MARINE RESOURCES ADVISORY COUNCIL

Meeting summary
November 1, 2024
9:30 a.m. to 3:00 p.m.
In Person at Ecology's Headquarters Office, Lacey, WA
Virtual via Microsoft Teams

Meeting attendance and objectives
The Washington Marine Resources Advisory Council (MRAC) held its 31st meeting in person and online on November 1, 2024. The meeting was facilitated by Angie Thomson, Thomson Strategic Consulting.

Members in attendance: Martha Kongsgaard (Chair), Cynthia Catton (Department of Natural Resources), Meg Chadsey (WA Sea Grant), Bill Dewey (Taylor Shellfish Farms), Aaron Dufault (Washington Department of Fish and Wildlife, alternate), Rod Fleck (Washington Coast Marine Advisory Committee), Jennifer Hennessey (Washington State Department of Ecology, alternate), Marilyn Sheldon (Coastal Shellfish Grower), Senator Keith Wagoner (Washington State Senate).

MRAC members not in attendance: Brian Allison (Puget Sound Commercial Crab Association), Mike Cassinelli (Recreational Fishing), Tom Davis (Washington State Farm Bureau), Norm Dicks (Van Ness Feldman LLP), Representative Joe Fitzgibbon (Washington State House of Representatives), Tony Floor (Northwest Marine Trade Association), Lucas Hart (Puget Sound Partnership), Dennis McLerran (Puget Sound Partnership), Erika McPhee-Shaw (Western Washington University), Mindy Roberts (Washington Environmental Council), Senator Jesse Salomon (Washington State Senate), Douglas Steding (Association of Washington Business), Laura Watson (Washington State Department of Ecology).

Other participants: Simone Alin (National Oceanic and Atmospheric Association), Cory Archer (True Wind Collaborative), Jessica Cross (Pacific Northwest National Laboratory), Richard Feely (National Oceanic and Atmospheric Association), Kirsten Feifel (Puget Sound Partnership), Micah Horwith (Washington Department of Ecology), Terrie Klinger (Washington Ocean Acidification Center), Natalie Lowell (Makah Tribe), Tommy Moore (Northwest Indians Fisheries Commission), Peter Murchie (Environmental Protection Agency), Jan Newton (Washington Ocean Acidification Center), Candace Penn (Squaxin Island Tribe), Liz Perotti (National Oceanic and Atmospheric Association), Candice Plendl (MRAC facilitation team), Angie Thomson (Thomson Strategic Consulting, MRAC facilitation team), Brad Warren (Global Ocean Health), Paul Williams (Suquamish Tribe)

Meeting objectives:
- Share updates on recent ocean acidification efforts.
- Discuss updates to ongoing activities and highlight current science work.
- Discuss potential projects to support ocean acidification communications and outreach.

Welcome and introductions

Angie Thomson, MRAC facilitation team, welcomed participants and reviewed the meeting agenda.

Recent ocean acidification happenings
Participants shared out on recent ocean acidification activities. Highlights include:

- MRAC submitted one decision package for the 2025-2027 Biennium for the Washington Ocean Acidification Center to continue biological response experiments focused on Dungeness Crab response, salmonids, and harmful algal blooms.
- Peter Murchie, EPA, provided links to a suite of recent papers:
    - Pacella et al, 2024. Quantifying the combined impacts of anthropogenic CO2 emissions and watershed alteration on estuary acidification at biologically-relevant time scales: a case study from Tillamook Bay, OR, USA. Frontiers in Marine Science.
    - Pacella et al., 2024. Feedbacks Between Estuarine Metabolism and Anthropogenic CO2 Accelerate Local Rates of Ocean Acidification and Hasten Threshold Exceedances. JGR-Oceans.
    - Kaldy et al., 2022. Carbon limitation in response to nutrient loading in an eelgrass mesocosm: influence of water residence time. Marine Ecology Progress Series.
    - Galavotti et al., 2021. Measuring coastal acidification using in situ sensors in the National Estuary Program. EPA Report.
    - Rosenau et al., 2021. Integrating High-Resolution Coastal Acidification Monitoring Data Across Seven United States Estuaries. Frontiers in Marine Science.
    - Pacella et al., 2018. Seagrass habitat metabolism increases short-term extremes and long-term offset of CO2 under future ocean acidification
- The White House has created a fast-track action committee on carbon dioxide removal (CDR) with NOAA as the lead. Expect a strategy to come out by the end of the year related to CDR.
- Additional mCDR resources shared:
    - Microsoft Signs Ocean-Based Carbon Removal Deal with Ebb Carbon - ESG Today
    - Permitting for mCDR and mSRM | US EPA
    - Marine Protection, Research and Sanctuaries Act (MPRSA) and Federal Facilities | US EPA
- Dick Feely, NOAA PMEL, is working with the Pacific Northwest National Laboratory in Sequim to conduct mCDR experiments in a lab setting, combined with modeling work, to examine the effects of injecting high-alkalinity water.
    - https://oceanacidification.noaa.gov/fy23-nopp-mcdr-awards/
- Over the past year, Ecology has been working with nine other state agencies to evaluate existing agency work and adapt to the impacts of climate change across Washington. This process includes assessing current programs, identifying gaps, and determining areas where agencies can increase their efforts. In collaboration with UW Climate Group, Ecology conducted outreach, resulting in a focused strategy with eight major categories of strategies and actions. The proposal includes a $450 million request to implement

these strategies over a four-year cycle, with regular updates to track progress. Agencies will report progress to the legislature.

- HAB recent website updates.
    - https://www.nanoos.org/products/habs/forecasts/bulletins.php
    - Rochelle Labiosa from EPA R10 Water Division is a regional and national leader on HABs policy and science. EPA webpage for Harmful Algal Blooms (HABs) in Water Bodies | US EPA
- Ocean Acidification Week 2024 is scheduled for Monday, November 18 to Friday, November 22, 2024
    - https://www.goa-on.org/webinars/OaWeek2024/webinar.php
- Job Opportunity: NOAA OAP is seeking four (4) Data Synthesis Postdoctoral positions: https://oceanacidification.noaa.gov/job-opportunities-4-data-synthesis-postdoctoral-positions/

Science update

Participants heard an update on Washington Department of Fish and Wildlife research and decision-relevant science, and the ocean acidification indicator development. Highlights include:

- Chris Biggs is introduced as a Research Scientist for WDFW working on conservation planning and shellfish management research.

- Chris has a focus on Dungeness Crab fishery and whale entanglement risk. Working on modeling whale distribution and entrapment risk in Washington, as well as researching how crab and whale distributions will respond to changing temperatures and OA.

- Warm water in the central Pacific appears to be good for crab recruitment.
    - Lagging environmental indices by 4 years (upwelling intensity, MEI index (ENSO based), Habitat compression index, Duration of Spring Transition) enables correlation of ecosystem metrics to Dungeness crab recruitment.
    - Do droughts impact Dungeness crab production?
        - Some aspect of drought conditions in the NW may increase recruitment success.

- Moving to bring OA into Dungeness crab research in Washington. The research developed in Oregon around OA works well there, but did not work when analyzing crab in Washington.

- There has been a shift in molting over the last 4 years, from June-September to October to January recently. This could help managers close fisheries when crab are vulnerable.

- Chris Biggs' work in Texas brings a background on interdisciplinary projects using acoustics, building partnerships between management entities, and providing research that enables sound management of coastal species.

Q&A

- Jan Newton, WOAC, asked if we are looking at larval condition in addition to doing larval sampling?
    - Chris is looking at what types of data would be most relevant going forward, including larval condition.

- Candace Penn, Squaxin Island Tribe, noted that when you incorporate TEK you touch on the interconnectedness and the causal relationships that you develop in Structural (causal) Equation Models.

- Simone Alin, NOAA, noted funded projects on multiple stressor data and the opportunity for cross pollination with WDFW.

- Liz Perotti questioned funding levels of light trapping efforts of larvae that has recently started in Washington.

Participants heard a presentation on Ocean Acidification Indicator Development by the Department of Ecology presented by Micah Horwith (Washington Department of Ecology). Highlights include:

- Washington has more OA data than anywhere else in the world, Ecology is now working on digesting that data and producing public facing materials.

- Department of Ecology has 28 stations and started monitoring in 2018.
    - Natalie Coleman leads a team for monthly samples at surface and at depth.

- OA in waters is more present across the globe, and waters are more corrosive than before burning fossil fuels. Lab work has identified different thresholds for various species where their development or ability to find prey is impaired by increased acidity of waters.
    - Puget Sound is naturally more acidic, and we are crossing the known thresholds of certain species, including commercially important species like Pacific oysters.
    - The timing of exposure to highly corrosive waters in their lifecycle is very important. Most animals are more robust to OA in adult phase.

- Industry efforts have been successful in adapting to OA.
    - Adaptation will become harder as OA increases.
    - Without shellfish hatcheries many of these adaptations are unavailable.

- Crab larval density is highly variable throughout Washington.

- There is a seasonality for water chemistry in Puget Sound. Late fall to early spring has more corrosive waters. Species have evolved successful reproductive strategies to utilize seasonal changes.

- OA indicator, why is it needed?
    - A metric to tell story of OA in Washington.
    - Communicate growing risk associated with OA to ecosystems & economy.
    - Designed to communicate with the public, policymakers, and natural resource managers.

- "Window of opportunity" nomenclature is the preferred Ecology OA indicator name and shows favorable days of higher aragonite saturation (>1.0) 194 days in 2022, 188 days in 2021, 178 days in 2019 (first full year)
- Estimated 257 days in year ~1700
- Reducing carbon emissions can preserve the window of opportunity

- Is there research on how molting and hard shell regeneration is affected by OA?
  - Paul McElhany, NOAA, has done work on early life stage shell formation and OA.

- When final 2023 data comes in they will synthesize all years and publish the work. This will be an ongoing data release by Ecology going forward. Grays Harbor and Willapa Bay data collection started in 2021 and waiting a few more years before data will be released.

Q&A

- Dick Feely asks is there a window of opportunity graph showing conditions at depth
  - Micah – Yes and the 'window' is smaller (more corrosive) at depth.

- Peter Murchie – What role modeling has for the indicator?
  - Indicator is based entirely on observational data.
  - Ecology has modeled both surface and deeper layers.
  - Modeling could be beneficial for particular areas where in-situ measurements do not exist.

- Dick Feely - Micah's work is similar to work done by Simone Alin (NOAA) in protected areas.
  - Simone's work looks at how OA may create impacts 20-30 years out.
  - Micah's work is a great approach to OA indicators and since waters are more corrosive at depth, at depth observations could foreshadow future surface conditions.

- How much of OA variability is related to precipitation and river flows?
  - Precipitation can create very high OA variability in Puget Sound.
  - Nisqually research shows larvae can take refuge in surface layers to avoid corrosive waters.

- Peter Murchie asks what type of support is needed to operationalize modelling for the window of opportunity indices?
  - Micah believes time, not resources, is the limiting factor to getting a modeling product out.
  - Areas that do not have in-situ monitoring are good candidates for modeling based 'window of opportunity' products and alert systems.

- Candace Penn, Squaxin Island Tribe, appreciates the salmon call out, even though they aren't as severely impacted as shellfish.

- Dick Feely likes the window of opportunity approach, and the ability to adjust the sensitivity for different species of importance for different communities.

Marine Forest Designation of Bull Kelp Forests

- The effort to designate Bull Kelp forests as state forests is led by Puget Sound Restoration Fund and the Seattle Aquarium.

- What would designation entail in terms of protection?
    - There is no budgetary impact to this designation and no increased protection. Designation signals the importance of kelp forests to the state of Washington.

- Rod Fleck, Chair of WCMAC, cannot speak in support, as he was not aware of this designation before this conversation. Some groups may not understand that the goal is non-regulatory, but certain stakeholders, especially tribes, may see this as a new regulatory action.
    - State agency MRAC members need to ask respective agencies about supporting the bill.

- Bill Dewey, asks if we could designate eelgrass as Washington State marine meadows?
    - There is a question if you can designation a species or an ecosystem, the goal is to protect ecosystems and highlight the importance of the ecosystems to Washington state.

mCDR

- In January, Goa-ON will be publishing information on mCDR representing current science on the west coast.
- Many in this space are interested in the Ebb Carbon mCDR project that Microsoft has invested in.

Communications and Outreach

Participants heard an update on NOAA communications best practices in progress, current work, available funding, and discussed potential activities. Highlights include:

- Liz Perotti, NOAA, shared updates on ocean acidification communications best practices, focusing on simple, practical messaging.
    - https://oceanacidification.noaa.gov/ocean-acidification-program-resources/
- There may be opportunity to engage with trusted messengers to improve communication effectiveness, such as with the industry and trade associations.
    - https://www.northwestfisheries.org/trade-associations/
- OASeS is working on educational videos about Dungeness crab and ocean acidification impacts.
    - https://www.olympiccoastsentinelsite.org/

- The Pacific Fishery Management Council's Scientific and Statistical Committee reviewed the updated light trap and environmental predictors report on November 5.
    - Report: https://www.pcouncil.org/documents/2024/10/review-material-shanks-et-al-dungeness-crab.pdf/
    - Meeting info: https://www.pcouncil.org/events/ecosystem-based-management-subcommittee-of-the-scientific-and-statistical-committee-to-hold-online-meeting-november-5-2024/
- Simone Alin, NOAA PMEL, shared several articles on Dungeness crab studies:
    - Seasonal ocean forecasts to improve predictions of Dungeness crab catch rates, co-developed with state and tribal fishery managers
    - The importance of environmental exposure history in forecasting Dungeness crab megalopae occurrence using J-SCOPE, a high-resolution model for the US Pacific Northwest
    - Exoskeleton dissolution with mechanoreceptor damage in larval Dungeness crab related to severity of present-day ocean acidification vertical gradients
    - Evaluating the evolving Ocean Acidification risk to Dungeness crab: time-series observations and modeling on the Olympic Coast, Washington, USA
    - Higher survival but smaller size of juvenile Dungeness crab (Metacarcinus magister) in high CO_2
- A toolkit is available for Washington teachers on educating about ocean acidification
    - https://oceanacidification.noaa.gov/ocean-acidification-education-outreach/education-toolkit-pnw/

Steps to effective OA communication presentation by Liz Perotti National Oceanic and Atmospheric Association, key points.

- Using research from Yale's School of Climate Communication, the framework for effective communication involves using metaphors, correcting common misconceptions, providing the mechanism, completing the explanatory chain, putting individuals into a community, using a tested value that resonates with all Americans (responsible management, protection).

- Metaphors like 'the Ocean is the heart of climate circulation' are important for building understanding through corollaries.

- OA is an energy problem, energy that could be used to find food, avoid predators, and reproduce is being used to build shells and skeletons. This framing is easy to understand.

- Consider telling stories of resilience.
    - When are species more resilient?
    - What species show adaptive capacity?
    - Examples of knowledge in action.
    - Community and industry partnerships.

- Often OA is not the biggest concern of industry or communities. How do we elevate OA relative to other issues?

- May have to provide incentives to engage, such as payments.
- Help connect communities to people who can help with permitting or information sharing.
- Micah Horwith, WDFW, OASeS educational crab video project funded, with a coastal focus, and will be delivered May 2025.

Trusted messengers for industry

- Commercial Crabbers Association, best opportunity to more broadly communicate, MRAC should ask the Association if they want to disseminate OA materials to members.

- Candace Penn, Squaxin Island Tribe, mentions that salmon connection to OA is important and Paul Williams asked if food webs are effective way to communicate OA broader effects to the marine ecosystems. Liz Perotti believes that they are very effective.

MRAC considers using some remaining WOAC funding for these communication efforts, what should be funded?

- We don't know exactly how much money we have, so having tiered plans related to higher and lower budgets can be helpful.

- Rod Fleck points out the impact of the film shown at Rivers and Films Festival. Relatively low cost but he can still visualize the film today.

- Micah Horwith, WDFW, believes communication is about motivating action, whether scaring them or patting them on the back, different tactics will work for different people.

- If you get an electric car rebate you could get a fact sheet on how switching to EVs enables sustainable crab fisheries.

- Candace Penn, Squaxin Island Tribe, looking for simple tangible examples, similar to sea level rise communication that sea level is up to top of Xtratuf shorties or Romeos boots over last 100 years (common working boots in fisheries). Easy examples for the audience to understand OA issues more quickly.

Digital communication strategies

- A communication package of one pagers, short videos and other media which allows partners to utilize media that best fits their communication channels for a particular project.

- OAinWA.com website revamp is discussed as a resource hub and universal landing page for all interested organizations in Washington. Currently search engine optimization (SEO) is needed as OAinWA.com, when searched in google, pulls up 20 links for Okinawa, Japan.

- Candace Penn believes ESRI StoryMaps work better than websites on phones and tablets, which engages younger audiences. StoryMap downside is ESRI is constantly updating software and it breaks story map pages built in ESRI environment. Candace also

suggested adding humor to communications to engage younger audiences and help with organically spreading OA message.

- The differing effects, shore accretion and ablation, cooling on Pacific Northwest coasts vs inland environments, the messaging has to capture the real and diverse experiences people experience.

Teaching outreach

- Paul has been working for years to try to get OA into curriculum. Meg believes that money is needed for professional development to support OA curriculum. You need a law that requires this, like PNW Tribal instruction, otherwise it is just up to individual teachers.

- The challenge with working with the Office of Superintendent of Public Instruction (OSPI) is there are so many districts doing different things. Cindy Donahue (Ecology) has worked to build relationships with many individual teachers as a grass root effort to tackle that challenge.

- Teachers do have to have continuing education hours and many teachers taking this course are learning about OA because they are interested in the topic.

Tactical outreach approach by MRAC

- Peter Murchie believes we need to engage with Puget Sound Management Council and Ecosystem Coordination Board. Recommends being tactical on building new relationships with incoming governor and federal administration.

- Prioritize identifying who the new Governors policy advisors are and utilize a 'boots on the ground' approach. Face time could make a difference early as new administration wades through thousands of "one-pagers".

OA priorities and next steps

The Committee concluded discussion with Angie Thomson promising updates to budget table with ANeMoNe info, and WOAC symposium dates, which will be communicated in update following the meeting. Priorities for 2025 include: updating OAinWA.com, stickers with QR codes for promoting the new website, and a promise to think through whether infographics and/or StoryMaps should be utilized to drive engagement for the website revamp.

Angie Thomson asks the group to consider if there is someone in this group who can do deep thinking on how to message around 'climate dissociators' and create impactful metaphors?

Cory Archer notes that meetings going forward will be virtual with an annual in-person meeting around November each year.

If we are reaching out to distinct legislative districts it would be good to have one-pagers for illuminating the issues in their own backyards related to OA. Bill Dewey proposes education or legislative day on the hill to get new legislative members familiar with OA in Washington.

Next steps

1. Identify OA indicator messaging gaps, are we missing anything for the Ecology OA Indicator rollout in terms of communications?
2. Audio spots for radio could be used if it reaches the media channels MRAC and partners want to target.
3. Members will touch base with the organizations they represent regarding Kelp Forest designation to understand support.