



California Ocean Protection Council

Joint Science Advisory Team/ Management Team Meeting

Hosted by California Ocean Science Trust

Wednesday, April 18, 2012

50 California Street, Suite 2600

San Francisco, CA

Meeting Minutes

California Ocean Protection Council

OPC-SAT
Science Advisory Team



Meeting Attendance

OPC-SAT Members Present: R. Ambrose, A. Boehm, M. Carr, F. Chavez, K. Coale, J. Field, G. Griggs, M. Hall-Arber, S. Johnson, K. McLeod, S. Murray, K. Nielsen, J. Schubel, W. Sydeman, and S. Weisberg.

Ocean Science Trust Staff Present: T. Freidenburg, E. Knight, E. Kramer-Wilt, R. Meyer, S. McAfee, A. McGregor, L. Whiteman, and H. Zemel.

Ocean Protection Council Management and Staff Present: S. Corbaley, *C. Kuhlman, M. Small, C. O'Reilly, and S. Toews.

**Catherine Kuhlman was recently appointed the new Assistant Deputy Director of Oceans and Coastal Matters, and stopped by the meeting to introduce herself to the SAT.*

Invited Guests: J. Boyd, Resources for the Future/National Socio-Environmental Synthesis Center, M. Gleason, The Nature Conservancy, D. Goldston, Natural Resources Defense Council, T. Grosholz, UC Davis, J. Lindholm, CSUMB, P. Nelson, Collaborative Fisheries Research Organization, J. Pasari, UC Davis, E. Praehler, Center for Ocean Solutions/Stanford University, G. Ruiz, Smithsonian Environmental Research Center, E. Saarman, PISCO/UC Santa Cruz, S. Williams, UC Davis, K. Wiseman, Marine Life Protection Act Initiative, Brian Owens, Department of Fish and Game.

OPC-SAT Members not Present: D. Cayan, C. Costello, S. Gaines, F. Gulland, M. Moline, J. Paduan, H. Scheiber, and J. Stachowicz.

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Highlight Actions

Filling SAT membership vacancies: OST will be working with C. Kuhlman and the SAT Executive Committee to identify areas of expertise to recruit onto the SAT as positions become available. OST will work with the SAT Executive Committee to develop a process for choosing new members as positions become vacant.

SAT Leadership: The SAT agreed to maintain membership of Executive Committee for one more year to allow A. Boehm to fulfill her role as co-chair.

Climate Change and Fisheries Literature Review: B. Sydeman, with support from J. Field and OST, will lead the writing of a white paper that summarizes the latest research on how climate change may impact California fisheries. B. Sydeman plans to utilize the climate change and sustainable fisheries working groups for potential draft reviews, but anyone interested in participating should contact him now.

Coastal and Estuarine Research Federation (CERF) Conference, San Diego 2013: S. Weisberg briefly discussed CERF 2013, of which S. McAfee is one of the program co-chairs. Connecting the SAT to the conference would be very valuable, interested members should contact him now.

AIS Vector Risk Assessments and Expert Judgment: SAT members interested in the upcoming planning for expert judgment with respect to the AIS vector risk assessments should contact E. Kramer-Wilt at OST.

Scientific Collecting Permits: M. Carr has put together a subset of SAT members (K. Nielsen, M. Carr, S. Weisberg, and J. Field) to participate in a working group on DFG scientific collecting permits in MPAs (marine protected areas). M. Carr stressed that this core group would serve as a conduit to the wider SAT, and interested members should contact him as soon as possible.

Harmful Algal Blooms (HABs): Some SAT members, including M. Carr and K. Nielsen, are working with OST, Sea Grant, and other HABs experts to write a white paper on HABs in California. Interested SAT members should contact M. Carr. The group may eventually explore developing a SAT position statement.

Meeting Summary

1. Welcome & Introductions

S. McAfee, OPC Science Advisor and SAT Co-Chair, welcomed the OPC-SAT and the OPC on behalf of the Executive Committee (A. Boehm, M. Carr, and G. Griggs). McAfee then reported that Catherine Kuhlman had been appointed Assistant Deputy Director of Oceans and Coastal Matters by the Governor's office, and she briefly discussed C. Kuhlman's background as Executive Officer of the North Coast Regional Water Quality Control Board, and that she would join the meeting around lunch. McAfee thanked our hosts, the Bay Conservation and Development Commission, and OST staff, for supporting the meeting. McAfee then turned it over to A. Boehm to introduce the meeting.

Boehm noted that today's meeting was a continuation on the theme Knowledge to Action: Theory to Practice, a concept introduced at the last SAT meeting held on September 30, 2011. Boehm asked everyone in the room to introduce themselves before walking through the morning agenda, noting in particular that there would be plenty of time for discussion.

2. Presentation and Discussion with Dr. James Boyd, Director for Social Science and Policy, National Socio-Environmental Synthesis Center (SESYNC), University of Maryland

McAfee gave a brief introduction to J. Boyd, including his background and training. McAfee discussed how Kai Lee was the introductory speaker at the last OPC-SAT meeting, presenting the Packard Foundation's science sub-program – *'Linking Knowledge with Action.'* This sub-program is intended to explore how best to integrate science into decision-making. In December, McAfee facilitated a day-long workshop of grantees of this program, as well as grantors, with the idea to explore if there is an emerging practice that leads to best outcomes for science in support of management. McAfee noted that there is a large role for social science in science integration. Through the structure of the OPC and the OPC-SAT, California has created the opportunity to bring the social and natural sciences together to more effectively infuse science into state management and policy-making.

Boyd focused his presentation first on SESYNC's approach to the concept of 'actionable science,' and then went on to provide an overview to SESYNC's proposed internal structure and processes to choose and fund proposals, including development of overarching research themes. Boyd noted his main goal was to learn from the SAT on behalf of SESYNC, and bring their ideas to the table as this new organization continues to develop. Boyd encouraged questions and discussion as they came up in the course of the presentation.

McAfee noted that defining 'actionable science' is particularly important because it is a spectrum that can mean different things at different scales. J. Boyd agreed, and went on to explain that often science communication is heralded as the limitation in making science more relevant to policy and management. While this is certainly true, Boyd noted that another key factor is identifying your audience and incorporating them into the articulation of the problem that needs to be addressed, and the development of the scope and scale (i.e. regional, national, global etc) of the science aimed at addressing it. J. Boyd noted that none of this is new, but rather it is a concept becoming invigorated in resource and other environmental issues. Boyd pointed toward public health research as an example of a field where this concept is regularly applied.

Boyd went on to suggest that there is now an 'actionable science' movement. We are seeing many grant programs support this activity, and many scientists are expressing a desire to see their work improve management in their respective fields, but simply don't know how to bridge that gap.

Before moving into the second piece of his presentation, or the development of the structure and process of SESYNC, Boyd fielded some questions:

- *Are you concerned about scientists becoming advocates?*

Boyd acknowledged that this is a challenge for many scientists because it applies they are not being objective. This goes back to the culture of science and how we're trained. Also, the policy community tends to simplify issues, which is uncomfortable for scientists, who often focus on complexity. It is also important to note the NSF (National Science Foundation) does not want the appearance that they fund science with political implications.

G. Griggs noted that the debate around climate change is a good example – the goal is not to advocate for a specific position or solution to a problem, but insert scientific information that might help frame the problem and weigh tradeoffs

into a political forum.

R. Ambrose emphasized Griggs' point by saying that public health is also a good example, in part because social science tends to be incorporated. However, the overall goal is clearer; few would disagree with pursuit of good public health. Therefore, scientists in the field of public health will push policy to a much greater extent. The desired goal or outcome with respect to environmental issues is often unclear, or a specific point of contention. M. Hall-Arber agreed – in fishing, for example, it is extremely difficult to clarify the best outcome; viable fishing communities or just healthy fish stocks, and perhaps we don't care what the face of the industry looks like? As an anthropologist, it is our job to communicate to policy-makers how the community sees itself and its role in the environment.

Finally, K. McLeod highlighted COMPASS' internal distinction, which is to advocate for the use of science in policy, not a particular policy.

- *Economic research aside, where do other fields of social science go for funding with respect to environmental issues? There seems to be a significant imbalance there.*

Boyd acknowledged that this is a problem, and lack of incentives is part of it. Without funding, many professional societies struggle with this. However, philanthropic societies are becoming more interested. There is also a lack of interaction among natural and social scientists. For example, the EPA (Environmental Protection Agency) employs ecologists and economists, but they do not know each other or interact regularly. E. Saarman also noted that the role of social science may not seem immediately apparent to many with respect to ocean issues in particular because people do not live in the ocean.

Hall-Arber also highlighted the role of funders in directing or steering research by noting an example where USAID (United States Agency International Development) pulled funding from a study that demonstrated elements of the agencies work were potentially ineffective. S. Murray noted that he had a similar experience when a government agency refused to release a report they had funded on invasive species on the west coast because the results were undesirable.

Boyd then went on with the second piece of his presentation beginning with the mission of SESYNC: SESYNC will foster actionable synthesis research and education related to the structure, functioning, and sustainability of socio-environmental systems. SESYNC is the latest in a line of NSF-funded synthesis centers, such as NCEAS (National Center for Ecological Analysis and Synthesis). SESYNC opened in January, and while it is a national center, it ultimately aims to be international in scope.

Boyd went on to note that a critical piece of SESYNC will be giving social science equal weight, and a clear commitment to actionable science. SESYNC will focus on co-development among social and natural scientists and decision-makers to projects, and will take a circular, non-linear approach to science – policy interactions. J. Boyd noted that NSF feedback emphasized this trend.

Boyd then explained the conditions of SESYNC support. They fund work over 1 to 2 week periods, which must be located at the center in Annapolis, and focus intensely on a synthesis project. Boyd then discussed SESYNC's developing balance between groups, projects and activities. SESYNC is exploring a series of broad themes under which proposals could be made. Boyd also noted a 'ventures' theme where ideas that do not fit under any particular theme could potentially fit.

Themes include:

- Human mobility and ecological wealth
- Globalization and environmental change
- Informing sustainability and adaptation decisions through assessment and modeling of ecosystem services

Boyd highlighted that the challenge will be measuring success in the synthesis, evaluation and application of science in a meaningful way, and was particularly interested in feedback from the SAT on this and the themes themselves. Highlight questions and discussion points included:

- *How do we evaluate success, or quantify the social or policy impacts of the science?*

Boyd noted that there have been decades of debate trying to place a dollar amount on these things – use statistical controls? Numbers? Goldston and Boyd both then noted that articulating desired outcomes in the policy realm is much more complicated than it seems, in part because decisions are being made about what to value most, which is often not a science question.

- *The themes are very broad – and if the center is evaluated on a 5 or 10 year basis, impossible to solve. Perhaps they should be reframed to more achievable goals, or how will you measure progress towards them?*

Boyd acknowledged that this worries him too. At this point, SESYNC is dedicated to working with the project teams to identify and articulate actionable project goals. Most of all SESYNC aims to be proactive in this – and looking to other fields such as public health for lessons.

- *How will projects be selected?*

Boyd explained that an RFP (request for proposals) will be issued. Selected proposals will be interdisciplinary, and managers will be involved. Boyd also noted that another element is that SESYNC will conduct research on broader issues across themes, to learn about how managers and researchers interact, and how management institutions interact with the science.

3. Presentation and Discussion with David Goldston, Director of Governmental Affairs, Natural Resources Defense Council, Washington, D.C.

R. Meyer introduced D. Goldston, including his background and training. Meyer noted that Goldston has focused his own research in how government manages and invests in science.

It is worth noting that Goldston spoke only for himself, not on behalf of NRDC. Goldston began with discussing the political polarization that has taken over in Washington, D.C. Goldston noted that it is important that our current discussions about the role of science in policy, particularly with respect to Congress, happen in the context of this unfortunate reality. Goldston said that this puts even more pressure on science because in general it is a field still perceived as “above the fray.” While this may not be accurate, or reflect a deep understanding of how science works, it is a mark of respect. Another complicating factor is that while everyone on any side of an issue will often claim to “respect the science,” people still pick their favorite source of information.

Goldston then went on to describe four categories of issues at the intersection science and policy from his professional experience:

- *Cases where the science and the policy are conflated*

These are issues where the scientific data is essentially there, but policy tradeoffs are conflated with the science. Goldston highlighted the 1997 debate around ground-level ozone as an example – there was virtual agreement among the scientific community about ozone data, and a science advisory board provided a range to the EPA (Environmental Protection Agency) that ozone standards should exist within. However, because of political implications associated with hospitals, the policy-makers dragged science into an unrealistic debate over identifying a particular ‘scientific’ number for ozone.

- *Cases where scientific consensus actually exists, but is continually questioned by policy-makers*

Goldston mentioned that this is a rare case – often policy-makers make decisions in the face of scientific uncertainty out of necessity, and it is not common for policy-makers to get stalled by science questions that have in fact been resolved. The main example of this is climate change – specifically the continued debate over whether or not it is happening, and caused primarily by human activity. It is especially alarming when you consider the massive policy and management challenges that we face in dealing with climate change, and deeply unfortunate we have not gotten any closer to having the discussions because we are by and large still hung up on a science question that has been resolved.

- *Cases where there remains scientific debate over an issue*

Goldston noted that this is the most common case. Goldston used forest management as an example. Goldston also noted that in many cases if scientific debate still exists, that debate will still be used to mask real unresolved policy debates as well. Goldston suggested that what to do in the face of uncertainty is the policy question. The science question in this is to articulate for decision-makers the risks associated with action and inaction, or help to delineate the tradeoffs.

- *Cases that have not matured enough – where no one (scientists or policy-makers) is sure of anything*

Goldston suggested that in these cases, scientists have a rare opportunity to help direct the conversation. This is because there may not yet be entrenched stakeholders lying in wait to fight for their position, and in general people are more open. Goldston highlighted the environmental consequences of pursuing nanotechnology as an example in this fourth category.

Goldston noted that in thinking across these four general areas scientists must explore their role and find ways to distinguish themselves from traditional advocacy, which many scientists find worrisome. Goldston suggested creating and working with institutions that are able to understand, emphasize and articulate the views of scientists in a credible way. Goldston noted the National Academies, which of course have had some time to establish a reputation.

Goldston then concluded by discussing the wall between science and policy, and how that wall has been highlighted

by the climate change debate. Essentially, what many of these issues come down to are ideological and philosophical differences in how we look at the world. Some recent ocean policy is an example – Republicans aren't attacking the President's National Ocean Policy based on science or regulation, but rather on their view of the appropriate role of government. Scientists must be wary getting sucked into these debates.

Goldston then fielded questions among the group, highlights included:

- *How are government institutions changing?*

K. Coale asked what is happening on the side of government and other NGOs to change the debate to something more rational. Coale noted from his perspective, scientists serve up information that always seems to get torn to shreds by the political process. Coale went on to express that it seems many of our government institutions were designed at a time when the environment was durable, and are no longer conducive to accepting and internalizing science on environmental issues. Goldston responded by saying the political process is and always will be messy, in part because its main constituents are the public. For example, many people believe climate change is happening and caused by humans. But they still have many incorrect notions about it, such as attributing most weather events they experience now to climate change. Goldston went on to say that a bigger issue, which is in part political, is how much do we want to regulate and how much can we regulate something into what we actually want. All the science in the world still may not clarify this for policy-makers.

Boyd noted that many of the public are also starting to perceive science as a pursuit of the 'elite.' Are there ways we could break down that perception to a more populist view – perhaps using as tools ways that average people interact with nature, either through their profession (i.e. farmers, fishermen etc), recreationally (i.e. hiking, kayaking etc), and/or citizen science. That could make more of an impact perhaps than actually altering government institutions. Goldston then noted there are some institutions, such as ASU (Arizona State University), that are exploring ways to engage the public better. Goldston noted that we need more of this. However, it is difficult to get the balance right – science must also be independent to do its job.

- *How natural vs. social sciences operate*

M. Carr asked Goldston to comment on why the expertise of social scientists receive less recognition than natural scientists, yet often natural scientists are criticized for conducting research in the absence of a socio-economic context provided by social scientists. Goldston suggested that the work of SESYNC is absolutely essential. There is a calling for this kind of work, but things function best once everyone (your audience) has agreed on the problem, whether it is fisheries or otherwise. Boyd added that social science is also messy, it won't simplify things, but it can help in telling the story of why society should care and communicating how things impact people. J. Schubel then noted that natural scientists do a bad job of communicating complex problems, and while we can't solve these problems we can better manage them.

4. Lunch

**Catherine Kuhlman, joined the meeting. Her official start date will be May 1, and you may read more about her appointment at <http://gov.ca.gov/news.php?id=17496>.*

Kuhlman spent the lunch hour with the SAT discussing her background in water quality, and expressing her support for more science informed policy. Kuhlman emphasized what she sees as two of her core tasks working to help make this team even more successful, and ensuring their work reaches policy-makers and managers across the state. Kuhlman also acknowledged the critical role of boundary organizations like OST in conducting this work. Finally, Kuhlman requested that everyone in the room introduce themselves, their discipline, and their interest in the practice of science integration.

5. SAT Business and Quick Updates

Boehm kicked off the session, then turned over to the Executive Committee for a variety of updates:

- McAfee described her role on the Blue Ribbon Citizens Commission with the Fish and Wildlife Strategic Vision, emphasizing how often the OPC-SAT came up as a body that might play an important role. McAfee noted that there is also discussion of the SAT being written into upcoming legislation.
- Griggs then alerted the SAT that Dr. Tony Haymet submitted his resignation from the SAT recently, and that there is now an opening. OST will be working with Kuhlman and with Executive Committee to identify expertise to recruit for the OPC-SAT with the intention to compose the SAT across disciplines in support of the SAT's mission.

- Griggs proposed keeping the same Executive Committee for one more year to allow Boehm to fulfill her role as co-chair. Last year, Boehm was on maternity leave, thus was not able to participate as much as she wanted. The SAT voted in favor of retaining the present Executive Committee another year.
- B. Sydeman provided an update on the climate change and fisheries paper, intended to inform managers on how climate change may affect California fisheries. Sydeman plans to utilize the climate change and sustainable fisheries SAT working groups for potential draft reviews, but anyone interested in participating should contact him. Sydeman emphasized that this will be a SAT product, and ultimately he and other participants plan to pursue publication. A draft should be produced in the next three months. This effort is jointly supported by OST and the Sonoma County Water Agency.
- S. Weisberg provided an update on CERF 2013, or the Coastal and Estuarine Research Federation conference, which will occur in 2013 in San Diego. McAfee and John Largier (Bodega Marine Laboratory, UC Davis) will be science program co-chairs. Weisberg stated that it would be valuable to have SAT members connected with the conference, and interested members should contact him.

6. Aquatic Invasive Species Vector Risk Assessments and Expert Judgment Discussion

E. Kramer-Wilt introduced and facilitated the session. Kramer-Wilt began by noting that the vector approach to addressing risk is relatively unprecedented. Kramer-Wilt explained that the research teams are conducting a synthesis as well as new research to characterize each of the vectors. OST will be using the vector reports undertake the challenge of assigning relative risk to these vectors, and how to make a useful and relevant list of recommendations for the state. In addition, OST may partner with Center for Ocean Solutions to bring the policy lens to this work as well.

Kramer-Wilt concluded her remarks saying that today we are looking for a discussion on how we get from the research and data collection to informing the state, and the possibility of using an expert judgment process to bridge this linkage. Kramer-Wilt then introduced Dr. Susan Williams, one of the lead PI's on the UC Davis team.

Williams first introduced the other researchers present: Dr. Ted Grosholz from UC Davis, Dr. Greg Ruiz from SERC/ Smithsonian Institute, and Dr. Jae Pasari from UC Davis who serves as the project coordinator. Williams began with introducing the issue of AIS, noting that climate change is increasing biological invasions. Williams also went on to highlight the need to manage introductions, and that there is a body of evidence that shows preventing introductions is less costly than dealing with invasions later on.

Williams described the current research, including early results. The research focuses on developing a risk assessment for AIS vectors that are not well understood, specifically: commercial fishing, recreational boating, live bait, live imported seafood, aquariums and aquascaping, and aquaculture. This approach is fairly new in biological invasion science. Major challenges to the project include lack of data, especially in trying to quantify propagule supply into the state, and exploring the economic, environmental, cultural and human impacts. Williams concluded that as the project moves forward, they are thinking through the appropriate balance between data gathering, and expert elicitation, which involves some amount of guessing.

Kramer-Wilt opened the discussion with the group. Several topics and questions were raised over the next hour. Highlights included:

- *How to include the regulatory opportunities when considering how to rank these vectors.*

Goldston asked about the ease of regulations – with ballast water that might be the most tractable one, which could explain why more is being done. Williams responded that the industry also wanted regulation in the case of ballast water. G. Ruiz agreed with Goldston's point, noting there hasn't been much research on the vectors of this project, so it remains unclear how to regulate. T. Grosholz also pointed out that vectors like the bait industry are not very well protected. McAfee mentioned that one way of dealing with this very issue is to partner with organizations such as the Center for Ocean Solutions (COS) based at Stanford University, who are particularly strong in bringing a policy and legal lens to this kind of research. Ruiz also reiterated that dealing with it at a vector level (rather than by species) is a change in mindset, and so the tools haven't really been explored.

- *Are the researchers familiar with the study in the St. Lawrence Sea (in relation to the species introductions bar graph that was shown)?*

Schubel asked about the introductions bar graph shown, and whether or not they were familiar with similar work that was done in the St. Lawrence Sea. Yes, they are. Ruiz elaborated that San Francisco Bay has been an important focal point for California and the continent in regards to AIS. However, it is not just the introduction that is important, but also the

capacity to spread. Williams pointed out that many of the data surrounding AIS are retrospective, and one of the things they wanted to do with this project was to take a future oriented approach.

- *How will expert judgment help a manager determine vector risk, or make a decision on how to handle a newly discovered AIS?*

Kramer-Wilt clarified that expert judgment has two phases: (1) A process to come up with the relative ranking, and (2) work with COS on understanding the management context around that and working with the California Agencies Aquatic Invasive Species Team (CAAIST) to ensure that our recommendations and options map on to their programs and policies. Williams and Grosholz stated that ranking the vectors will be difficult.

- *P. Nelson recommended the software tool – RAPFISH.*

Nelson explained that it's a way to assess the sustainability of data poor fisheries in developing countries on multiple axes. S. Williams agreed that it sounds like a very useful approach. Williams explained that the teams have matrices that go through multiple decision points. Ruiz also mentioned that one other idea is to not just analyze vector-by-vector, but partition them by different components. For example with vessels, not all vessels are created equal, and so there are operational units to consider. This might help do a ranking exercise, and target actions.

- *How are the teams using the word 'risk' or 'risk assessment' - in the research community, we have a very specific definition of risk, so what is the definition being used here?*

Williams responded that they are not using the word 'risk' in a formal way, rather as a concept to think about the process by which invasions occur and cause impacts. Impacts may include ecological, economical, and human health to name a few. Weisberg stated that while the projects teams should collect as much data as they can, they will never have all the data they need or want, so you have to move past that. Weisberg went on to say that the teams also have to build agreement around the conclusions to then move to the management context. The strength of this project is that it is employing a process to validate the conclusions, therefore insulating the various participants. Kramer-Wilt then noted that unlike other projects, with this one we have some time to get additional data and synthesize it before doing the expert judgment process.

Williams stated she would prefer to include stakeholders to explore variance in agreement around the numbers. Goldston and others cautioned that you must think about the structure and timing of when to involve stakeholders – if done at the outset, it can reduce the credibility. Goldston suggested having the science group first, then widening it if stakeholders are necessary to the process. Williams suggested that including stakeholders was the model of the MLPA Initiative. However, E. Saarman cautioned that the MLPA Science Advisory Team did not include stakeholders.

Boyd then raised two points: (1) there is the elicitation part, finding win-wins, but then there's capturing the right expertise. Boyd used the example – you wouldn't ask an ecologist how many vessels are coming into Oakland harbor every year any more than you'd ask a ship captain how a mollusk will impact the bay. (2) There is also the retrospective vs. prospective question. Can you relate vessel traffic to these introductions? Boyd also added that there is the issue of future development, and what impacts those might have. Williams answered that Ruiz has a great deal of trend data on shipping, aquarium, and aquaculture vectors, but we need additional expertise to help on future trends.

- *Shubel noted that various forms of citizen science, such as invasive species alert cards are potentially huge resources.*

Williams agreed that for some invasive species public education is way more effective than regulation. S. Murray noted that parallel to this they also need to look at it from the management side. Kramer-Wilt responded that OST intends to do this. McAfee liked P. Nelson's idea for using a model, and noted that it forces us to think through the values tradeoffs as well as expert judgment. S. Johnson cautioned that expert judgment sometimes does not produce meaningful change in the long run, and challenged the group to consider identifying key indicators that could be monitored regularly towards a rigorous model.

- *Are there tools that have been successfully used in other areas that are worth exploring?*

Goldston noted that energy efficiency might offer some lessons in this, and to think of it as a three-tiered system: (1) regulation, (2) gathering new information, and (3) prizes (incentives). Boyd added that a social science question here is about the monitoring, and optimal allocation of a monitoring budget. McAfee responded that there's some legislation under way that might provide for that.

Kramer-Wilt wrapped up the session by stating that this is not the last the SAT will hear about this project, but to reach out to her if you want to continue the discussion. *For more information on the AIS Vector Risk Assessments, visit <http://calost>.*

org/science-initiatives/?page=aquatic-invasive-species. OST also provided advanced materials to frame this session, contact E. Kramer-Wilt for details.

7. Central Coast Trawl Impact and Recovery Study: Findings and Management Opportunities

M. Carr opened this session providing an overview of the Central Coast Trawl Impact and Recovery Study, including the OPC's funding timeline of the study, and highlights of the two principle investigators' backgrounds: Drs. James Lindholm and Mary Gleason.

Gleason presented first, providing an overview of the history and scope of the central coast trawl fishery, noting that the fishery is a multi-species fishery. Starting in the 1980's and 1990's, it increasingly became overcapitalized, leading to declines in landings and overfishing on certain stocks. In 2011, the fishery began transitioning to catch share management, specifically an ITQ (individual transferable quota) system.

Gleason also highlighted that either through the new ITQ system, or additional measures, the fishery is also interested in reducing bycatch and the impacts of trawling on bottom habitats. This in part led to the Central Coast Trawl Impact and Recovery Study. In late-2009, The Nature Conservancy and California State University Monterey Bay, joined by a host of partners from the commercial fishing industry, the state and federal governments, and other NGOs, initiated a multi-year study at the southern end of Estero Bay, CA, to quantify the relative impacts of small footrope trawl gear to low-relief, unconsolidated (soft) sediments of the outer continental shelf.

J. Lindholm described the approach, methodology and results thus far of the study for the period from June 1, 2009 to December 31, 2011, or Years 1 and 2 of this ongoing multi-year study. Known levels of trawling intensity were applied to study plots and compared to control areas using visual surveys and grab samples. The study was originally designed and proposed as a five-year study, including tracking recovery rates following both 'low-intensity' and 'high-intensity' bottom trawling effort:

- *Year 1:* study data were collected before 'low-intensity' trawling, as well as at two-weeks, six-months, and one-year post trawling.
- *Year 2:* the treatment plots were then subjected to 'high-intensity' trawling effort, and again surveyed at two-weeks, six-months, and one-year post-trawling.

Lindholm provided an overview of the results thus far, including:

- *Micro-topographic complexity:* A feature considered important for small organisms, including young fish on the seafloor, declined in the trawled plots immediately following both low- and high-intensity trawling.
 - Trawled plots differed significantly from control plots for a year following low-intensity trawling. Trawl door scour marks were clearly visible throughout the trawled plots at one-year post-trawling.
- *Sessile and Mobile Invertebrates:*
 - Sessile invertebrates (such as sea pens and sea whips) occurred in very low densities in the study area, and did not differ significantly between trawled and control plots.
 - Densities of mobile invertebrates (such as sea stars, sea slugs, and polychaete worms) did not differ significantly between trawled and control plots. Temporal variability in the densities of mobile invertebrates was considerable, including notable seasonal variation in epifaunal polychaetes and brittle stars.
- *Infaunal and Epifaunal Communities:*
 - The community of infaunal invertebrates (including polychaete worms, crustaceans and mollusks) did not differ statistically between trawled and control plots.
 - The diversity in epifaunal organisms in the study area was lower than other locations along the shelf.
- *Anomalous Event:* Sometime between November 2010 and May 2011 our study area was impacted by an event that has yet to be identified. The impact resulted in a complete smoothing of the seafloor across all eight study plots, including the loss of trawl door scour marks that had been visible in the sediment in November 2010. Currently, the Japanese tsunami of March 2011 is considered to be the most likely explanation for the smoothing of the seafloor.

Lindholm then requested feedback in particular on 'the event,' noting that the Japanese tsunami happened within this period. Lindholm also requested input on whether or not to continue the study, assuming no additional funding. Lindholm and Gleason also welcomed feedback on outreach among management and other audiences.

“The Event” Discussion & Ideas

F. Chavez

- Ken Smith – MBARI (<http://www.mbari.org/staff/ksmith/>) - is conducting a time series in deep water, and recorded largest flux in 2011 (early). He may have seen the tsunami.
- Undercurrent should be right over their sites – this may have been intensified by the tsunami, however it is usually weak in the first part of the year.

S. Johnson

- Sam Johnson – USGS - http://walrus.wr.usgs.gov/infobank/programs/html/staff2html/staff/Samuel_Johnson.html - has seismic reflection data right in that area. There is a mound at that site, and internal waves get focused right below shelf break and have potential re-transport sediment down shelf – these are not annual, nor would it require a tsunami.

G. Griggs

- If the tsunami impacted the sites, then wouldn't it have been recorded much more broadly? While sea level changes were seen all over the CA coast, it is unclear if the tsunami was felt coast-wide at depth.

K. Coale

- Along with the tsunami we are seeing signals of radioactive sediments (Cesium 137) at that depth, in conjunction with the Fukushima nuclear power plant meltdown.

M. Hall-Arbor

- Have you talked to older fishermen in the area about potential occurrences that have taken place in the past?

Management Relevance Discussion & Ideas

K. Coale

- It appears fish associate with the ridges from the scour marks – is it possible that trawl scour can create habitat?

G. Griggs

- The negative result among many positive ones from other areas could be similar to how some stakeholders reacted to the impacts of seawalls on beaches. People were saying that because a seawall didn't impact one place that this would apply everywhere, and we were forced to think deeply about how we qualified our story – including location, habitat type etc. It is imperative to clearly communicate the conditions of this particular study.

L. Whiteman

- Very interested in the collaborative aspect of this – as the Monitoring Enterprise is also struggling to build productive relationships with stakeholders in this region around monitoring. This project could serve as a model to us on communicating the results, which is also a piece of your collaboration with fishermen.

Discussion Around Continuing the Study

J. Field

- Did you look for or find any measurable change in catch rate of the species? Ultimately those are the dots you are trying to connect, and could set up for possible monitoring in the future.

D. Goldston

- This could also create additional incentives for fishermen to collaborate in the future.

T. Grosholz

- Added that because this is over such a large scale, it may take propagules some time to come back.

M. Carr

- Cautions walking away from the study: this 'event' could present a new and rare opportunity to study these systems.

8. New Projects on Harmful Algal Blooms (HABs) and Scientific Collections Permitting

Carr described an upcoming project around scientific collections permitting. Carr explained that DFG (Department of Fish and Game) approached McAfee about using the SAT to inform how DFG should assess individual requests for scientific collecting in MPAs (marine protected areas). B. Owens of DFG was in attendance to provide the management context. Carr went on to explain that DFG has configured a working group, of which the following SAT members are willing to participate: K. Nielsen, M. Carr, S. Weisberg, and J. Field. Carr emphasized that this core group would serve as a conduit to the wider SAT, and interested members should contact him as soon as possible. SAT members discussed some of the details of this, including ensuring that the SAT is not in a position of making direct recommendations on permits, but rather informing cumulative impacts and other scientific issues. Finally, K. McLeod mentioned that the Environmental Law Institute has done a study on this that might be helpful.

Carr introduced another upcoming SAT-related project on harmful algal blooms (HABs) and invited Nielsen to discuss further. Nielsen then provided a brief overview of the HABs workshop sponsored by OST and California Sea Grant in January 2011 (<http://calost.org/resources/?page=workshops>). Nielsen discussed follow up from the workshop, and conclusions included: increased collaboration and communication, development of response protocols, identification of management triggers for HABs event response, and improved monitoring. The workshop participants will now work with OST and California Sea Grant to develop a white paper, and may explore the potential to develop a SAT position statement. Interested SAT members should contact Carr. Of note, Sydeman recommended considering birds and marine mammals, which can often be some of the best indicators of events, and McLeod mentioned that the West Coast Governors' Alliance on Ocean Health has a HABs action team.

9. Summary Comments and Wrap Up

Boehm closed the meeting – thanking the SAT and guests. F. Chavez noted that we need more time worked into the agenda to talk as a group. Chavez also requested that there be more SAT member updates – whether on the spot, or planned in advance, and that he'd like to hear more from OPC, including remaining funds. Others agreed.
