NOAA FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Fisheries and Oceans Canada | Pêches et Océans Canada

July 28, 2011

A Bilateral Scientific Workshop Process to Evaluate Effects of Salmon Fisheries on Southern Resident Killer Whales

Background and context: Southern Resident killer whales (*Orcinus orca*) are listed as an endangered species under both the U.S. Endangered Species Act (ESA) and Canada's Species at Risk Act (SARA). The National Marine Fisheries Service (NOAA Fisheries) and Fisheries and Oceans Canada (DFO) have developed and adopted recovery plans as required by their respective statutes. These recovery plans present the biological status of the population, describe threats and factors believed to be limiting recovery, establish interim recovery objectives and identify critical uncertainties. They prescribe actions to address the threats and limiting factors and call for research to address critical uncertainties and data gaps.

Both recovery plans identify several threats to killer whale recovery – environmental contaminants, insufficient prey, physical disturbance by vessels, noise pollution, oil spills, diseases, climate change, small population size, cumulative effects – but due to insufficient information generally do not characterize the absolute or relative importance of these threats. NOAA Fisheries and DFO have undertaken research to better understand these threats. They also have initiated and/or continue to support or conduct a wide range of actions to address the identified threats. For example, the agencies support efforts to restore and protect salmon habitat to improve salmon abundance. They have promulgated regulations designed to limit physical disturbance of whales by vessels, and to limit noise pollution in areas frequented by the whales. They have reviewed proposed actions within their respective jurisdictions for potential negative effects on killer whales and have used their authorities to prescribe measures to mitigate such effects. This workshop process described herein is not intended or designed to undertake an extensive review of all of the threats or the comprehensive recovery programs.

In addition to the development of recovery plans, the listing of a species under the ESA or SARA requires the applicable U.S. or Canadian federal agency to consider the potential effects of various management actions on that listed species. In the case of the ESA, the purpose of this evaluation – set forth in a "biological opinion" – is to determine whether the implementation of the proposed action will jeopardize any listed species or result in the adverse modification or destruction of designated critical habitat. With respect to fisheries and killer whales, the evaluation focuses on the effects of fisheries by reducing the abundance of salmon prey – particularly Chinook salmon – available to the whales in relation to their metabolic requirements.

Pursuant to this ESA requirement, NOAA Fisheries in 2008 conducted an evaluation of new eight-year fishing regimes recommended by the Pacific Salmon Commission for U.S. and Canadian fisheries covered by the Pacific Salmon Treaty. This analysis focused on the estimated reduction in Chinook salmon available to the whales from the proposed fisheries in relation to the whales' estimated prey requirements. Using the best information then available, NOAA Fisheries concluded that the proposed regimes would not jeopardize the killer whales or adversely modify their critical habitat, but also noted that new scientific information would continue to emerge that would help inform future consultations.

In 2010, the Washington Department of Fish and Wildlife and the Puget Sound treaty Indian tribes submitted a proposed new fishing plan that would govern their Chinook salmon fisheries in Puget Sound for the next several years. NOAA Fisheries again evaluated the effects of fishing on the abundance of prey available to the killer whales using a similar approach to the 2008 analysis, but incorporating new scientific information available since 2008. This newer analysis suggests that the amount of Chinook available to the whales in comparison to their metabolic requirements may be less than what was estimated in 2008. This change results from several factors, including but not limited to revised estimates of the metabolic requirements of the whales, their selective

preference for larger Chinook salmon and inclusion of a broader range of years to represent expected variations in the annual abundance of Chinook salmon. In addition, NOAA Fisheries developed new analyses regarding the relationship between Chinook salmon abundance and Southern Resident killer whale population growth.

NOAA Fisheries and DFO are mindful of the potential significance of this new information to fisheries and other activities that affect the abundance of Chinook salmon available to the killer whales. For this reason, NOAA Fisheries and DFO want to ensure that their scientific data and analyses are carefully reviewed in an open and scientifically rigorous process. The bilateral workshop process described herein was conceived and designed with these purposes in mind. It will provide a structured and focused scientific forum wherein NOAA and DFO scientists and other invited experts can interact with an independent Science Panel to review the best available scientific information on the effects that salmon fisheries may have on Southern Resident Killer Whales by reducing their prey. The panel and workshop participants will review the ecology of the whales and their feeding preferences and energy requirements. They will examine the extent to which various salmon fisheries may reduce prey available to the whales, and the potential consequences to their survival and recovery. This focus on the effect of fisheries does not suggest that fisheries are believed to be the primary cause of the whale population's depleted status or that fisheries are the only actions affecting salmon abundance. Rather, it is intended to shed light on the extent to which prey scarcity may be limiting recovery of the whales and the role that salmon fisheries may have in contributing to that scarcity.

By addressing one of the identified threats to killer whale recovery, this process will contribute to the broader recovery programs for Southern Resident killer whales. A rigorous scientific investigation of the effects of fishing on the whales when placed in the broader context of all the factors affecting the whales will better inform future fishery management decisions by NOAA and DFO. Note that this workshop process and the resulting report of the panel are not intended or designed to establish policy or make management recommendations or decisions.

Key question: To what extent are salmon fisheries affecting recovery of Southern Resident killer whales by reducing the abundance of their available prey, and what are the consequences to their survival and recovery?

Overall approach: NOAA and DFO will establish an independent Science Panel to oversee the scientific deliberations and to produce a report at the conclusion of the process. Three workshops will be convened, the first on September 21-23, 2011, the second on March 13-15, 2012, and the third on September 18-20, 2012. The specific objectives of each of the workshops are detailed below. To keep the workshops to a manageable size and foster productive scientific discussion, attendance will be limited to the Science Panel, scientists invited to make presentations ("Presenters") and other experts to engage in the scientific discussions and help perform a scientific peer review function ("Participants"). A limited number of observers representing the public and stakeholders also will be invited, but they generally will not participate in the scientific discussions. All participants in the workshop process are expected to maintain a professional demeanor befitting the scientific nature of the workshop process. Participant selection criteria and the specific roles of the attendees are described below.

Independent Science Panel. The seven-member Science Panel will oversee the workshop proceedings, participate in workshop discussions, question Presenters, critique data and methods, and provide expert feedback on the matters under consideration. By engaging in an iterative dialog with workshop participants, the panel will help fulfill an important purpose of the workshop proceedings: to improve scientific understanding of the subject matter. At the conclusion of the process, the panel will produce a report that:

- identifies the extent to which salmon fisheries in specific locations and times, in combination or in the aggregate, or as a function of annual prey abundance, may be affecting the well-being of Southern Resident Killer Whales by reducing their prey;
- describes the nature of those effects (e.g., through a reduction in whale survival, growth rates, fecundity, or some other mechanism);
- discusses the consequences to survival and recovery of the killer whales; and,

- identifies assumptions, critical uncertainties, and data gaps, their associated implications and research and monitoring actions that would help reduce uncertainties.

Science Chair. Dr. Ray Hilborn, a member of the faculty of the University of Washington, has been selected to chair the independent Science Panel. Dr. Hilborn is a senior scientist widely respected for his scientific credentials, extensive contributions to the scientific literature and professional accomplishments. He was chosen for his expertise and his experience chairing scientific panels of a similar nature. Dr. Hilborn will serve under contract with NOAA and/or DFO.

As Chair, Dr. Hilborn will become familiar with recovery plans, biological opinions, and scientific publications relevant to salmon fisheries and Southern Resident Killer Whales prepared by NOAA, DFO and others as necessary to plan, implement, participate in, and direct the workshop process described herein. He will:

- assist in the selection of the other Science Panel members;
- help frame the agendas and scientific issues to be addressed at the workshops;
- help identify and select appropriate Presenters;
- chair the workshop plenary sessions and work with the Science Facilitator to manage the workshops to ensure objectives for each session are achieved;
- work with the other Science Panel members and the Science Facilitator to identify relevant scientific questions, findings, and uncertainties, provide feedback to Presenters and to summarize results of the proceedings;
- convene intercessional meetings and/or phone conferences as may be necessary to further the purposes of the workshop process; and,
- serve as principal author of the draft and final reports of the workshop proceedings.

The Independent Science Panel

Dr. Ray Hilborn (Chair), School of Aquatic and Fishery Science, University of Washington
Dr. Sean Cox, School of Resource & Environmental Management – Simon Fraser University
Dr. Francis Gulland, Marine Mammal Commission; Marine Mammal Center, Sausalito, CA
Dr. David Hankin, Department of Fisheries Biology, Humboldt State University, Arcata, CA
Dr. Tom Hobbs, Natural Resource Ecology Lab., Colorado State University, Fort Collins, CO
Dr. Daniel Schindler, School of Aquatic and Fishery Science, University of Washington
Dr. Andrew Trites, Marine Mammal Research Unit, Univ. of British Columbia, Vancouver, BC

Science Facilitator: David Marmorek, President, ESSA Technologies, Vancouver, BC Canada

Science Panel members (other than the Chair). Six additional scientists will be chosen for their relevant expertise in salmon fisheries, killer whales and predator-prey dynamics and their ability to constructively and objectively collaborate to fulfill the purposes of the workshop process. Funding for their services will be provided by NOAA and DFO. Panel members will not be employees of NOAA, DFO, any of the agencies involved in managing salmon fisheries in western Canada or the western United States, or entities who benefit economically from salmon fisheries or killer whales (e.g., the whale-watching industry). Although the Panel will include both U.S. and Canadian nationals, no predetermined ratios will be prescribed. The salmon experts will be selected for their knowledge of salmon biology and/or the use, limitations, and assumptions of salmon management models, abundance indices, and other relevant specialties; the whale experts will be selected for their knowledge of marine mammal ecology and/or physiology (particularly killer whales); and the predator-prey experts will be selected for their knowledge of predator-prey dynamics, food webs, and related subjects.

The Science Panel members will become familiar with recovery plans, biological opinions, and scientific publications relevant to salmon fisheries and Southern Resident Killer Whales prepared by NOAA, DFO and others as necessary to prepare for and constructively engage in the workshop process to accomplish its intended

purposes. In addition to attending the workshops and participating in the deliberations, Science Panel members will:

- help plan the workshops and identify appropriate preparatory or follow-up steps (e.g., identify additional analysis, pertinent data or methods, appropriate Presenters, etc.);
- critically evaluate the science and data presented at the workshops;
- participate in intercessional meetings and/or phone conferences as may be required to further the purposes of the workshop process;
- formulate findings and help write and review the draft and final reports of the proceedings; and,
- in the event he/she disagrees with findings and conclusions supported by other panel members, write a minority opinion to the report.

Science Facilitator. ESSA Technologies, Ltd., a scientific consulting firm with demonstrated experience in resource management problem-solving processes, has been retained to provide a Science Facilitator (David Marmorek) and other professional staff to provide workshop facilitation services. The Science Facilitator will become familiar with recovery plans, biological opinions, and scientific publications relevant to salmon fisheries and Southern Resident Killer Whales prepared by NOAA, DFO and others as necessary to help plan, implement, and follow through on the workshop process described herein. The Science Facilitator will:

- work with NOAA, DFO and the Science Panel to plan, prepare for and manage the workshops and workshop process;
- assist with logistical matters such as workshop location set-up and distribution of information prepared by Presenters to workshop participants;
- prepare and disseminate materials to facilitate the workshop proceedings (e.g., structured questions, survey forms, etc.);
- maintain detailed records of the proceedings and organize them for inclusion in the final report;
- help organize and participate in intercessional meetings and/or phone conferences as may be required to further the purposes of the workshop process;
- assist the Panel in conducting its analyses and authoring and revising drafts of the report; and,
- assist in the preparation of other documents as may be requested by the Science Panel through the Science Chair.

Presenters. Presenters will include NOAA and DFO scientists who have conducted research relevant to the workshop subject matter and/or conducted relevant analyses in connection with their responsibilities for listed species. Additional Presenters will be experts from outside NOAA and DFO who have been invited to make presentations based on their expertise on matters pertinent to the proceedings. Presenters will attend and participate at their own cost or as supported by their employers or sponsoring entities. In special circumstances, support for travel costs associated with attending the proceedings may be offered to certain Presenters by NOAA and/or DFO if, in the opinion of the Science Chair, they have a particularly important scientific contribution to make to the proceedings and no alternative means of covering such costs is available.

All Presenters will be expected to make their data, analyses and written presentations available at least two weeks in advance of the applicable workshop. NOAA will establish a web site where presentations and other relevant materials, including published literature will be posted and made accessible to participants. At the workshops, Presenters will present summaries of their data, methods, and key findings and participate in the scientific discussions that ensue. In most cases, Presenters will be expected to attend each of the workshops and engage constructively in the workshop deliberations, including serving a role analogous to Participants for presentations made by others.

Participants. A number of additional experts will be invited to attend the workshops and participate in the workshop deliberations. Collectively referred to herein as "Participants," they will be invited based on their subject-matter expertise and their willingness to invest the necessary time to constructively contribute to the workshop proceedings. Some may be experts employed by state, federal, provincial, tribal or First Nations

management entities; others may be from non-government organizations or stakeholders groups. Participants will attend and participate at their own cost or as supported by their employers or sponsoring entities.

Participants may bring different data, analyses, views or conclusions to the process, but are not chosen to play an adversarial role with Presenters or any other workshop attendees. Rather, their role is to help critique the scientific data, methods and conclusions, thereby performing a function analogous to scientific peer review. They are expected to come to the process already familiar with recovery plans, biological opinions, relevant scientific publications and the information distributed in advance of the workshops so that they can contribute effectively and constructively to the scientific deliberations. Individual Participants may be requested by the Science Chair to prepare written analysis or documentation of particular points that they may have brought to the deliberations. Participants also may choose to collaborate in the preparation of specific questions or critiques of presentations at the workshops. It also is anticipated that some Participants will prepare papers and make presentations at the second workshop in response to information presented at the first workshop or in response to feedback from the panel after the first workshop.

Public Input. To keep the workshops to a manageable size and to ensure the discussions are focused and productive, attendance at the workshops will be limited to invited attendees. NOAA will establish a web site where presentations and other relevant materials, including published literature will be posted and made accessible to participants and the public. Between the second and third workshops a draft of the scientific panel report will be available for public review and comment.

Workshop 1: Sept. 21-23, 2011 (at a place TBD in Washington State)

Process. The first workshop will take the most time and advance preparation because, as noted above, participants are expected to come to the process familiarized with recovery plans, biological opinions, and scientific publications relevant to the subject matter and as appropriate to the nature of their participation. Presenters will distribute their study results, data and/or analysis in advance of the workshop.

Purposes. Workshop 1 will serve the four primary purposes outlined below. Note that this outline is not meant to serve as the agenda for the workshop and may not reflect the final ordering of topics; a detailed agenda that identifies specific presentation topics and Presenters will be distributed well in advance of the workshop.

1. Establish and discuss the factual context: what do we know about threats to Southern Resident killer whales, their feeding habits, and the relationship between salmon abundance and killer whale population dynamics?
    a. What threats and limiting factors were identified in the recovery plans, and what actions are being taken relative to these findings?
    b. What are the Killer Whale foraging habits and bio-energetic needs: how much food do they need and how/where do they get it?
    c. Census and population structure of SRKW: how many whales are there, of what sex and maturity?
    d. Migratory habits of SRKW: where are they at various times of the year?
    e. Prey species and size selectivity of SRKW: what do they eat?
    f. Food energy value of prey: how many prey items must they eat?
    g. What can we learn from data about the Northern Residents?
    h. What fisheries potentially affect prey availability to SRKW, and to what extent? (Fishery profiles will be provided in advance of workshop.)
    i. What ecosystem considerations and/or trends might be relevant, especially including carrying capacity questions?
    j. What general knowledge can we bring to the problem based on other predator/prey studies?

2. Present and discuss analyses done to date:
    a. Presentations by NOAA scientists: analyses done for consultations on the 2008 PST Agreement and 2011 Puget Sound Resource Management Plan.
    b. Presentations by DFO scientists.

c. Presentations by states, tribal, First Nations and other scientists on relevant topics as pre-arranged with the Science Chair.

3. Identify and discuss key assumptions and uncertainties and the potentials for reducing them.
   a. Identify additional information and/or alternative methodologies that can be undertaken in the short term (i.e., prior to Workshop 2) to improve confidence in the results and/or otherwise address the questions that were raised.
   b. Identify any other short term or long term research or other ideas that may contribute to reducing uncertainties in the presentations.

4. Identify and assign specific follow-up tasks for completion and presentation at Workshop 2.

Time period between Workshop 1 and Workshop 2.

1. Soon after the first workshop, the Independent Science Panel will meet and deliberate on the presentations and analyses presented at Workshop 1 with a view towards identifying alternative or additional analysis that should occur and/or means by which presented analyses might be improved. This feedback from the panel will be posted on the workshop web site as soon as practicable so as to provide sufficient time for the preparation of refined analyses by Presenters and/or new presentations by Participants for the second workshop.
2. Presenters will refine/modify their analyses based on discussions at Workshop 1 and/or feedback received at or subsequent to Workshop 1.
3. Other scientists may prepare analyses in response to Workshop 1 proceedings for presentation at Workshop 2.
4. Additional information will be compiled for presentation to the workshop process (e.g., biological performance criteria applicable to salmon and marine mammals) and for consideration by the Science Panel.
5. The Science Panel and Facilitator begin to outline the draft report (sans conclusions for matters still under consideration)
6. The Chair and Facilitator prepare and distribute an agenda for Workshop 2.

Workshop 2: Mar. 13-15, 2012 (at a place TBD in British Columbia)

Purposes. The primary purposes of Workshop 2 are as follows:

1. Workshop 1 Presenters will summarize the results of their updated/refined analyses prepared in response to feedback from Workshop 1.
2. Other scientists (e.g., state, tribal, NGO) may make presentations in response to matters presented at Workshop 1.
3. The Science Panel and participants will discuss the new information, ideas and analysis identified in Workshop 2.
4. The Science Panel begins to formulate tentative conclusions and identify key uncertainties in discussions with workshop participants.
5. The Science Panel and Facilitator may meet at the conclusion of the workshop to begin synthesizing the information and assign writing responsibilities for sections of a draft report.

Time period between W2 and W3.

1. The Science Panel members write their assigned sections.

2. The Chair and Facilitator synthesize the sections into a coherent first draft of their report for review by Science Panel.
3. The Science Panel approves its first draft of the report for public distribution.
4. The agencies solicit, receive, and organize (collate and summarize) public comments on the report for consideration at Workshop 3.
5. The Chair and Facilitator prepare and distribute an agenda for W3.

Workshop 3: Sept. 18-20, 2012 (at a place TBD in Washington State)

1. Workshop participants meet to review and discuss:
   a. the scientific findings and conclusions of the Science Panel's draft report;
   b. public comments received on the draft report;
   c. the methods employed to estimate effects of alternative fishery scenarios on prey availability;
   d. major findings and conclusions that can be reached based on workshop proceedings;
2. The Science Panel identifies additional information needed to inform its final report, and how to obtain it.

Following Workshop 3, the Science Chair will collaborate with the Science Panel and the Facilitator to produce the final report by Nov. 30, 2012.