California Whale Entanglement Discussion
Dungeness Crab Fishing Gear Working Group
Summary of Key Themes, May 16-17, 2017

The California Dungeness Crab Fishing Gear Working Group held an in-person meeting on May 16-17, 2017 to continue building on priorities and recommendations established in 2015 and 2016. Goals for this meeting included:

- Reaffirm Working Group composition and full commitment to shared, and agreed to, goals and priorities.
- Review and consider initial outcomes and draft products of Working Group 2016-2017 pilot projects and related next steps as agreed to in September 2016.
- Informed by 2015-2017 Working Group activities, continue exploring potential solutions and strategies, including possible management considerations and options.
- Identify goals and desired outcomes for July 2017 Working Group meeting and outline a short-term work plan (May-July) for carrying out existing projects and initiatives to further group priorities.

The following summary captures key themes discussed by the Working Group and its advisors during the May 16-17, 2017 meeting; it is not to be considered a transcript. Working Group next steps are captured throughout the document (**blue**), and also summarized at the end as part of the "Next Steps" section of the summary. The summary is available to the California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), the Ocean Protection Council (OPC), and the California Dungeness Crab Task Force (DCTF) on the topic of whale entanglements. This summary will also be shared with the Fish and Game Commission and California State Legislature, along with fishing associations and leadership throughout California.

Key themes summaries are developed following all Working Group meetings, and are designed to provide Working Group participants with information to share and discuss with their peers, as well as inform ongoing discussions within the Working Group itself. Additionally, these summaries will act as a source of information for those interested in this topic. Previous meeting summaries, memos, and other information about the Working Group is available at http://www.opc.ca.gov/whale-entanglement-working-group/.

Reaffirm Working Group Composition and Commitment

At the start of the meeting, Working Group participants expressed a commitment to continue to work together on this pertinent issue. Many expressed the need for a clear pathway to addressing the issue of whale entanglements for the upcoming 2017-2018 fishing season.

At the completion of the meeting, Working Group participants reaffirmed their commitment to the group's shared, and agreed to, goals and priorities, and reconfirmed their readiness to be active in carrying out all next steps identified during the meeting.

Updates on 2016-2017 Pilot Projects

In September 2016, the Working Group identified a number of recommendations and next steps, including identifying pilot projects to be tested during the 2016-17 fishing season and voluntary actions to be taken by the California Dungeness crab fishing industry.

Gear Modification Projects

Pacific States Marine Fisheries Commission (PSMFC) Gear Innovations Workshop

- Various Working Group participants and advisors participated in the PSMFC Gear Innovations Workshop held in March 2017 (http://www.psmfc.org/crab/). The workshop brought together fishermen, gear developers, marine mammal experts, agencies, and nongovernmental organizations (NGOs) from California, Oregon, and Washington to begin discussing this issue at a tri-state level and explore ideas and options for addressing whale entanglements in Dungeness crab fishing gear.
    - Working Group participants who attended the workshop stated it was a valuable experience and brought together a wide range of interests to constructively discuss how to address whale entanglements on the West Coast.
    - Some Working Group participants expressed concern about the possibility of a Take Reduction Team (TRT) in the California Dungeness crab fishery, which was a topic of discussion during the workshop. Working Group advisors shared some of the pros and cons of the TRT, including the short timeline (avg. 6 months) that TRTs are given to develop regulatory options. Working Group participants agreed that California fishermen should be proactive and work with the state and federal entities to address whale entanglements and avoid a TRT.
    - No concrete or specific gear modification ideas or next steps emerged from the workshop. PSMFC has additional funding available to support additional gear modification work, and recommendations for specific projects/needs could be informed by the Working Group priorities and recommendations.

Line Profile Project

- Peter Nelson, H.T. Harvey & Associates, presented the preliminary findings from a Bycatch Reduction Engineering Program (BREP) funded project that he is leading. The project is investigating line profile behavior, line strength, and gear configurations used by the California Dungeness crab fleet. The study utilizes sensors at key points on a crab trap line to look at how the gear behaves under different conditions and at different depths.
    - Currently, line profile data has been worked up and analyzed from one Working Group participant, and two other Working Group participants have loggers on their lines and are actively collecting data.
    - There have been challenges with getting the project off the ground due to difficulties with the short timeframe between pre-programming the sensors and getting the loggers to fishermen,

coupled with weather constraints. Additionally, Pete is looking for additional fishermen to participate in the project so he can evaluate the line profile of a variety of line types.

- Participants provided suggestions on project methods and how to better communicate about and interpret the data to support the Working Group's efforts:
    - Suggest overlaying the line profile data with oceanographic conditions data (e.g., NOAA tides and currents data). This would help to make stronger connections between changes and variations in the profiles of the line relative to tides, wind speeds, water temperature, etc.
    - Recommend utilizing different line types (e.g. floating versus sinking line) and gear configurations (e.g. more slack) in the study. The Working Group expressed interest in learning if there is a difference in how different line types behave underwater.
    - Part of the project will involve surveying the fleet on fishermen's gear configurations, learn more about the breakdown of gear type used across the fishery, etc.
        - The Working Group suggested that in-person discussions with fishermen at the dock will be more successful than a mailed-paper survey. Targeting fishing associations would be a good strategy to connect with multiple fishermen at one time. Additionally, the group suggested interviewing gear suppliers to understand what type of line was most popular as additional information to factor into survey results.
        - CDFW also offered to circulate a survey to the fleet via their communications channels, as helpful and appropriate.
    - In addition to understanding the strength/tension of fishing line in various configurations in the water column, the group would also like to have the load strength of line at the block be evaluated and tested.
- **Strategic Earth will convey the Working Group's suggestions on the project design and communications to Pete following the meeting. Strategic Earth will also help support an open line of communication between Pete and the Working Group.**
    - **Dan Lawson will check in with Pete on the gear modification project overall, and to discuss the suggestion of testing line load strength.**
    - **Strategic Earth will work with Pete to determine how/if the gear configuration survey results can help evaluate the implementation of the best practices (see below).**
- The group discussed the opportunities and challenges with seeking solutions to reduce whale entanglements through making gear modifications. Once the study is complete, it may still be difficult to recommend the 'optimal' gear set-up.
    - Scientists know that whales tend to rub their bodies on objects in the water including kelp, kelp patties, and vertical lines. There is still insufficient understanding, however, of how whales become entangled in these objects.
    - Recent observations by NOAA whale experts, members of the disentanglement network, and Working Group participants indicate a potential correlation between excessive slack and loops in lines, the extent of the surface line, and the number of trailer buoys and increases in whale entanglements.
        - The extent of this trend and its effects on entanglement risk is difficult to quantify and assess. For this reason, the Working Group will continue to focus their discussions and recommendations on surface line until there is a better understanding of how different gear configurations affect subsurface line profiles and working loads.

- A Working Group participant shared that Santa Monica Seafood has expressed interest in supporting the Working Group's efforts, and may be interested in contributing funding for gear modification projects.
    - **Strategic Earth will investigate potential funding opportunities through Santa Monica Seafood for gear modification projects.**

Evaluation of Implementation of the 2016-17 Best Practices

Following the September 2016 Working Group Meeting, a 2016-17 Best Practices Guide was developed and broadly circulated to the fleet and public to encourage (voluntary) more conservative surface gear configurations designed to reduce the risk of whale entanglements. Working Group participants agreed an evaluation of the guide's recommendations is important to understanding whether the best practices were implemented and if this change helped to reduce the risk of whale entanglements in Dungeness crab gear. The group discussed steps to take to evaluate the implementation of the best practices:

- During a recent ACCESS cruise trip (see more details below), a Working Group participant considered how/if a vessel-based survey could effectively evaluate surface gear configurations (e.g., number of trailer buoys, length of line between buoys, depth of fishing activity, etc.). Based on this initial assessment, the Working Group agreed that a low-cost evaluation of best practices compliance could be conducted during ACCESS cruises.
    - ACCESS cruise data collection could evaluate surface gear configurations of strings of gear using techniques that ensure crab traps were not handled or interfered with. It is unlikely that every string in an area would be evaluated, but the project could be designed to ensure a sufficient sample size is included in the evaluation.
    - Currently, there is no additional funding available as part of the OPC grant funding to conduct this project. Point Blue and The Nature Conservancy (TNC) will continue discussing funding needs for this project, with the goal to have this project piggyback on other research being conducted to help reduce costs. Additionally, CDFW expressed interest to explore how LED and/or Marine Region research vessels could help support this effort.
    - **Geoff Shester to work with Karin Forney to develop experimental design for evaluating best practices implementation, and share project outline with CDFW/LED to consider how they can help support project efforts.**
    - **TNC and Point Blue to discuss potential, small-scale funding to offset project costs (see Vessel Survey details below).**
- The Working Group discussed additional methods to determine how effectively the best practices are being implemented throughout the fleet. Information gathered via the gear configuration survey that Pete Nelson is developing could be considered, as well as NMFS forensic review of entangled whales during the 2016-17 fishing season.
    - **Strategic Earth to work with Pete Nelson to determine how/if the gear configuration survey results can help evaluate the implementation of the best practices.**
    - **NMFS to consider supporting a forensic review discussion during the July 2017 meeting, with specific focus on the best practices implementation.**

Enhanced Reporting

Vessel Surveys: Fishing Effort and Whale Distribution Data

Karen Grimmer, Monterey Bay National Marine Sanctuary, and Ryan Berger, Point Blue, presented initial data and maps from the cruises conducted during the second week of May 2017 (presentation available here). The surveys counted observations (visual count) of whales and Dungeness crab traps between Monterey Bay and

Ano Nuevo. Krill densities were also measured using acoustics and CTD (connectivity, temperature, density) casts to look at various ocean parameters.

The Working Group discussed the information presented and ways to continue improving and refining vessel surveys that may be conducted during the 2017-18 fishing season.

- There was an acknowledgement that the surveys were conducted late in the Dungeness crab fishing season, and that there would be value in expanding the survey design to include months in the fall, winter, and earlier in the spring.
    - Currently, survey funding is limited and is anticipated to be allocated to both vessel and aerial surveys during the upcoming fishing season. Also, additional funding would be required to extend the survey into other times of year (i.e., fall, winter).
        - **TNC will engage in discussions with Point Blue to consider potential investment in ACCESS cruise(s) for the 2017-2018 fishing season for evaluating the best practices implementation and continuing to conduct vessel surveys focused on trap and whale distribution.**

Aerial Surveys: Fishing Effort and Whale Distribution Data

Severe weather constraints during the 2016-17 fishing season prevented aerial surveys from being conducted.

- Reflecting on lessons learned from the past season, Karin Forney suggested if weather is a factor during the 2017-18 season aerial surveys could be conducted in smaller geographic areas with more frequent trips (rather than fewer flyovers of the entire study region).
- **Efforts will be made to conduct aerial surveys at the start of the 2017-18 fishing season. Karin and TNC will coordinate to confirm contracts are set and ready with Aspen Helicopters.**

Electronic Reporting: Fishing Dynamics

A pilot project was launched in April 2017 to evaluate four data loggers (onboard GPS system, solar logger, modified logbook, and eCatch) specific to each tool's ability to gather geospatial information (e.g., timestamp, where/when traps are deployed or moved) along with other considerations such as costs, ease of use, timeliness of data collection, and scalability (presentation available here).

The Working Group continued to discuss how fishing effort information will be used by managers and other agencies in the short- and longer-term.

- A Working Group participant inquired why there is a need to know specifics about the gear, including who the owner of the gear is. CDFW shared that this information can help with better lines of communication with the fleet for any voluntary or regulatory actions the Working Group may recommend.
- Some Working Group participants expressed concerns that gathering this kind of data could be used by managers to increase regulations and constraints on the fishery, which may reduce profitability and access as experienced in other fisheries.

The Working Group discussed the pilot's key findings.

- The goal of the pilot was to have 5-10 participants involved; four fishermen agreed to participate. Low participation was primarily due to the project starting so late in the season, with most fishermen having already removed their gear from the water. There was, however, some feedback from fishermen solicited to participate who expressed concern with the project, specifically their ability to operate a tool when fishing and caution with sharing their fishing effort information with CDFW or other groups. Concerns were also reiterated about how the data could be used by managers and non-fishermen to put constraints on fishing.

- Generally, there wasn't Working Group support for continuing to explore the GPS tool and modified logbook.
    - The lack of consistency across GPS tools used by fishermen in terms of the information collected and how information could be downloaded from the tool made it challenging to evaluate the tool's effectiveness.
    - The paper logbook was cumbersome to use in real-time and was primarily filled out at the completion of a fishing trip. There was some interest in using specific logbook fields (e.g., timestamp) in conjunction with other more automated tools (e.g., solar logger).
- There were a few questions asked by Working Group participants specific to the ranking of the evaluation criteria. **Strategic Earth will review the evaluation criteria table and update it accordingly.**

The Working Group expressed broad support for moving the Electronic Reporting Project into a second phase to focus on further investigating the use of solar loggers and eCatch.

- Many fishermen felt the solar logger was the easiest tool to use since it collects data passively (i.e., not manual buttons to push). This will be of particular interest to fishermen who may not be technologically savvy to operate a smartphone-type tool.
    - There were questions raised about the solar logger's ability to capture information that accurately depicts fishing activity (e.g., fishing effort versus transiting). One participant suggested that logbook data could be used to complement the tool and help distinguish movement of fishing vessels to better understand behavior. The group discussed the possible need for solar loggers to undergo "machine learning" over time which will help ensure more accurate interpretation of the data collected (e.g., start and end of a string).
    - A fisherman introduced a solar logger platform he is using for a direct marketing project outside the Working Group that is operated by Pelagic Data Systems. He suggested that this organization could be another partner for the Working Group to consider during Phase 2.
- eCatch has been upgraded from its original use in the groundfish fishery to better reflect the needs of the Dungeness crab fishery. Various Working Group participants use the tool in the groundfish fishery and welcome the opportunity to use it while fishing for Dungeness crab.
    - The Working Group discussed the value of having eCatch data be available to help cross-reference data collected by the solar logger instead of a logbook. This additional dataset from eCatch could help improve the accuracy of the solar logger tool.
- There was support to extend the pilot into the 2017-2018 fishing season and scale the project to have 10-20 boats test both tools. In addition to continuing to evaluate the usability of the tool, this next phase of the project will also evaluate the usefulness of the data that the tools collect (e.g., resolution, frequency of data collection, etc.).
    - There may be value in coordinating the testing of the solar logger and eCatch with the same group of fishermen to help with efficiency.
    - The group acknowledged that it will be important to include recreational fishing in the next phase of testing, particularly if there were adjustments needed to be made to reflect recreational fishing patterns (e.g., CPFV trip may target Dungeness crab along with other fisheries).

The Working Group discussed the importance of Phase 2 to identify data use and confidentiality parameters. Concerns were expressed about how data would be shared beyond those fishermen who are involved in collecting the data.

- Data collected via eCatch is the private property of the data users (i.e., fishermen). Data is aggregated and displayed in the form of a heat map with no distinguishing information that could represent an

individual fisherman's activities. The tool is an app that can be downloaded to a smartphone or tablet for free. There are no fees for maintenance or upgrades.

- Confidentiality and data use parameters for the solar logger are largely unknown and will likely require additional discussion with Pacific States Marine Fisheries Commission (PSMFC), the organization that supplied the solar loggers for the pilot.
- Additional discussions within the Electronic Reporting Project Team will be required to begin outlining a proposed way forward for addressing data use/access and confidentiality, including the importance of identifying a secure database for housing the data collected.

The group discussed the resolution that was needed for data collection to achieve the Working Group's goals.

- There continued to be questions about whether managers need data specific to individual traps or more general trap location information (i.e., strings of traps). Participants generally agreed that capturing information that would illustrate individual strings, with an approximation of the number of traps in the strings, would be valuable to understand the density and geographic range of fishing at a particular time.
    - This finer scale data would help refine possible management actions (voluntary or regulatory) with the goal to reduce potential impacts to the fleet. For example, fishermen could be asked to move or reduce gear within a specific depth contour, rather than being asked to move/reduce gear in a larger geographic area.
    - The group also discussed the frequency in which data should be collected. The group also discussed the need for accurate, real-time data (e.g., daily, weekly) versus data that may be uploaded and/or evaluated less frequently (e.g., monthly, at the close of the season). It was agreed that additional discussion and evaluation of these criteria will be required.
- Some participants expressed an interest in gaining a better understanding of how many fishermen would need to participate in an electronic reporting effort (long-term) to gather sufficient information about fishing dynamics to help inform management decisions.

The fisherman in the Working Group brainstormed how to encourage their peers to participate in Phase 2 of this project. It will be important to have clear communications developed following the Working Group's May 2017 meeting, including information about the Electronic Reporting Project. Fishermen on the Working Group will act as port liaisons to convey information about and support for the Phase 2.

- **The Electronic Reporting Project Team will take steps to design Phase 2 of this project. Guidance and support will be solicited from Working Group advisors to help with the experimental design (e.g., project scale, data resolution, data use and confidentiality, etc.).**
- **TNC will move forward with testing eCatch in the Dungeness crab fishery.**
- **Additional outreach to solar logger researchers will be made through Working Group participant's existing connections (e.g., PSMFC, Pelagic Data Systems, etc.).**
    - **Christy Juhasz will check in with PSMFC on solar logger data analysis and outputs to compare side-by-side with GPS and other tools to share during July 2017 meeting. Christy will also check in with PSMFC on their strategy to engage fishermen to participate in their solar logger project.**

Forage Species Distribution: Prey and Whale Distribution Data

Jarrod Santora, UC Santa Cruz, shared results from the first phase of the Forage Species Distribution Project. The project looked at the importance of ocean-climate conditions on forage species (krill and anchovies) and top-predator (large whales) distribution patterns in Central California between 2013-2016 (presentation available here).

There was general support and understanding expressed by the Working Group for the primary take-home

messages of the project.

- Ocean-climate conditions drive the abundance and distribution of forage species off Central California. During cooler/stronger upwelling years, krill is in high abundance and distributed in large patches, while during warm/weaker upwelling years, anchovy are more abundant with schools concentrated nearshore.
- From 2013-2016 there was a shift from record upwelling to an unprecedented warm sea surface temperature trend. This led to a change from high krill abundance and patchy distribution throughout the outer shelf-break region in Central California (2013) to a decline in krill and increase in anchovy abundance with high concentrations on the shelf (2015-2016).
    - Humpback whales have been known to switch prey preferences depending on what is more abundant. During low krill years (2015-2016), predators may prey-switch and concentrate on prey resources such as anchovy schools that typically concentrate nearshore.

Fishermen and whale experts on the Working Group shared that what was conveyed through this project aligned with their experience on the water. The Working Group discussed the uptick in whale entanglements from 2014-2016, as well as the delay of the 2016-17 California Dungeness crab fishing season due to unprecedented levels of domoic acid.

The Working Group agreed to the value of carrying out a second phase of the project and recommended allocating an additional $30,000 in funding from the OPC/TNC grant to advance this effort.

- This second phase will focus on using the available prey data to inform existing whale distribution models to help improve the ability to predict whale distribution patterns, ideally, in advance of a fishing season. Additionally, there was general interest expressed by the Working Group for Phase 2 of the project to expand its geographic scope to include the northern and southern extent of the fishery.
    - Over time, the group identified there could be value in overlaying new fishing effort data that is collected via the Electronic Reporting Project to this effort.
- **Jarrod and Karin will work together to carry out Phase 2 of the project, and will continue to work with the Forage/Modeling Project Team to help inform next steps.**
- The Working Group expressed interest in having Jarrod develop a brief description of the project to share with fishermen, decision makers, and other audiences. **Jarrod will work with the Communications Team to develop draft content for the Working Group's review. Additionally, Jarrod will bring forward opportunities to the Working Group to have this project's key findings be considered for peer-reviewed publication per Working Group support.**
- The Working Group expressed interest in creating stronger connections across researchers involved in Working Group-related projects. **Jarrod will help to improve communication and integration amongst researchers involved in Working Group projects (e.g., Point Blue, Integrated Ecosystem Assessment).**

Communications

The Working Group discussed how best to share the details of group projects and efforts to reduce the risks of whale entanglements more broadly. While communications tools have been developed over the past year (e.g., talking points, slide deck, status updates), the group agreed there is value in identifying additional communications tools and channels.

- The group discussed specific audiences it was interested in reaching. Dungeness crab fishermen and Legislators were identified as high priority. Priority messages to share include telling the compelling story of how this diverse group has come together to address this pressing issue, identifying the efforts the Working Group is initiating (projects, trainings, BPG), acknowledging the challenges the group faces, and outlining a call to action (fishing audience) and/or support for the Working Group's efforts (legislative audience). Secondary audiences (other fixed-gear fisheries, whale watch community) would be targeted once a risk assessment framework (see below) was more fully developed.

  - The group brainstormed on communications channels it would focus on using over the coming months to disseminate key messaging. These include a short "glossy" 2-pager for decision makers, a short film directed at fishermen, and other channels (social media, electronic newsletters, blogs, webinars, etc.).
  - Additionally, the Working Group agreed that a presentation to the Pacific Fisheries Management Council would be an important step, and will look towards the April 2018 meeting to give a joint presentation with the salmon fishery.
  - **The Communications Team will develop draft key messaging, update the Communications Strategy, and move forward communications ideas for full Working Group review.**

- The group discussed the challenges with responding to requests for letters of support received by researchers involved in projects that may help inform the Working Group's efforts directly/indirectly.
  - There was general agreement a standard letter of support will be developed with full Working Group review and approval that can be made available to support grant proposals for projects that align with Working Group priorities.
  - Additionally, there is a need for a statement to be developed that outlines the type of research questions and priorities the Working Group is focused on, which can help inform researchers interested in working with the Working Group directly.
  - **Strategic Earth will draft a general letter of support and research priority statement for the Working Group's review.**
- Fishermen shared a number of "letters of support" they have received from fishing associations and industry leaders for the Working Group's efforts and the 2016-17 Best Practices Guide. **Strategic Earth will work with OPC to post the letters of support on the Working Group webpage.**

2017 Entanglement Update

NMFS gave an update that there have been 14 entanglements in 2017—11 gray whales and 3 humpback whales—to date. NMFS will continue to provide regular updates on entanglements to the Working Group.

2016 Entanglement Data

NMFS presented a summary report of whale entanglement events from 2016. 2016 was the largest entanglement year on record with 71 whales entangled off the west coast including California, Oregon, Washington, Baja California, and British Columbia. Of the 71 entanglements, 22 of the events involved Dungeness crab fishing gear and 54 of the entanglements involved Humpback whales.

- The Working Group expressed support for reducing the number of "unknown" gear-type entanglements by recommending better gear markings in all fisheries. The group agreed that all fixed-gear (recreational and commercial) should have some form of identification to clarify the specific fishery and the owner of the gear to lead to a better understanding of how entanglement may have occurred.
  - The group brainstormed on the type of information that would be helpful to recommend, including a buoy tag and in-trap tag. Ideally, these tags would be printed on either side of the tag and would include permitholder information. Longer term, the group thought additional gear markings could be important to explore (e.g., a specific line color/type for a given fishery).
  - **Strategic Earth will draft recommendation language in support of establishing gear marking across all fisheries for the Working Group's review during the July 2017 meeting.**
  - Since the California spiny lobster fishery will now have trap tags, participants hoped the lobster trap tags would be a different shape and size than the Dungeness crab tags to improve identification of gear associated with entanglements.

    - **Strategic Earth will follow up with the CDFW License and Revenue Branch to learn how spiny lobster tags will look different from Dungeness crab trap tags to help improve identification of gear in whale entanglements.**
    - The group discussed the importance of encouraging fishermen whose gear has been involved in an entanglement to speak with NMFS.
        - **Strategic Earth will work with NMFS and CDFW to explore options for encouraging fishermen to respond to NMFS when they are contacted about an entangled whale.**

- In September 2016, the Working Group recommended that commercial Dungeness crab trap tags be double-sided to improve the ability to identify the gear. The group was reminded that the California Dungeness Crab Task Force (DCTF) approved allocating Dungeness Crab Account funds to print double-sided tags for the 2017-18 fishing season.
    - DCTF Members would like to see an evaluation developed by the Working Group following the 2017-18 fishing season to determine if the printing of tags on both sides has helped to improve reporting and/or reduced the risk of whale entanglements.
    - **NMFS to consider how double sided tags may have improved entanglement identification during recent seasons for discussion during the forensic review at the July 2017 meeting.**
    - **Lauren Saez to work with CDFW to review/update master list of gear markings across fixed-gear fisheries.**
    - **Strategic Earth to work with Karin to share report on entanglement outcomes with Working Group.**

Explore Potential Solutions and Strategies, Including Possible Management Considerations and Options

Identifying and Addressing Entanglement Risk
The Working Group discussed a pilot to test voluntary management measures during the 2017-18 Dungeness crab season. This effort will consider available, relevant information and work to identify tools and strategies that are likely to reduce the probability of entanglement.

WHAT Framework

The group discussed piloting a Whale Hazard Avoidance Team (WHAT) to work with state and federal agencies in anticipation of and/or response to whale entanglement events during the 2017-2018 fishing season. The WHAT process design and role was outlined as follows:

- A “hot shot” team (i.e., similar to teams established to be anticipate/respond to forest fires) will be formed to review “factors” or circumstances under which entanglements could occur. This team would be responsible for recommending voluntary measures to reduce entanglement risk. The team will consist of individuals with local expertise from the Northern and the Southern Management Areas (actual composition of team TBD).
- Prior to and during the season, data will be collected and recorded into a risk assessment framework that will provide a quantitative assessment of the potential risk of whale entanglements (i.e., a score of high, medium, or low). Surveys (aerial or vessel) may be utilized to help with data collection, including to evaluate the implementation of voluntary actions.
- If the risk of entanglements in Dungeness crab gear increases to a “moderate or high” level as measured by the risk assessment framework, the hot shot team will further evaluate the data to understand which variables are contributing to the increasing the risk of whale entanglements and which management

measures may be most effective in addressing those variables.

- Possible recommendations for voluntary actions during the 2017-18 season include, but are not limited to:
    - Ensure gear conforms to Best Fishing Practices Guides (i.e. minimize surface slack and tighten up gear especially in high risk area(s))
    - Gear modifications
    - Remove any non-productive or marginally productive gear in high risk area(s)
    - Reduce active gear in problem area(s)
    - Move all gear out of problem area(s)
- Other tools may also be explored at upcoming Working Group meetings, but participants generally agreed that the risk assessment framework should not overly prescribe suite of management options associated with each level of risk.
- CDFW will create a communication channel or "hot line" to share information with the CA Dungeness crab fleet regarding the voluntary action(s) recommended by the hot shot team.

As a first step, the risk assessment framework would consider readily available information (i.e., information the Working Group has been organizing and informing over the past two years).

- Based on available data, the risk of entanglements may be identified as high (red), medium (yellow), or low (green) through scoring a number of variables (e.g. prey abundance, season opener, density of gear, number of confirmed entanglements, etc.) and creating a clearinghouse of current, relevant information, and assigning numerical values to those variables. The Working Group, including state and federal managers and science advisors, will be involved in identifying and defining the variables; the hot shot team would be involved in on-going scoring.
- Increases in certain variables may point to specific voluntary measures that may be effective in addressing the risk of entanglements. For example, a normal fishing season and krill year would likely be green (low risk), while a year with anchovies and/or a late opener due to domoic acid will likely be yellow (medium risk) or red (high risk).

The group discussed a number of mechanisms that could be considered and utilized to inform the risk assessment framework:

- CDFW can create an online reporting portal for fishermen, researchers, and public to report real-time whale activity. Alternatively, Whale Alert and HappyWhale can be explored as potential tools that could be used for this purpose. The Santora-Forney whale prediction models (Phase 2 of the forage species distribution project) can also be incorporated into the tool to understand potential whale activity.
    - **CDFW will discuss Happy Whale, Whale Alert, and cetsound.gov with Kathi Koontz and Ryan Berger to understand real-time whale reporting options.**
- The data collected through the Working Group's e-reporting pilot project (i.e. solar loggers and/or e-catch) (see section above) could be managed by CDFW and imported into the tool to understand the density of Dungeness crab gear being fished within a geographic area.
    - Managers recognize the need to protect valuable fishing grounds while also understanding and addressing the overlap of whales and high densities of fishing.

The Working Group agreed that the risk framework showed promise in helping to address the risk of whale entanglements. Understanding that the late opener of the 2015-2016 fishing season contributed to the increase in 2016 entanglement events, the Working Group expressed support for testing the tool in extreme years to understand its utility.

- **To assess the ability of the framework to quantify risk, that NMFS, CDFW, and the science advisor will run the framework with multiple scenarios from the last 5 years and share with the Working Group during the July meeting.**
- **Strategic Earth will set up an in-person conversation in mid-June to walk through the framework's table of criteria to inform the evaluation system and develop some initial decision trees.**
- **Working Group participants were encouraged to continue thinking about (and discuss with their peers) situations/factors, indicators, and potential actions that can be added to the framework, including possible management considerations.**

Planning for the July 2017 Meeting

The next Working Group meeting will be July 18-19, 2017 in Santa Rosa, California. An initial list of priority agenda items was developed by the Working Group to include:

- Risk Assessment (WHAT) Framework
  - Review and discuss initial data gathering and testing of the risk assessment tool
  - Conduct forensic review of 2016-17 season whale entanglements
- Updates on projects
  - Gear modification
  - Enhanced reporting
  - Communications
- Focused discussion on engaging with the recreational fishery and incorporating the fishery into the Working Groups efforts including pilot projects and the risk assessment framework
- Presentations from advisors and researchers, such as:
  - John Calambokidis, Cascadia Research (http://www.cascadiaresearch.org/)
  - NOAA Integrated Ecosystem Assessment team (https://www.integratedecosystemassessment.noaa.gov)

Working Group participants will continue to consider goals for the July 2017 meeting.

Additional Next Steps

In addition to any next steps identified above:

- **Working Group participants will mark the upcoming in-person meeting dates on their calendars: July 18-19 and September 27-28.**
- **Strategic Earth will continue to maintain open lines of communication with agency staff in Oregon and Washington who are helping to coordinate efforts to convene similar working groups to address the issue of whale entanglements in Dungeness crab fishing gear. Efforts will be made to have a California Working Group participant attend any upcoming OR or WA Working Group meetings.**
- **Strategic Earth will keep Working Group participants, observers, and advisors informed on all of the efforts of project teams and the collective group.**
- **A summary of key themes will be developed and circulated to the Working Group for review, prior to making it publicly available on the OPC website.**

Meeting Participants

Working Group Participants
Jim Anderson, *Commercial Fishing, DCTF Member*
Tom Dempsey, *The Nature Conservancy*
Calder Deyerle, *Commercial Fishing*
Tom Estes Jr., *Commercial Fishing*
Gerry Hemmingsen, *Commercial Fishing, DCTF Member*
Christy Juhasz, *CDFW Marine Region*
Kathi Koontz, *California Whale Rescue*
Doug Laughlin, *Coastside Fishing Club*
Dan Lawson, *NMFS*
Bob Maharry, *Commercial Fishing*
Tom Mattusch *CPFV Owner/Operator*
John Mellor, *Commercial Fishing*
Brian Nolte, *Commercial Fishing*
Dick Ogg, *Commercial Fishing*
Kevin Pinto, *Commercial Fishing*
Andy Roberts, *CDFW Enforcement*
Lauren Saez, *NMFS*
Geoff Shester, *Oceana*
Andrea Treece, *EarthJustice*

Observers
Ryan Berger, *Point Blue*
Aliya Rubenstein, *TNC*

Advisors
John Calambokidis, Cascadia Research
Pieter Folkens, California Whale Rescue
Karin Forney, *Southwest Fisheries Science Center*
Karen Grimmer, *Monterey Bay National Marine Sanctuary*

Agency Staff
Paige Berube, *Ocean Protection Council*
Peter Kalvass, *CDFW Marine Region*
Sonke Mastrup, *CDFW Marine Region*
Holly Wyer, *Ocean Protection Council*

Other
Amanda Gladics, Oregon Sea Grant, Oregon State University
Peter Nelson, H.T. Harvey and Associates
Jarrod Santora, UC Santa Cruz

Facilitation Team
Rachelle Fisher, *Strategic Earth Consulting*
Sierra Helmann, *Strategic Earth Consulting*
Kelly Sayce, *Strategic Earth Consulting*