1573 Warnings and Alerts bills focuses on improving NOAA communication of weather and forecast events.

In looking at all three bills, there are 4 recommendations for new advisory bodies. The House bill includes establishment of interagency coordinating committee for weather and codifies EISWG as a standing body to work with SAB and in addition give advice for prioritizing weather initiatives, emerging technology and improving communication.

EISWG Discussion

Jean May-Brett suggested that EISWG fill its open seats as soon as possible and not wait for action on the legislation, because she is concerned that waiting to fill the vacancies could reduce the WG's effectiveness.

There was concern that the legislation would be impacting the ability of the SAB to do its job. Walt thought that calling out EISWG was a legislative decision, because previous attempts to create a new FACA committee were not popular.

Dr. Sullivan stated that NOAA is closely watching the bills. It is currently in the flexibility of the SAB to reorder or combine WGs. If the bill passes it makes rigid the existence of EISWG. This is a bad idea in a world of quick change. It is not ideal to take the fluidity of the SAB where smart people can gather and make decisions. The legislation is reaching around NOAA and the SAB to make direct changes.

Climate Working Group (CWG) Summary

Dean Roemmich focused on observations and modeling. The observational element goes back to the CWG enjoying the opportunity to give feedback about the importance Tropical Pacific Observation System (TPOS) at the April SAB meeting. The CWG was wondering if it would be useful if they continued to give observation system comments focused on extending observing to the bottom and under ice and sampling systematically the boundaries of the ocean. Would CWG be useful to the SAB by developing comments on these topics?

Modeling has similar questions. Would it be useful to the SAB for CWG to give comments on modeling approaches? It was stated that NOAA would take a community approach to modeling. CWG would be happy to get some topics to give feedback and guidance for the SAB.

CWG Discussion

Dr. Spinrad asked the CWG to take a close look at SRGM for some guidance. On the observation side the CWG has done a good job capturing the new technology. NOAA doesn't own all observational responsibilities. An effort must include mission alignment and consider how important are deep ARGOS or any technology are for the mission of NOAA's products and service. He thought it would be helpful for comments on model scaling to determine the scales, which can best meet NOAA's mission.

Ecosystem Sciences and Management Working Group (ESMWG) Summary

Dave Fluharty really appreciated the invitation and the SAB efforts to include the WGs. He stated that there is much overlap with ESMWG efforts and the strategy documents. ESMWG is looking at new technologies for observing systems. Perhaps there is new way for WGs to work

together. He also mentioned there could be a need to consider extending WG terms to help create increased continuity.

Ms. Scarlett stated that the strategic effort is both about content and process and that the SAB must consider how its working groups can be most effective.

Review of Actions

Elizabeth Turner, Acting Executive Director, SAB

The SAB approved the Consent Calendar items, which included 5 new candidates and the extension for one year of a member of EISWG.

SAB approved the DAARWG report and recommendation, which will be transmitted to NOAA. NOAA will respond within a year of transmittal.

SAB accepted the review panel report for the Cooperative Institute on Marine Resource Studies (CIMRS).

The SAB will send questions, comments, and edits for the Strategic Research Guidance Memorandum (SRGM) to Beth Turner by August 18.

Strategy next steps. NOAA leadership along with Lynn Scarlett and Steve Polasky will take a first effort at synthesizing the discussions for the SAB. Give that product to the SAB to prepare for October meeting.

SAB members will send suggested speakers and useful documents for October meeting to Beth Turner.