Oregon Whale Entanglement Working Group Meeting
Wednesday, January 13th from 2 pm - 3:30 pm

Location: on Zoom

Overall meeting goal

Conduct a brainstorming session with working group members to collect a broad range of ideas for monitoring whale entanglement that might help meet Incidental Take Permit (ITP) application requirements. Generate a short-list of monitoring approaches that could be ready to implement in the near-term, and longer-term list of ideas that need further development.

Participants

Amanda Gladics, Caren Braby, Troy Buell, Kelly Corbett, Brittany Harrington, Susan Chambers, John Corbin, Rick Lilienthal, Ron Mason, Tony Pettis, Joy Primrose, Jim Rice, Leigh Torres, Ben Enticknap, Angee Doerr, Dan Lawson, Victoria Knorr, Morgan Ivens-Duran, Tim Novotny, Lisa Ballance, Colleen Weiler, Fran Recht, Lauren Saez, Gway Kirchner, Cari Brandberg, Heather Nicholson

Welcome, Introductions, and Review Proposed Agenda

To open the meeting, Amanda Gladics (Oregon Sea Grant, facilitator) provided a brief welcome, background on the working group structure and ground rules, and agenda overview. This was followed by introductions of all group members and guests, including affiliation and role.

ODFW Framing of Request to OWEWG

ODFW staff provided an overview of work to date on developing a Conservation Plan (CP) for reducing the risk of marine life entanglements in Oregon commercial Dungeness crab gear, and the agency's request for the working group.

- Caren Braby introduced the topic for this meeting, beginning with the role of OWEWG in establishing preliminary recommendations that formed the basis of regulations adopted to reduce entanglement risk and gain better information from future entanglement events. She described the conservation planning work that has been done so far by ODFW and key partners, and the areas of the CP that need additional ideas and refinement. In addition to working with Tri-State and NMFS partners, ODFW is requesting help from OWEWG to generate new ideas and refine existing ideas on how to monitor for entanglements and entanglement risk to allow for effective adaptive management. ODFW hopes to compile a running list of ideas which will continue to be developed and evaluated moving forward.
- Brittany Harrington provided a brief description of the CP and key elements. The CP is a required element and the foundation of an ITP application under the Endangered Species Act. A CP must describe the terms and conditions of the requested ITP, the impacts of the crab fishery on key species covered under the permit, the steps that will be taken to minimize and mitigate those impacts, how impacts will be monitored and reported to

determine CP effectiveness, and how impacts will be evaluated to inform adaptive management. Progress has been made in most of these areas, but the monitoring approach needs further development.

- Kelly Corbett and Troy Buell introduced ODFW's current list of monitoring ideas (provided to OWEWG in advance, see pre-meeting draft at the end of this summary) which intends to capture all potential ideas for monitoring entanglements directly or utilizing proxies for entanglements (e.g., co-occurrence). ODFW will maintain the list for posterity, and evaluate each for feasibility in the short-term. Kelly briefly walked through each idea for monitoring entanglements directly. Troy briefly walked through each idea for monitoring co-occurrence (i.e., overlap between whales and fishing gear in time and space).

Discussion and Focused Brainstorm

ODFW's intention is to do work subsequent to this meeting to work through the benefits and drawbacks of each idea. Today's meeting is designed to brainstorm potential ideas, even expensive or technology-limited ones, that may become feasible in the coming years.

Questions and comments from the discussion are summarized, by specific monitoring idea, and broken into entanglement and co-occurrence monitoring. Additional notes captured as a spreadsheet during the discussion can be found at: https://docs.google.com/spreadsheets/d/1v0gZBC33edP2LXmaPwuYbQn7NmkufFzVyAkhtCdq1ps/edit?usp=sharing

Questions/comments on entanglement monitoring ideas

- Observer program
    - Whale entanglements are such a rare event, putting observers or volunteers on boats doesn't seem realistic. The cost is likely extremely high for very little possibility of observing an entanglement.
    - There are other places where they're looking for marine mammal interactions with fishing gear using cameras on board that are positioned to observe the areas around the boat. That method wouldn't require an individual. You still have the problem of whether you'll see much, and there is a delay for footage review, but it might be another way of doing that.
    - Electronic monitoring is pretty expensive, both the price of putting it on the boat and video review. Solar loggers to see where boats are would be pretty reasonable, but using EM to monitor whales would be very expensive. There is also the issue of delay for video review – you'll know where they were, but not where they are.
    - Most crabbers spend their entire lives on the water and never see an entangled whale. It seems unfeasible to go out and physically count entangled whales. I'm more inclined to agree with the approach of monitoring risk, real-time co-occurrence, or using best available historical data. When you do have random encounters, you can go back to co-occurrence data and try to make sense of it that way.

- Dedicated survey effort for entanglement monitoring
    - Seems unrealistic and unproductive because of the large geographic area and number of crab pots, along with the low occurrence of entanglements.
    - Co-occurrence predictive modeling work should be valuable in the future, but some groundtruthing (UAV, aerial manned, acoustic) will be valuable.
- Modeling/extrapolation from more limited-scale monitoring
    - It doesn't seem like you can really extrapolate something with such a low occurrence rate.
- GPS gear tracking
    - Seems very expensive, but curious about it. Gear is taken away all the time by other boats and dragged all over the ocean. Monitoring the gear will be a lot of work.
    - Gear movement varies year to year, so it seems like it would be difficult to develop a consistent enough pattern to monitor. There are some times when a lot of kelp drags gear away.
    - Machine learning algorithms could be used to automatically detect possible whale movement, so the monitoring side of the GPS buoy shouldn't necessarily be a deterrent.
- Trap loss information sharing
    - Trap loss is higher in some high traffic places (e.g., Astoria), where there isn't necessarily higher entanglement risk. That would have to be taken into consideration.
- Systematic volunteer program
    - There are times in January and February when a small boat can get out safely. There are charter boats and at least a few whale watching boats, up and down the coast, with people interested in seeing whales. During a nice weather window, these entities could cover some ocean to help with surveys. If they agree to a consistent route each time, it could provide an idea of where whales are and how many. It shouldn't be terribly expensive, people may be willing to pay part of the cost to go on those trips and then you just need a few people on board that are knowledgeable about whale identification with a good camera.
    - Evidence of whale presence (from acoustics, sightings, etc.) may be the time to put observers on boats. Have them available on 3-4 day notice to get photos of a group that is observed. You could have a set group of people you call to see if they are available on that day.
    - Direct surveys are still looking for a needle in a haystack.

Questions/comments on co-occurrence monitoring ideas

- Acoustic monitoring
    - Q: Can you track individual whales from their songs? Or determine approximately how many whales are in an area?
        - A: Humpback songs are most occurring on the breeding grounds, not the feeding grounds which we have here. There are ways you can triangulate the

sound with multiple hydrophones to look in a specific area, but it's basically presence or absence information, not abundance.
        - A: If you know the call rates, you can extrapolate acoustic detections to look a densities. You can come up with some understanding about the level of vocalization of the population that you are monitoring, then take what you record and use those call rates to estimate density.
- Q: Can you identify species through acoustics?
    - A: Yes. It's relatively straightforward because there are very distinct calls between species.
- Q: How big of an area can you monitor with acoustic surveys?
    - A: It depends on the properties of the water column. Baleen whales vocalize in low frequencies which travel far making acoustic monitoring a more effective tool over large spatial areas. The detection range of a hydrophone depends on temperature, depth, and other sound sources which may contribute noise. In deeper areas, you can hear farther. Vessel traffic would reduce the detection ability. For humpbacks, a hydrophone may detect up to a ~20 km radius from the location of the hydrophone.
- Hydrophones are typically not cabled, so you can't hear from shore in real-time. Real-time acoustic monitoring would be much more expensive. It is taking place in other places, but typically they are deployed and then picked up 6-12 months later.
- Q: Could a hydrophone be attached to data buoys that are already out there?
    - A: Yes – should be done more.
- Acoustic surveys could be considered in key areas, or as a good first step to know when whales are in the area. We still might need fly-overs, drone, etc. to confirm, but acoustic moorings to all the weather buoys could help figure out where to start looking for entanglements.
- Technology may not be available now, but might be something we can work towards during the 20-year proposed permit timeframe. There might be applications that are more relevant in the short- versus long-term.
- [In chat] There is a system of acoustic monitoring devices on the East Coast intended for alerting ships to right whale presence in near-real-time (https://apps-nefsc.fisheries.noaa.gov/psb/surveys/MapperiframeWithText.html). Canada also has a system deployed (https://whalemap.ocean.dal.ca/).
- Q: What about the possibility of using acoustics as a gateway to track migrations into Oregon waters? Would it be more or less feasible than looking at hotspots?
    - A: These animals do migrate into certain areas and then leave. It would be helpful to understand when that happens. A lot of acoustics work is done on a relative basis, so to gain that understanding, we would need some baseline understanding of how much these animals vocalize when they're here. Lines of assessment areas is a good idea, looking at movement both in and out.
- Q: Have researchers ever identified a different sound made by a distressed whale?

        - A: Don't think so, to date. That would require validation to know the whale is in distress and having the acoustic recorder in the water at that time to listen.
- Scar rate studies
    - There is a lot of value in this method. It's a simple way to look at changes in rates. Humpbacks are pretty well photographed throughout their range. If we can get a baseline understanding of scar rates for Oregon, we can look over time for freshness of scarring rates or new scar rates, to get a sense of new scar accumulation over time. Current modeling efforts in Oregon will help with understanding co-occurrence, but a better handle on current and new scarring rates over time would provide a way to confirm patterns.
    - Q: Would this be most effective done in collaboration with California and Oregon?
        - A: Yes, and to some extent that coordination is already occurring. There have been discussions about linking information on residency of whales (e.g., whether certain whales are found in OR waters than CA or WA waters) with scar rates to understand spatiotemporal changes.
- Whale tagging (added to list during discussion)
    - Q: Is there a reason why tagging whales is not being looked at? Are there reasons for not allowing it to be done?
        - A: Whale tagging effort will be added to the list. There isn't a lack of interest from NMFS and other researchers.
    - To do any kind of research on whales, even photos, a research permit (issued by NMFS PRD) is required. [The OSU Marine Mammal Institute] does have an existing permit that allows them to put some satellite tags on whales, but there are a lot of fine points associated with that type of permit (e.g., type of tag, species/stock).
    - There are a lot of things we can learn from tagging, but drawbacks as well. A lot of tags last only a few months. It is very expensive and difficult to tag a lot of whales, meaning that small sample sizes may limit extrapolation to the whole population. It's a great tool, but not a silver bullet for understanding a population's movement patterns.
    - Q: Do humpbacks tend to stay in the same group over a period of time?
        - A: They are not necessarily thought to have group social structure, at least off Oregon.

Public comment

- The priority should be to have real-time distribution and abundance information on humpbacks and leatherbacks to inform in-season, area-based management. Should focus on aerial suveys with human observers or possibly drones.
- Q: Can Oregon collaborate with Washington and California on an ESA Section 6 funding proposal to get funding towards a systematic aerial survey?
    - A: Section 6 funds cannot be used for a Conservation Plan monitoring program.

- We should be looking at UAVs and work that is happening in Alaska in remote, inhospitable environments. Acoustic gliders are already being used to listen for whales on the East Coast. This would be more reliable if combined with manned aerial surveys. We also need 100% real-time monitoring of the fleet to collect information on fishing effort and co-occurrence. Predictive models will be incredibly useful in the future and we need to start the groundwork now to make those reliable and robust. GPS buoys could be interesting if a reliable tool could be developed down the road, but needs testing.
- [In chat] Expensive & can be dangerous, but aerial surveys important for both whale presence, habitat use, entanglements – reliable and regular use on east coast, a lot in Canada right now (combo of surveys, acoustic monitoring), used in RAMP. Can combine with PAM (fixed and gliders) to help inform where whales are and help build up those predictive models to know where to look for whales. Those models likely be incredibly useful in future and know where to look for whales and where to monitor for entanglements as well as avoid what happened on east coast with massive habitat shift of right whales, abandoned known areas, still don't know where they are going; similar to what happened here with blob and shift in habitat use. If you don't look for whales, you can't find them, and don't know what you're missing. Use of UAVs, building on work in AK for remote monitoring, acoustic gliders/PAM system to triangulate locations; 100% real-time monitoring of fleet via solar loggers or other means to know when and where fishing effort is occurring and ID that co-occurrence. GPS buoys could be used to detect entanglements if something is developed that can reflect how a buoy attached to a whale might move – but because we know so little about what happens in an entanglement event and how whales move, hard to put together.
- Some kind of incentive for fishers to report entanglements could be important given the amount of effort already on the water. Otherwise, there might be disincentives to report in some cases, if entanglements report poorly on the fishery.
- We need to be cognizant of the cost to the fishers. It will have to be affordable or subsidized to keep the fishery going.

Wrap up

ODFW plans to take the ideas from today and continue to work on them internally and with counterparts from NMFS, Washington, and California. Feel free to send additional ideas to Caren or Amanda. In part, this will help to build an encyclopedia of monitoring ideas with the pros/cons and barriers captured for each so that there is an ongoing record. ODFW will be moving towards finalization and submission of the draft CP to NMFS in the spring. There will be an information briefing and opportunity for public comment with the Oregon Fish and Wildlife Commission, likely in April.

ODFW is also building a description of explicit advisory roles into the CP. Members of OWEWG are a key component and ODFW will be circling back with this group to talk about longer term roles.

OWEWG Pre-Meeting Draft of the Half-baked Monitoring Cookbook

Distributed to OWEWG members prior to the meeting

Context: The intent of this list is to capture all ideas for monitoring entanglements, or entanglement risk. Oregon's process will be to evaluate each idea for feasibility in the short-term (logistics, funding, readiness of science/approach) and hold all ideas on a long-term reference or resource list, so our evaluation (thumbs up, thumbs down) is captured for posterity. Certain ideas on this list may be more or less relevant for consideration in Oregon. This is the same approach we are using for our management measures, for which we have a list of management measures that may have "long-term potential".

- Monitoring for entanglements
    - Collaboration with other states, agencies, organizations, or industries to include entanglement monitoring on existing surveys, platforms or projects – requires development of a set plan or program for survey work, necessary training, and commitment of either funding/time/resources to make it successful
    - Organized volunteer program (shore-based, boat-based, and/or crab fleet-based) with set protocol that is repeatable, organized, etc. – requires ability to ensure that the monitoring is happening as designed
    - GPS gear tracking (e.g., Blue Ocean Gear buoy) for crab pot movement that resembles whale track lines – would benefit from capability to locate/evaluate and verify if an entanglement has occurred
    - Dedicated/targeted agency/scientific survey effort to monitor for entanglements – aerial, boat-based, shore-based (for nearshore habitats), piloted or autonomous (i.e., drones)
    - Fishery observer program
    - Scar rate studies relying on dedicated survey efforts and/or collaboration with whale watch vessels/community scientists providing high-quality images (e.g., modeled after work on East Coast and current CA project by Cascadia/SR3/TMMC)
    - Sharing trap loss information between states to detect potential correlation between trap loss and entanglements
    - Limited-scale monitoring for estimating proportion of undocumented entanglements (e.g., complete coverage of an area for a limited amount of time) – the result could be used to extrapolate after several repetitions
- Monitoring for co-occurrence
    - Monitoring surrogates or proxies
        - Whale distribution predictive modeling based on real-time ecosystem indicators and fishery activity (e.g., building off Oregon whale distribution aerial surveys assuming it leads to successful modeling)
        - Fishing dynamics (line-days) through logbooks, improved electronic monitoring, or some combination
        - Crab distribution as predictors for fishing effort

        - Surface chlorophyll as predictors for feeding areas/krill hotspots
    - Acoustic monitoring stations (buoys, gliders, shore-based receivers) – potential for west-coast wide network; leverage Ocean Observing System (OOS) assets/funding?
- Monitoring approach that combines monitoring for entanglements and co-occurrence

Some key considerations:

- Logistical barriers? Weather/environmental barriers?
- Funding/workload barriers?
- Opportunities for collaboration between states, scientists, other organizations/agencies/industries (e.g., offshore energy)?
- Collective buy-in of stakeholders?
- Estimation methods vs. absolute counts?