

2019 NOAA Integrated Ecosystem Assessment Meeting report

The NOAA IEA effort originated from the need to create a simple mechanism to manage U.S. marine ecosystems more holistically and has since grown into a national program working with many partners to implement the IEA approach in five regions across the U.S.

About the Report:

This report was developed from notes taken during the NOAA Integrated Ecosystem Assessment (IEA) meeting that took place May 14-17th, 2019 in Silver Spring, MD. The purpose of this report is to summarize the presentations, panels, and discussions that occurred during this meeting. This report is intended to provide an understanding of the origins of IEAs within NOAA, what has been done since then, and to help build future NOAA IEA efforts.

Meeting goal:

2019 marks ten years of NOAA IEA program planning and implementation since the publication of the Levin et al 2009 PLoS paper describing the IEA approach. The 2019 IEA meeting highlighted this milestone along with the origins, evolution, successes of the program. The meeting also highlighted lessons learned from the IEA approach, and the IEA program's work with partners across NOAA and external science and management collaborators. **The meeting was intended to enhance internal and external awareness of NOAA IEA's role in advancing ecosystem science.** This includes strengthening partnerships within and outside of NOAA, and incorporating ecosystem science into management and stakeholder processes resulting in continued growth NOAA IEA's community of practice.

Key Outcomes:

- Increased commitment from NOAA to conduct IEAs
- Increased awareness of NOAA IEAs within and outside of NOAA
- Organized teams to frame, outline and draft multiple manuscripts for special "ten years of NOAA IEA volume" of the Coastal Management Journal that will capture all key aspects of NOAA IEA efforts

Next steps:

- Increase awareness, support, and resources for IEA program
 - (1) get all line offices on the same page, and
 - (2) prioritize resources commensurate with the efforts required
- Advance ecosystem science provided to decision-makers
- Enhance collaboration with stakeholders, managers, and other scientists to advance the use of Ecosystem-Based Management

Tuesday, May 14, 2019

Showcase summary:

The “showcase” session began with opening remarks from Mark Monaco, IEA Steering Committee Chair, and Rebecca Shuford, the IEA Program Manager, highlighting the 10 year anniversary of NOAA planning and implementing IEAs. This was followed by reflections from David Fluharty, Phil Levin, Jason Link, Ned Cyr, and Chris Kelble on the origins, current status, and potential future of this program, showing its broad and growing reach. Speakers emphasized that IEAs are a process to incorporate ecosystem science into decision-making.

Partners shared their perspectives on how the IEA approach has helped them address issues by providing a framework to tackle multiple aspects of an ecosystem and partners showed the diverse impact of this program. Partners included Brian Lezina with the Coastal Protection and Restoration Authority of Louisiana, Brandon Muffley with the Mid-Atlantic Fisheries Management Council, Casey Streeter with the Florida Commercial Watermen’s Conservation, Gerry Davis with the Pacific Islands Habitat Blueprint partnership, Yvonne deReynier with the NOAA Fisheries West Coast Region, and Mitchell Tartt with the Office of National Marine Sanctuaries (ONMS).

NOAA Leadership from several line offices showed their support for this program and offered their thoughts on moving forward. Leadership included Nicole LeBoeuf (Acting AA NOS), Gary Matlock (Deputy Director, OAR), Harry Cikanek (Director NESDIS STAR), and Cisco Werner (Chief Scientist NMFS).

Reactions to the showcase:

Discussion following the showcase included IEA team members following up with NOAA Leadership to ensure support for IEAs, the importance of human dimensions, and setting thresholds for indicators. Mark Monaco stated he will follow up with Nicole LeBoeuf about support for IEAs. Working with communities and incorporating human dimensions and social science into decision-making came out as important themes. The need to cross-reference indicators across NOAA programs, and identify and set indicator thresholds was discussed. There was also some discussion/debate on the need to define if ecosystems are healthy or not in order to show the value of the ecosystem work being done. Needing to have the same goals or allowing different groups to have different goals was also discussed. This prompted a conversation about identifying what are the IEA programs goals. There are multiple goals that may benefit from being defined and process goals, research goals, ocean goals, and ecosystem goals.

A point was also made that IEA scientists tend to publicize their work as scientific papers and we are having to convince communications staff to report on IEA work. Publications are an opportunity to talk about our work, and to educate and to coordinate with partners that also have communications staff. Ellen (the IEA communications specialist) agreed and is working on drafting a communications strategy. To this point, it was brought up that there is a break between scientific value and broader societal value. In order for us to make a full transition to application and use, we need well-defined customers. The perceived imbalance toward fisheries may be that the fishery management councils are well-defined partners, so we may just need to do a better job of identifying partners in other sectors.

SCIENCE FOR EBM - WHERE DO WE ALL FIT IN?

Chris Harvey presented on Ecosystem-Based Management (EBM) and how all different types of scientists fit under the EBM umbrella. He also discussed how IEAs, the Ecosystem-Based Fishery Management (EBFM) Road Map, the climate-science strategy, and transformational ideas relate to each other. The presentation highlighted the need for a transdisciplinary team of scientists because that is the interface where creativity advances science.

IEA Around the Nation: Regional updates

Gulf of Mexico

The Gulf of Mexico (GoM) IEA team is working on several different projects. They are using the IEA approach to potentially inform decision making around managing coastal erosion, evaluating trade-offs, developing a long-term management and restoration plan for the Mid-Barataria in Louisiana. They are providing objective science on ecosystem service tradeoffs and social impacts that may potentially inform management decisions. Products will include an ecosystem status report and qualitative network modeling.

The GoM IEA team is also working with fishermen to better understand red tides and model the west coast of Florida ecosystem. Regional scientists held participatory workshops with local fishermen impacted by red tides. The IEA provided a framework that built up partnerships and developed indicators, which were really important in responding quickly to the 2018 red tide. The products of this work include a response plan which will document impacts, describe what is going on now and prepare for next time. For more information on this project go here:

<https://www.integratedecosystemassessment.noaa.gov/regions/gulf-of-mexico/red-tide>

The GoM IEA team is also working with the Florida Keys National Marine Sanctuary (FKNMS) to advance the science behind the Sanctuaries condition report and management plan. This is being done through the selection of a set of indicators. The team also plans to identify and quantify thresholds between ecosystem pressures and indicators--management targets for FKNMS. Read more about this project here:

<https://www.integratedecosystemassessment.noaa.gov/regions/gulf-of-mexico/fknms>

Northeast

The Northeast (NE) IEA team is working on several different projects. They are working with the New England and Mid-Atlantic Fisheries Management Councils to support ecosystem-based fisheries management efforts. The team develops an annual State of the Ecosystem report which starts with the status of human dimensions and includes protected species, fish, invertebrates, habitat quality, and ecosystem productivity. They are also providing ecosystem information for stock assessments. Keep updated on their reports here:

<https://www.integratedecosystemassessment.noaa.gov/regions/northeast/reports>

The NE IEA team is also using the IEA approach to generate a risk assessment for the Mid-Atlantic Fishery Management Council. The initial assessment was done in 2017 and explored trade-offs to help the council focus on the most at-risk ecosystem components. From this effort, they will develop conceptual models of Summer Flounder and then conduct a management strategy evaluation. Read more about this effort here:

<https://www.integratedecosystemassessment.noaa.gov/regions/northeast/risk-assessment>

They are also working with Stellwagen Bank National Marine Sanctuary to update their condition report by providing relevant indicator data. These indicators will help provide context for Stellwagen Bank ecosystem within a broader Gulf of Maine context. Read more about this effort here:

<https://www.integratedecosystemassessment.noaa.gov/national/sanctuaries>

Some other efforts they are working on include participating in the International Council for the Exploration of the Sea (ICES) Working Group on the Northwest Atlantic Regional Sea (WGNARS). This group just finalized their three-year Terms of Reference for reporting, data efficiency, and management strategy evaluations. The NE IEA team is also working on northeast climate modeling to follow the [Alaska Climate Integrated Modeling Project \(ACLIM\)](#) efforts in Alaska and they are doing an analysis of retrospective of High Res ocean simulations for NE Shelf.

West Hawaii

The West Hawaii (WH) IEA team is working on several different efforts. The team has focused on identifying cultural services and defining a sense of place. They are hard to assess and are rarely included in the Ecosystem Status Report so far. There has been much community engagement around these efforts which are leading to the development of human wellbeing and cultural services indicators. You can read more about that here:

<https://www.integratedecosystemassessment.noaa.gov/regions/hawaii/hi-expandinghumandimensions>

The WH IEA team is also supporting the State of Hawaii's 30x30 initiative to effectively manage 30% of nearshore marine areas by 2030. This has been a tractable way for WH IEA get ecosystem science into management decisions. Learn more about this effort here:

<https://dlnr.hawaii.gov/dar/announcements/hawaii-30-by-30-oceans-target/>

The WH IEA team just released their latest Ecosystem Status Report. They developed new maps of place-based marine management activities such as gear restriction zones and others which will be used by the state. You can read the full report here:

<https://www.integratedecosystemassessment.noaa.gov/regions/hawaii/hi-esr>

The WH IEA team also just completed two climate vulnerability assessments. One on anchialine pools and another on coral reefs. There are lots of endemic animals and lots of cultural importance and traditions associated with these marine ecosystems so assessing which areas are most vulnerable is critical.

Surface slicks are another area of research the WH IEA team is working on. Read more about this effort here:

<https://www.integratedecosystemassessment.noaa.gov/regions/hawaii/hi-surface-slicks>

Alaska

The Alaska (AK) IEA team has several efforts in progress using the IEA approach. They are working with the North Pacific Fisheries Management Council (NPFM) to conduct ecosystem-based fisheries management. The IEA approach set up the structure to institutionalize EBFM work in the council setting. The AK IEA team has been presenting Ecosystem Status Reports to the council since 1996. The council has graduated from “this is interesting science” to “what do we do with it”. In December of 2018 the Bering Sea Fisheries Ecosystem Plan was adopted by the council. Through this process they developed six ecosystem goals and they are mapping objectives to indicators. The AK IEA team is also working on Bering Sea Regional Ocean Modeling System (ROMS) and Nitrogen Phosphorous Zooplankton (NPZ) models for the NPFM Council.

California Current

The CCIEA team has many efforts going to implement the IEA approach. They have just presented their 7th Ecosystem Status Report to the Pacific Fishery Management Council. They are participating in the Council’s Climate and Communities Initiative going to understand how climate change will affect fishery-reliant communities. They are also working with the Council on updating their Fisheries Ecosystem Plan. They are also completing a Sanctuaries Conservation Series report on their work with the Channel Islands, Olympic Coast, and Monterey Bay National Marine Sanctuaries to update their Condition Reports with indicators. Other projects the CCIEA team are working on include: the Future Seas Project on how climate and oceanographic variability affect pelagic fisheries and protected resources; a Fishery Participation Project funded by the National Science Foundation, which focuses on how different groups respond to fishery closures; causes of increased rates of whale entanglements in fishing gear along the West Coast; an ecological risk assessment for fisheries managed by the State of California; scoping of potential wind energy with Bureau of Ocean Energy Management; and fishery-reliant communities affected by harmful algal blooms and ocean acidification.

Wednesday, May 15, 2019

Panel: Managers and end-users – Identifying how and where IEA Supports Decision-Making

- **Facilitator:** *Josh Lindsay*
- **Panelists:** *Steve Giordano, Yvonne de Reynier, Steve Gittings, Kathy Broughton, Jim Pahl, Casey Streeter*

The end-users on this panel exemplify a broad range of interest groups at diverse scales: NOAA partners (ONMS), public user groups (Florida fishing communities); a complex multi-agency project (Mid-Barataria project); and a regional fishery management council (PFMC). IEA represents an adaptable tool and process that has effectively lent itself to addressing ecosystem-based goals associated with each of these projects. Several themes recur in the presentations and discussion around this topic. First, personal relationships and trust have often been the lynchpin to effectively applying IEA approach to the goals of these user groups. Oftentimes, these relationships have been organic and were initiated through happenstance or fortunate coincidence from the bottom-up. Communication is a critical element that permeates a successful project, and is a process that involves 2-way engagement and iterative improvements or corrections; community engagement tools are invaluable. The collection, management, and access to and communication of data are fundamental precursors to its use; in some cases, this has been a shortcoming, especially real-time data communication. Particular data gaps include interdisciplinary information on socio-economic conditions, human wellbeing, cultural resources, and data collected by citizen scientists. To address some of these data shortcomings in the future, we discussed the possibility of engaging the Integrated Ocean Observing System (IOOS), which has extensive experience in managing and serving these types of information. Likewise, Sea Grant may provide community-based outreach and engagement platforms and contacts for facilitating social science research and uptake of citizen science to feed the IEA process.

Panel: Indicators to meet the needs of end-users

- **Facilitator:** *Chris Kelble*
- **Panelists:** *Jason Link, Shannon Martin, Jamie Gove, Geret DePiper, Todd O'Brien, Karma Norman, Jenn Brown, Andy Whitehouse*

Summary:

The panel talked a lot about how indicators are used to turn ecosystem science into operational use. The IEA team has made significant progress towards indicator selection and presentation. The IEA indicators have been helpful in the development of Sanctuaries Condition Reports, interactive web-based graphics, the Mid-Barataria sediment diversion conceptual model (especially the inclusion of human wellbeing indicators), scaled indicators for the State of Hawaii, communication with stakeholders, annual quota setting for fisheries, incorporating plankton time series, and solving tensions incorporating human dimensions. The next challenge is to develop thresholds for these indicators. The challenge to developing thresholds is that life is multivariate and single time-series indicators may not necessarily meet traditional thresholds so we need to develop approaches that provide objective measures of good.

Panel: Risk assessments to meet the needs of end-users

- **Panelist:** *Jameal Samhuri, Kirstin Holsman, Sean Lucey, Steve Kasperski, Chris Kelble*

Summary:

Lessons learned from conducting risk assessments to meet end-user needs include the understanding that risk is subjective and influenced by individual perception. Risk assessments have also

brought different parts of NOAA together to address issues where people were previously siloed. The Alaska IEA team is working on the next step of adaptation after completing a risk assessment. It is important to co-develop knowledge with partners in order to come up with creative approaches to deal with cumulative layers of risk. The NE IEA team are also conducting climate vulnerability assessments and have benefited from a clear articulation of risk. They used different methods of conducting risk assessments for different end-users. The next step for the NE IEA team after conducting the risk assessment is to develop conceptual models. The GoM team highlighted that risk is often unpalatable term to end-users and challenges us to come up with different language to describe that work. Economists also think of risk in relation to something and recognize risk is subjective. Stronger knowledge often increases certainty of rating value. There is also value in a range of approaches to ranking risk from data-driven approaches to expert-opinion approaches. Indicator selection can help mobilize people and build relationships.

Panel: MSEs to meet end-user needs

- **Facilitator:** *Mark Monaco*
- **Panelist:** *Mandy Karnauskas, Howard Townsend, Kerim Aydin, Scott Large, Jamie Gove*

Summary:

A lot of different efforts have been initiated around MSEs and it was a good idea to do them as part of the IEA efforts with a focus on dealing with uncertainties. Ecosystem models are useful tools to conduct MSEs and support the adaptive management process. In Hawaii the genesis of doing a MSE was the local community deciding they wanted to do community based fishery management but didn't know exactly what they wanted to do. So the W H IEA team did a trade-off analysis and the community decided to preserve herbivores to help manage their local ecosystem. The Alaska IEA team brought up the importance of defining what is meant by MSEs because the council had a different understanding and expectation of conducting MSEs. This disconnect led to an issue, all Science and Statistical Committee members showed up looking for one MSE type and the stakeholders came in looking for another MSE type. The Northeast IEA team did a MSE of herring which resulted in direct management outcome in the harvest control rule. They highlighted the importance of making sure that the right people are included early and often. The GoM IEA team did a MSE related to red tides and management objectives came from the discussion between the scientists and the council. Some of the CC IEA team have thought of MSEs like scenario analyses. The challenge is to convey data reliability to managers and stakeholders.

Panel: Integrated social science and ecology for end-users throughout the IEA

- **Facilitator:** *Steve Kasperski*
- **Panelist:** *Jim Pahl, Matt Mcpherson, Kirsten Leong, Alan Haynie, Jamal Moss, Geret DePiper*

Summary:

The WH IEA team is working to build an integrated Atlantis model for the state that will help them balance broad ecological and human well-being goals. A challenge is that human well-being is

often amorphous when trying to understand the current state of the social-ecological condition. Since we don't manage fish but we manage people, it is important to keep in mind that people can act as system stressors and as stewards. So if we are trying to affect people's behavior we need to understand what the barriers are. The Northeast IEA team brought up the need to assess an appropriately broad ecosystem spectrum and without social science you can't do that. There are still some impediments with the complexity of coupled models but the IEA team has opened the door for qualitative models. There has been a lot of progress in showing the relevance of qualitative models for identifying indicators. The red tide work has been a real success for interdisciplinary engagement. Another challenge is people's unwillingness to come up with social goals because they are so controversial. Working with people on the ground, if they understand that things are going to change you can have really rich conversations and you can envision a variety of social outcomes of the project. Thinking more of scenario outcomes you can be more proactive about the social outcomes and get more than just impacts. Working with an interdisciplinary team challenges each scientist and helps move the ball forward. Social science also lends the ecological scientists credibility when interacting with the community. There are also a diversity of types of economists so don't just have a token economist on the team. Think of it as a long term relationship with social scientists rather than just a short term connection. The Gulf of Mexico IEA highlighted the importance of discussing socio-economic goals on the front end of a project. There is a challenge of looking at data across disciplines because there are spatial and temporal issues.

Panel: How are we transitioning IEA, its components, its products for ongoing, operational applications?

- **Facilitator:** Jameal Samhoury
- **Panelist:** Chris Kelble, Becky Shuford, Chris Caldwell, Sean Hardison, Kelly Kearney, Dave Fluharty

Summary:

The IEA approach is operational from the get go because it is informed by application of the IEA process. This is why we are seeing the success that we are having with the IEA approach. The Northeast IEA team is directly transitioning IEA science into management with the development of the State of the Ecosystem report and the risk assessment. They have improved this process with software development. We need to lower the barrier to entry for data processing and data management. The IEA partnership with the sanctuaries has demonstrated the utility of the IEA approach. We need to continue to build capacity and engage stakeholders. Another benefit of the IEA application to sanctuaries is the downscaling of indicators, ensuring ready access to data products that are easily consumable, and identifying data gaps. They are formalizing the IEA approach and working to implement the process around the nation. It is better to not think of people that use the IEA science as end-users because it implies that this is a linear process and a lot of the time it is not. Dave Fluharty said we are at a pivotal point of expansion and use of IEAs more broadly. We need to now see where the opportunities are and figure out how we can prioritize our work. We need to keep in mind the adaptive management piece and this process is an experiment to learn how the system works. Operational is being able to respond to partners needs. What is the nature of the program in terms of continuity and expansion of IEAs?

Breakout Session: Communications

There is a large need for communications in the process of implementing IEAs. It is important to identify who your target audience is, work with them early and often and keep constant communication.

Breakout Session: Way Forward Back-To-Back

We need to collectively improve and adapt the IEA approach and science to advance specific management and conservation needs, and economic considerations. We also need to improve the approach to support EBFM, coastal zone management, and more comprehensive, cross-sectoral EBM. EBM requires the coupling of natural and social sciences with governance structures, thus IEA needs to facilitate the integration of these EBM components.

Thursday, May 16, 2019

Presentation: IEA origins, by Frank Schwing

Summary:

The path that led to the inception of the Integrated Ecosystem Assessment Program was incremental and collaborative. Efforts ranging from casual discussions to congressional acts were integral in the inception of the program. One key utility of the Levin et al (2009) paper was to create a simple mechanism to legitimize the simple decision-making process for ecosystem management.

Panel discussion: Levin et al. 2009 and beyond

- **Facilitator:** *Becky Shuford*
- **Panelists:** *Phil Levin, Dave Fluharty, Mike Fogarty, Steve Murawski, Frank Schwing*

Summary:

Five of the key architects of the current NOAA IEA program participated in a panel discussion to talk about the ten years since the Levin et al. (2009) paper and to offer recommendations for the future of the program. The panelists briefly described how they each came to be involved in the NOAA IEA effort. They were then asked to each discuss their feelings about why the IEA approach has proven so versatile. Key themes were that it was a flexible, adaptable approach that was also easy to grasp because it is commonly used in many other aspects of decision-making; it was also compatible with the evolving push for EBFM that was occurring within marine sciences and marine resource management agencies. Next, they described what they viewed as the approach's enduring strengths. Important strengths were that it is a flexible process rather than a narrow, specific suite of tools that must be applied; that it was compatible with evolving mandates, agency priorities and governance structures; that there was an emerging generation of marine scientists from multiple disciplines that were ready to take on the challenge of implementing the process; and that there are many potential customers for IEA products if we are able to connect with them. The panel took several questions from the audience, chiefly dealing with whether we should be emphasizing products or process; consensus among the panelists seemed to be that the two are somewhat inseparable.

Finally, the panelists gave a list of recommendations for the future of the program. These included:

- Increase the diversity of IEA practitioners, to more closely resemble the communities we serve
- Move from static annual products to continuously updated, accessible products
- More effectively translate what we do to other line offices and to sister agencies, particularly those in related sectors or adjacent freshwater and terrestrial systems (so that we don't "stop at the shore")
- Work with a broad range of customers to develop clearly defined operational objectives
- Tell our story more effectively, particularly to NOAA leadership; this helps to make it part of the broader NOAA story and may help with increasing IEA resources
- Conduct an assessment of IEA demands and priorities
- Anticipate emerging governance structures, and reach out during their formation stages, to connect with new customers
- We still need to address the "what's an IEA?" question through our products; this might be through publishing some regional papers or reports that are explicitly called, e.g., "IEA of Region X" so that customers have a better sense of what we can provide

Presentation: "Forks in the Road"

The California Current IEA team went through an exercise of identifying major decision points or "forks in the road" of the California Current efforts. They created a spreadsheet and had the whole team input what they thought were major decisions in the direction of the IEA efforts. The forks were categorized into several themes: Events, Decisions, Circumstances, Innovations, Omissions, Personnel.

Breakout Session: Regional "Forks in the Road" and Impediments to successful application of the IEA

The Alaska IEA team identified all of the Face to Face IEA meetings as forks in the road because they guided their next steps. The funding structure was also a large piece of their forks in the road. One early decision was that we weren't going to support raw data gathering but product delivery and management. The formation of working groups was really informative. Some things that came and went like marine spatial planning. Things that came and stayed like climate change. The Alaska region had some specific decision points for example when they decided to support the development of the ROMS NPZ model and that kept them collaborating with the Pacific Marine Environmental Laboratory and kept cross-line office efforts alive.

The West Hawaii team had many forks in the road. The designation of our region, the region itself and the geographic scope. The 2015 bleaching event was a major turning point in the direction of the IEA efforts.

The Northeast IEA team had many forks in the road. They had the ecosystem assessment branch form, also had inclusion of the social sciences, habitat, and oceanography and working across those labs. They also chose to focus on the mid-Atlantic, development of the risk assessment, and management strategy evaluation.

The Gulf of Mexico IEA team had several forks in the road. This included a crisis and respond to red tide events was a big fork and changed some of the ways we approached the IEA. Started trying to engage the Council and figured out that wasn't partner so re-scaling to other partners at smaller scales.

The California Current IEA team had many forks in the road. Key fork was early engagement with partners that guided the scale and focus with partners. Very early on a circumstance was the Atlantis ecosystem modeling capability and thinking about using end-to-end models. More recently, the major North Pacific marine heatwave of 2013-2016 was an ecosystem-scale perturbation that brought the IEA team and many stakeholders, such as the Pacific Fishery Management Council, to the same table.

Friday, May 17, 2019

Manuscripts were identified and initiated outlining them.