

Orca Recovery Conference 2002 Report



Earth Island Institute Orca Recovery Campaign

Orca Conservancy

**Center for Conservation Biology, University of
Washington**

Canadian Consulate General, Seattle

ORCA RECOVERY CONFERENCE REPORT

University of Washington, Seattle, WA

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Hosted by

Earth Island Institute

Orca Conservancy

Center for Conservation Biology, University of Washington

and

Canadian Consulate General, Seattle

With Support From

The Humane Society of the United States

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People for Puget Sound

Puget Sound Water Quality Action Team/Office of the Governor

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This report is available in electronic form at
www.earthisland.org/immmp/orca/orcreportfinal.pdf

Executive Summary

In April 2000, a workshop was held to discuss the status of Southern Resident killer whales. The workshop concluded that the population was in trouble, and that a number of factors were likely to be responsible. Subsequent to the workshop, the Center for Biological Diversity and co-petitioners petitioned NMFS to list Southern Residents under the Endangered Species Act. In 2002, Earth Island Institute, Orca Conservancy, the University of Washington, and the Canadian Consulate General, Seattle, collaborated to organize a discussion of the framework for a Recovery Plan for the population and to identify data gaps that would need to be filled before a final plan could be completed. Development of a Recovery Plan is required under the Endangered Species Act.

The conference was composed of four main tracks. Invited speakers presented current information on the status of Southern Residents, their environment, and how natural and human factors may be impacting the population. The second track was a discussion among scientists of the data presented and additional work that needed to be done. The third track was a discussion among government and non-government agencies of what actions could be taken immediately to conserve Southern Residents based on existing data. The fourth track was discussions between the two working groups.

The conference was organized into five subject areas. The conference began with presentations providing an overview of the current status of the population, its habitat, and projections for its future survival under a variety of scenarios. The conference then focused in turn on prey availability, toxins and disease, whale watching and vessel traffic, and other factors that may be affecting Southern Residents.

This report presents a summary of the information presented, and highlights recommendations of the working groups. There were not extensive efforts to determine how widely held the views expressed here are, nor to prioritize the action items identified in the discussion. This report is intended to reflect all views presented at the conference, so points of view reflected here do not necessarily reflect the views of the organizers, hosts, participating organizations, or even a large number of individuals, unless otherwise indicated.

Prey availability was recognized as a major problem. Natural stocks of salmonids believed to be the primary food source of Southern Residents are on the order of 10% or less of their historical biomass. Even with hatchery supplementation, food availability would be less than half of what it was historically. Rebuilding stocks is the most important action toward resolving this problem. This would require a number of steps, including restoration of spawning habitat, rebuilding the prey base for wild salmonids (from eel grass beds to forage fish), and managing fishing to ensure rapid recovery of stocks. In short, prey availability is an ecosystem-scale problem that impacts Southern Residents.

Toxins were also recognized as a problem that deserves further attention, due to the extremely high levels of PCB's found in Southern Residents. The sample size for Southern Residents is still relatively small, making it difficult to assess the actual impact on this population. Since toxin levels vary across populations, there is potential for comparative research to infer the seriousness of this problem. There is also potential for research with other species and captive cetaceans playing an important role in assessing the magnitude of this problem. Additional biopsy sampling of Southern Residents would allow a more direct assessment of impact. Modeling would also be a productive approach to assessing the implications of this problem. Resolving this problem will be

difficult, as large quantities of toxins are already in biomass, (e.g., disposing of stranded orcas as hazardous waste rather than allowing them to decompose in nature was recommended). However, cleaning up existing polluted sites, prohibiting new sources of toxins, and international actions to prevent further introductions of toxins around the world that would find their way into Southern Residents, would be helpful. Infectious diseases may pose a threat to the long-term viability of the Southern Resident population. However more research is necessary to assess relative risk and potential mitigation strategies.

Whale watching was recognized as both part of the problem and part of the solution. There were a range of views on the seriousness of this problem. Some felt that whale watching was harmless, as evidenced by population growth in the presence of large numbers of commercial fishing vessels, recreational boaters, and other disturbances. However, there is growing evidence from marine and terrestrial mammals that eco-tourism can have negative impacts on wildlife. Under conditions of reduced food availability, the extra energy expenditure observed in the presence of whale watching boats combined with potentially impaired foraging efficiency due to masking effects of anthropogenic noise on echolocation, might provide a mechanism for whale watching and other vessel traffic to have a substantial impact on population growth rates. There is also potential for a synergistic effect with lipid-soluble toxins (e.g., PCB's) as they are released from the blubber to increase the concentration in the rest of the body. More widespread observance of industry guidelines to prevent excessively close approaches and reduce noise exposure (including by recreational boaters) was strongly encouraged. Should these guidelines prove inadequate, time and area closures could be considered, along with technological changes to reduce noise exposure. Whale watch operators were recognized as an important communication channel to the public and there is potential for them to strengthen their role as educators. There is also potential for whale watch operators to become an important source of financial support for scientific research and conservation actions.

Catastrophic oil spills were recognized to pose the most acute threat to the survival of the population. A full-time rescue tug program could significantly reduce the risk and severity of spills. Noise was recognized as a major problem. Keeping the level for permitting at 120 dB re 1 : Pa rather than relaxing the standard to 180 dB was strongly recommended. Entanglement was thought to be a small and occasional problem. Effort is needed to prevent and monitor the consequences of ecosystem changes caused by invasive species and climate change.

The importance of collaboration by diverse groups with a wide range of specialties was emphasized throughout the conference. The conference proceedings amply document that no one factor can be implicated for the decline of the Southern Resident Community. The diverse needs of this population will require a diverse set of tools to assure their recovery. Improved bilateral cooperation was proposed by representatives of both the US and Canadian governments for management of this international population, and endorsed by conference participants.

There was a general consensus that future meetings will be necessary. There is a need to define priorities, allocate resources and identify non-government (NGO) and government agency team leaders for each of the main subject areas. Only when that process is completed can we say that we have the basis for a Recovery Plan. It is also generally recognized that without a written Recovery Plan, all efforts to stem the extinction of the Southern Residents will be piecemeal, and hampered by a lack of funding and cooperation and coordination between the nonprofit and government agency domains. The NGO working group strongly recommended, and most

participating scientists agreed, that Southern Residents be listed under the ESA, and felt that listing them as “Depleted” under the MMPA would be inadequate to ensure their recovery.

Editors’ note: Subsequent to the conference, NMFS announced its proposal to list Southern Residents as a “Depleted Stock” under the Marine Mammal Protection Act but not to list them under the Endangered Species Act. NMFS Biological Review Team found that the published taxonomic status of populations within the genus *Orcinus* was unlikely to be correct. However, they were unable to agree on what the correct division into species and subspecies is. Depending on what the correct taxonomy proves to be, Southern Residents may subsequently be determined to be a component of a Distinct Population Segment that merits listing under the ESA. Given the importance most participants placed on the ESA listing, research that could clarify whether Southern Residents are a “Distinct Population Segment” probably would have been considered a conservation priority. Unfortunately, since the organizers’ felt it was already clear that Southern Residents are a DPS, this topic was not placed on the agenda for discussion.

ORCA RECOVERY CONFERENCE AGENDA

Welcoming Remarks

Michael Harris, Orca Conservancy

David Bain, University of Washington

Bob Lohn, Western Regional Administrator, National Marine Fisheries Service

U.S. Senator Maria Cantwell

Bryan Burton, Canadian Consulate General, Seattle

Sam Wasser, Center for Conservation Biology, University of Washington

Will Anderson, Orca Recovery Campaign of Earth Island Institute

Introductory Session

Robin Baird, Dalhousie University

The Committee on the Status of Endangered Wildlife in Canada Report on Resident Killer Whales

Martin Taylor, Center for Biological Diversity

The Petition to List Southern Residents Under the Endangered Species Act

Mike Rylko, Environmental Protection Agency

Georgia Basin-Puget Sound Ecosystem Indicators

Prey Availability Session

Laurie Weitkamp, Northwest Fisheries Science Center

The Status of Fish Stocks in the Pacific Northwest

Judith Noble, Seattle Public Utilities

Endangered Species Act Strategies and Salmon Restoration

Sam Wright, Formerly with Washington Department of Fish and Wildlife

The Essential ESA in Interior State Marine Waters

Discussion Groups on Prey Availability

Toxins and Disease Session

Joe Gaydos, Marine Ecosystem Health Program, University of California at Davis
Disease Risks Faced by Southern Resident Killer Whales

Gina Ylitalo, Northwest Fisheries Science Center, NMFS
Toxins in Eastern North Pacific Killer Whales

Fred Felleman, Orca Conservancy
Threats to Orcas from Oil Spills and PCBs Found in Puget Sound Naval Bases.

Introductory Remarks (continued)

Ralph Munro, Former Washington Secretary of State
Human Attitudes Toward Orcas in the Pacific Northwest

Ken Balcomb, Center for Whale Research (via videotape)
The Status of Killer Whales in and Around Puget Sound/Georgia Basin

Discussion Groups on Toxins and Disease

Whale Watching Session

Rich Osborne, The Whale Museum
The History of Southern Resident Killer Whale Watching

Rob Williams, Sea Mammal Research Unit, University of St. Andrews
Effects of Vessel Traffic on Northern Resident Behaviour

Jodi Smith, Orca Conservancy
Effects of Whale Watching on Southern Residents

Bill Wright and Michael Bennett, Whale Watch Operators Association, Northwest
Research, Education, and Conservation Activities of WWOANW

Whale Watching Discussion Groups

Other Factors Session

Scott Smith, Washington Department of Fish and Wildlife
Potential Impact of Invasive Species on Ecosystem Structure

Helena Symonds, Orcalab
Effects of Acoustic Harassment Devices at Fish Farms on Northern Resident Orcas

Mark Palmer, Earth Island Institute
LFA Sonar

David Bain, University of Washington
Effects of Noise on Killer Whales

Marsha Green, Professor, Albright College; Ocean Mammal Institute
Acoustic Interaction of Humpback Whales and Vessels in Hawaii

Other Factors Discussion Groups

Discussion Group Summaries

End of Formal Conference

Informal Discussions, and discussion of the orphan orca, A73

END OF CONFERENCE

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American Cetacean Society/Puget Sound Chapter; Center for Biological Diversity; Earth Island Institute; Canadian Consulate (Seattle); Fisheries and Oceans Canada; Friends of the San Juans; Georgia Strait Alliance; The Humane Society of the United States; Marine Ecosystem Health Program; Natural Resources Defense Council; Oceans Blue Foundation; Orca Alliance; Orca Conservancy; Orca Network; Orca Relief; Orcalab; Olympic Environmental Council; People for Puget Sound; Prince of Whales Charters; Project Seawolf; The Russell Family Foundation; Save Our Wild Salmon; Shoreline Schools; Washington Toxics Coalition; Whale Watch Operators Association; The Whale Museum; Whaleman Foundation; and members of the public.

ORCA RECOVERY CONFERENCE PROCEEDINGS

This report summarizes spoken presentations, and presents highlights of points raised in the discussion groups. With some exceptions, there was not adequate discussion to determine how widely shared opinions were or to prioritize the action items proposed. These steps were left for future meetings, which we hope will be held in the coming year. While this report is not comprehensive, we hope it is sufficiently detailed to allow government agencies and NGO's to start setting priorities for conservation work. More detailed information is available in the documents and web sites referred to in the addendum.

It is important to emphasize that points of view expressed herein were not necessarily held by all participants, and participants were expressing their personal rather than organizational views. Likewise, this report reflects discussions held at the conference, and may or may not reflect the views of the hosts, our organizations, or the sponsoring organizations.

As with any conference, many individuals who were invited were unable to attend. Some submitted written material or prepared video-taped presentations. Others have commented on drafts of this report so their thoughts are reflected through that mechanism. Finally, those unable to attend have shared thoughts with their colleagues, so many people were represented indirectly. While many talented individuals were not present and were missed, those who did attend had more total experience than existed in the world only a decade ago.

The scientific discussion groups divided topics into three sections. The first was to identify prevailing beliefs. The second phase addressed uncertainty in data and models. The third phase considered future research to clarify the issue. In general, the scientific group did not consider policy issues.

The agency and non-government organization discussion groups included brief statements by participants, limited discussion of policy issues, and proposed elements to be addressed in a Recovery Plan.

I. Introductory Remarks

Michael Harris opened the conference and welcomed the participants.

David Bain welcomed the participants. He urged them to move forward with the sense of urgency and spirit of cooperation that Mike Bigg exemplified during his lifetime. He suggested following one of Ken Norris' favorite interests and focus conservation efforts on ensuring that Southern Residents have an adequate supply of clean food that they can find without human interference. Finally, Bain pointed out that it would be the combined efforts of many individuals, with a broad spectrum of talents, interests, and ability levels, that would lead to the recovery of the population, just as it was the cumulative effect of many actions that put the population in peril.

Bob Lohn, Western Regional Administrator of the National Marine Fisheries Service, indicated that a decision would be announced in early summer, 2002, regarding whether to list Southern Residents. He indicated it was clear to all that the population was in trouble, and conservation actions were needed, regardless of whether listing under the ESA was warranted. He told the

audience that intervention on behalf of Springer (A73, the “orphaned orca” residing near Vashon Island) was in the planning stages. He indicated that although he was a Republican appointee, and Senator Cantwell was a Democrat, that he looked forward to continuing to work with her on the conservation of orcas.

U. S. Senator Maria Cantwell made several proposals. She called for expanded cooperation between the governments of the United States and Canada and development of specific protocols to achieve objectives ranging from facilitating quick responses to rescue individual orcas such as A73 to developing conservation programs for recovering the Southern Resident Orca population. She called on NMFS to consider listing Southern Residents as “Depleted” under the MMPA in addition to listing them under the ESA and to expand federal funding for protection of orcas under current law, whale research, and rescue programs. She urged a proactive rather than reactive approach to conservation.

Ralph Munro, former Washington Secretary of State, recalled the time of the previous decline of the population. He described human actions taken without regard to the welfare of the population, and praised those individuals who rose to the occasion to protect the population. He urged conservation groups to stop fighting with each other and start working together. The entire food chain needs to be rebuilt rather than trying to save one species at a time. He stated that whale watch operators are “our friends” and that incentives should be established to encourage human behavior that protects whales. Rescues of stray orcas such as Luna and Springer require citizen volunteers, scientists, and government officials to work together, and such actions were microcosms of the problems and solutions that exist today. Secretary Munro called for a treaty between the U.S. and Canada to protect orcas as there are for other trans-boundary species such as salmon. Finally, he indicated there was a list of things that could be done, and that a recovery plan needed to be implemented whether or not Southern Residents were listed under the ESA.

Brian Burton, acting Canadian Consulate General, Seattle, noted that the conference was being held at a critical time. He called attention to the two stray orcas who needed help, and recognized they were symbolic of entire populations. He indicated that Canada was taking a leading role in protecting Southern Residents, having already listed them through the COSEWIC process. He indicated the Species At Risk Act was working its way through the Canadian parliament. He indicated Canada looked forward to working together with the United States to protect the population.

Sam Wasser, chair of the Center for Conservation Biology at the University of Washington, reviewed the role science had played in protecting other threatened and endangered populations. He commended NMFS for taking on orca recovery. He indicated a lot could be learned from measuring hormones and other chemicals in samples obtained with little impact on animals, such as feces and skin biopsies. Such studies helped provide the basis for concrete steps that resulted in benefits to recovering populations of other species. He also reminded participants that Southern Residents are not alone in facing extinction, with approximately 27 species becoming extinct each year, and that many of the challenges facing orcas are local manifestations of world-wide problems.

Will Anderson welcomed participants and thanked The Humane Society of the United States, the Russell Family Foundation, People For Puget Sound and the Puget Sound Water Quality Action Team of the Office of the Governor for their supporting contributions. After summarizing the format and schedule of the conference, he stated that this was a working conference to identify

the components of a Recovery Plan based upon established NMFS guidelines. He stressed that individual lifestyle decisions are an essential component of a plan. The use of toxic substances such as household cleaning products and lawn herbicides, water and energy conservation, and dietary choices are all keys to the survival of orcas and their ecosystem. He noted that the conference provided paper, pens and other materials that were high in recycled content and that the food and beverages served were organic, vegan and delicious. He expressed hope for the Southern Resident orcas based on the diversity and spirit of cooperation of conference participants.

II. Background Information

Robin Baird reviewed the key points in the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) report. Baird considered whether the decline in the population could be accounted for by disruption due to collections for public display. The change in age structure was discounted as a cause, since mortality rates were up in all age classes, and fecundity was down even when considered on an age specific basis. Numerically, the population appeared to recover to pre-capture levels before the current decline, although the population might have reached higher levels if it had not been reduced. The change in prey availability was identified as a potential factor, along with high levels of toxins, in particular PCB's, and whale watching. Random and other factors could also play some role. He reported Canada now considers Southern Residents "Endangered," and Northern Residents and Transients as "Threatened."

Ken Balcomb stressed the importance of photo-identification as a research approach. He reminded the audience of the importance of the distinction between facts and models. He noted that Southern Residents probably numbered more than 100 individuals in the 1950's, declined to about 70 in the early 1970's, and recovered to about 100 in the mid-1990's. He noted the concern raised by the subsequent decline of the population to fewer than 80 individuals. He questioned whether noise and vessel harassment could really be causes of the current decline, since there was intense vessel activity and acoustic disturbance during the periods of collections for public display and population growth in the 1970's. He emphasized his belief that toxins were an important factor in the decline. He cited high levels of toxins (particularly PCB's) in killer whales and the reproductive failure, uterine prolapse, and loss of offspring by young adult females expected to result from that. He cited immunosuppression and lack of spermatogenesis in a young adult male who had stranded. He found it reasonable that the effects of hormone mimics being observed now would have started during gestation when toxin levels peaked in the environment. He noted that toxin levels in harbor seals appeared to decline between the 1970's and the late 1980's, and that the seal population has grown since then. He was hopeful that in another 2-3 generations, killer whales would show the same recovery. However, he noted the decline in PCB levels that persisted for two decades has been interrupted, and that we cannot be certain the situation will improve.

Martin Taylor reviewed the basis for the petition for listing Southern Residents as endangered under the Endangered Species Act, citing many of the same reasons reported by Baird. He presented results of a population viability model. Model simulations indicated that extinction risk varied greatly with assumptions. Simulations considered inbreeding effects, Allee effects, catastrophes such as oil spills and disease outbreaks, reductions in carrying capacity and reductions in intrinsic survival and mortality. If survival and fecundity averaged over the entire 25 years of known life histories were used as the basis for simulations, and ignoring inbreeding

and catastrophes, extinction risk was predicted to be low. Low probability catastrophes from oil spills and epidemics significantly increased the risk of extinction. If the last several years of low survival and fecundity were used as the basis of population projection, median extinction time was predicted to be 33-121 years.

Mike Rylko reviewed the Georgia Basin-Puget Sound Ecosystem Indicators Report. He indicated PCB levels were highest in the Seattle-Tacoma area, and lower in waters near Vancouver. In addition to orcas and at least 22 species of marine fish, many other species are at risk throughout the region, including 10-25% of freshwater fish, amphibians, reptiles, birds, mammals and plant species. Terrestrial and marine protected areas are a conservation approach that is being utilized. He noted that the human population is rapidly growing, and that areas with natural vegetation have been reduced by 37% over the past 25 years.

III. Prey Availability

III A. Presentations

Laurie Weitkamp reviewed a wide range of information about salmonids. She indicated mass ranges from about 2 kg to 15 kg depending on species. She indicated a variety of statistics have been used to characterize population size. These include escapement, catch, terminal run size, and total run size. She suggested the latter number was the best to use, although it is derived from the other counts.

She pointed out that there is variation within species. For example, chinook vary in how long they remain in streams, different runs spawn at different times of year, and some spawn near the ocean while others spawn high in river systems. Pinks have large runs in odd years, and small runs in even years. Hatchery fish compose a high fraction of a species, typically representing 70-95% of the catch, except in Northern British Columbia and Alaska.

Geographical ranges vary among species, with chinook and coho ranging as far south as Monterey Bay, and steelhead ranging south to Mexico. The species differ in the time of year they occupy inshore waters near Puget Sound. Steelhead are present from November through April and June through October. Chinook are present from May to September. Sockeye are present mainly in June and July. Pinks are present in August and September, and coho and chum are present October to December.

Puget Sound salmon stocks have fluctuated, with some stocks declining, some increasing, and others have shown no overall trend. Fraser River sockeye increased from the 1920's into the 1990's. Columbia River salmon stocks declined in the 1990's but showed an increase in 2001, as did Oregon coho. Chinook from the Sacramento River have partially recovered to ~300,000. Alaskan salmon stocks have been increasing in recent years.

Judith Noble discussed the response of local government to the ESA listing of Puget Sound salmon stocks. She noted the practical impossibility of returning the region to pre-settlement conditions, so that full recovery of local stocks could not be expected. She explained that local government lacked adequate information on fish and regulations to know what to do. They set the goal of determining what was both possible and would lead to sustainable fish stocks. A Technical Recovery Team was established to work with independent populations to assess

abundance, productivity, and diversity and determine what would make the populations viable. The team first developed general goals and then a specific recovery plan. NMFS had to work with local and tribal governments as co-managers. The process involved negotiation, science, and implementing a response. It required managers to develop policy with stakeholders. She stressed the importance of monitoring to see which management actions actually achieved intended effects. She indicated funds were directed at the most important projects, but there was a need to increase funding so that all necessary projects could be carried out. She also stressed the importance of obtaining citizen support for policies.

Sam Wright discussed the failure of fishery managers to sustain stocks. He indicated that one problem was that scientists could make recommendations, but lacked the authority to implement them. He showed a number of graphs illustrating recruitment rate as a function of population size. He pointed out that while simple models indicate populations will increase their per capita growth rate when populations decline, real populations sometimes hit alternative stable states where return to historical populations does not occur, or hit points of no return well above zero population. He indicated in-river survival of many salmonids was related to flow, and that human activities that affect run-off or are intended to manage flow impact fish survival. He indicated that while fish production could be increased by projects such as removing the Elwha dam, there were perhaps 3,000 miles of stream blocked by minor obstacles such as culverts that also offered significant potential for increased production. He cautioned that fishery statistics can be unreliable for a variety of reasons that are known to “institutional memory” but not published, in addition to the limitations described by Weitkamp. Finally, he raised the concern that fish stocks are managed down to approximately 20-30% of their natural levels, which would also limit the carrying capacities for populations of their predators, even if management intends to keep them at higher levels.

III B. Scientific Discussions of Prey Availability

III B 1. Prevailing Beliefs

Chinook scales are abundant in scale samples collected near resident whales. Some correlation exists between orca population trends and some chinook or other salmon runs within their range.

Although large salmonids were considered to be an important prey species, it was pointed out that they are only present in significant numbers in Greater Puget Sound for about 6 months of the year. It was postulated that although steelhead are now small in number, they might form an important component of the diet when other salmonids are absent. While baleen whales are capable of storing fat for long fasts, orcas are limited in this ability. Thus orcas probably need to rely on other food sources that are currently not well known.

It was pointed out that caloric expenditure was related to activity level. Thus when orcas spend more time foraging and less time resting to cope with prey scarcity, they need to catch more fish to balance their nutritional budget than they did when fish were abundant.

III B 2. Uncertainties

Concern was expressed that feeding information was very limited. Only 28 scales had been identified (approximately 1 feeding event per year) in addition to five stomach contents. The possibility that scales were more likely to be collected from large prey taken near the surface was identified as a potential source of bias. TDR records obtained by Baird indicated that whales dive deeply, and scales shed during feeding at depth were unlikely to be seen at the surface. It was also noted that small prey may be consumed whole, so no scales would be available for sampling.

Catch records were considered to not be very useful for fine-scale population analysis. In some cases, records may not reflect accurately composition of the catch. In any case, run size was recognized as the best number to use, as catch reflected effort, fishing regulations, and other factors not related to the number of fish available to whales.

The importance of working on the appropriate spatial and temporal scale was recognized. Although fish data are typically published as annual data, the raw data are available at a weekly time scale.

III B 3. Future Work

A number of areas for future work were identified.

New data on foraging were considered vital. To obtain these data, several studies were proposed.

Data obtained through the use of tags that record time, depth, and video images would be valuable to determine whether feeding occurs at depth and whether the species involved were the same as determined through scale sampling.

Additional scale sampling was considered important as well, since the existing data represent a tiny fraction of feeding events.

Collection of fecal samples was proposed, although the probability of success of this approach was considered to be low.

Toxins were considered potential markers of diet and range. It was pointed out that different prey species accumulated toxins in different ratios. Some of these differences were due to differences in exposure (e.g., fish that feed on prey that reside in waters off California contain relatively higher levels of DDT related compounds than fish that feed primarily in waters of the Northwest). Other differences would be due to species differences in the ability to metabolize particular compounds. Careful quantitative analysis of relative concentrations of a range of toxins may help clarify diet and distribution issues.

More extensive analysis of fish distribution and abundance was proposed. This work would serve several purposes. One, it would allow testing for correlation in fish population trends and whale population trends. A high correlation would indicate a fish stock is a candidate for being

an important dietary component. This could also be valuable in estimating historical population levels. Correlations in distribution might suggest that a prey species is an important dietary component.

An important policy issue that was raised was that many fish stocks are managed for maximum sustainable yield or maximum economic yield. Under such policies, stocks are generally reduced to 50% or less of their historic levels. It was pointed out that this may not leave enough biomass for marine mammals to maintain healthy population levels. The implications of these conflicting management objectives should be studied and understood.

One study that was proposed was to determine the year-round range of Southern Residents. That is, where do they go in the winter when they are rarely in the Salish Sea, and where do they go during the summer when they leave their core area for short periods of time? This would allow determining whether Southern Residents seek out other areas where large salmonids are available when they are not available in the Salish Sea, or whether they seek out other types of prey. Several technological approaches were identified that could be applied to determining winter distribution.

One approach was the use of passive hydrophones. These could be monitored to determine whale presence. For example, a hydrophone placed on the Central Coast of British Columbia by Ford and colleagues indicated that Northern Residents occasionally used the area. Field studies were subsequently launched that indicated these whales used nearby waters on a regular basis. A similar approach could be used to determine the overall range of Southern Residents.

Satellite tracking was identified as the most straight-forward way to determine range. However, current technology would require capturing whales and surgically attaching tags. Tags that could be remotely applied are under development, but may be years away from being ready for use.

Gathering sighting information from fishery observers and others at sea was recognized as a method for determining whale locations. This could form the basis for field studies to determine whether orcas in an area are Southern Residents or members of another population. Sighting networks were also recognized as an important source of information that may be useful for focusing effort.

Finally, dedicated effort, by shipboard or aerial survey, was recognized as another approach for determining distribution. These surveys may need to be supplemented by small vessel work to allow identification of orcas that are located.

III C. Organization and Agency Discussion of Prey Availability

Several guiding principles were identified. These included taking an ecosystem approach, using the precautionary principle, and providing for on-going stewardship, not just the short-term actions required to recover Southern Residents to sustainable levels.

The group recognized the importance of recovering salmon and bottomfish, as well as forage fish such as herring, sand lance, and surf smelt. Accomplishing this through habitat enhancement was noted as preferable to catch restrictions, although both might be required. Protection of herring at Cherry Point from oil and removal of the Elwha Dam to increase salmon spawning

habitat were identified as habitat improvement projects that could be especially valuable. Vitality of prey (body size, overall health) was suggested to be a better indicator of environmental health than population size alone. These projects would require funds for habitat assessment and prey monitoring, as well as for developing recovery plans and their implementation.

Effects of human activities on fish were identified as an area of concern. For example, there was an interest in whether vessel traffic might modify fish behavior in a way that influenced their availability to whales as prey. There were also questions on the impact of toxins on fish species.

It was suggested that additional data on the Southern Resident diet be obtained to determine relative importance of the various prey species. Nevertheless, salmon seem to be representative species for prey availability and an index of ecosystem health.

The use of stewardship areas for protecting orcas was suggested. These would include marine protected areas such as the proposed Trans-boundary MPA known as Orca Pass (see Document B8 linked in the Addendum).

Finally, it was recognized that all stakeholders needed to be involved in the process. First Nation governments in Canada and Native American governments in the United States should be involved as well as national, state, provincial and local governments.

In summary, it is believed that Southern Residents are declining in large part due to inconsistent quantity and quality of the prey species they depend upon for survival. Only with a comprehensive strategic plan that is well funded, coordinated by governmental and non-governmental agency team leaders, and involves key stakeholders and the scientific community, can we ever hope to reduce the impact of prey availability on orca survival.

IV. Toxins and Disease

IV A. Presentations

Joe Gaydos indicated that bacteria, viruses, and fungi were known to cause disease in orcas. He indicated 15 pathogens have been described to infect killer whales, and that based on data from sympatric odontocetes, 28 others could potentially infect them. Pox virus and calcivirus infections in killer whales are generally not harmful, but could lead to systemic infections. He noted *Brucella* was an emerging disease that could cause abortions. He noted *Morbillivirus* was a disease that could have catastrophic effects when a population is first exposed, leading to mortality on the order of 50%. Other pathogens such as herpes viruses and protozoans also could be an issue. PCB's impair the immune system, which would lead to increased vulnerability to disease. He also warned that global warming could lead to range shifts, leading to exposure to new pathogens and emerging diseases. For example, *Morbillivirus* is unknown in the Pacific Northwest, but anti-bodies have been found to it in California. Potential infectious disease threats do exist. However, more research is needed to adequately assess risk.

Gina Ylitalo focused on organochlorines (OC). These toxins are persistent, ubiquitous, bioaccumulate, and have deleterious effects. Samples for analysis have come from strandings,

by-catch, subsistence harvests, and biopsy. It would be helpful to conduct mark-recapture type studies where levels within an individual could be compared through time. It would be helpful to have full necropsies to look at overall effects. It would be helpful to study live animals to test for physiological effects. Controlled studies to determine mode of action in captive animals would complement epizootic studies. Populations could be compared to help determine effects. She noted that Bering Sea residents have generally low levels, as do many Prince William Sound residents. Northern Residents have slightly higher levels, and Southern Residents typically have the highest levels found in residents. Transients have high levels in Prince William Sound, higher levels in British Columbia, and the highest levels have been measured in blubber of California transients. Within a population, males generally have higher levels than females. However, female transients from the AT1 group that resides in the Prince William Sound / Kenai Fjords region contain OC levels comparable to the concentrations in male transients from this area because no recruitment has occurred in this group since the mid-1980's. Young juveniles have higher concentrations than adult males. First born offspring typically have about twice the concentration of toxins of second born and later offspring, and both have higher levels than their mothers. The female that stranded at Sequim in early 2002 had very high OC levels. Reduced fecundity is likely at the levels found in Southern Residents.

Fred Felleman addressed PCB sources in Washington State. He noted from Gina Yitalo's paper that PCB levels in resident orcas increase from Alaska to Puget Sound. This is the opposite of what one would expect if the primary source of the pollution was from atmospheric deposition, underscoring the need to address local hot spots. There are 2,096 sites identified in the State's Toxic Clean up Program. The EPA maintains a National Priorities List of all known Superfund sites, including 69 sites in Washington State, 34 of which are located adjacent to Greater Puget Sound. Of those, 60% are considered to have been cleaned, 33% are being cleaned, and planning is underway for the other 7%. Six sites on the NPL are Navy facilities adjacent to Puget Sound. However, not all Navy facilities that are polluted with PCB's are on the NPL. The Navy has a significant presence in Puget Sound and has more financial resources than most federal agencies to have sites cleaned up. The Navy has spent \$330,687,000 to date and needs to spend \$161,925,000 more before they are done with the sites they have identified. Sites containing PCB's include: Bangor Submarine Base, Puget Sound Naval Shipyard, Whidbey Naval Air Station, and Puget Sound Fleet and Industrial Supply, Manchester.

Between 1958 and 1985 NW Transformer Service Company leased some agricultural farmland as a salvage yard and stored, repaired, and recycled electrical transformers and capacitors on site. They also dismantled and reclaimed equipment, burned castings for transformers in an open concrete pit, burned waste oils in a space heater, and drained transformer oils into a seepage pit. In 1985 the company transferred its main storage and salvage operations to within a half mile of the Nooksak River which drains into Bellingham and Lummi Bays and Washington's once largest herring beds at Cherry Point Reach. Herring are the most oil rich fish per body weight. They would retain high quantities of PCB pollution if it made it to the beds, which in turn could be consumed by chinook salmon and on up the food chain to orca whales. There is interest to reopen an investigation of this site and the effectiveness of its cleanup.

In all, 24,720 transformers were known to be "treated" at both sites. Soil samples containing 31,000 ppm of PCB's were detected. Early action at the Mission Pole site included having 1,400 cubic yards of contaminated soil removed and 6,500 gallons of liquid waste containing 10ppm or more of PCBs removed. Between 1991 and 1994, 4,700 tons of soil and debris and 50,000 gallon of contaminated liquids and wastewater were disposed of.

Early actions at the South Harkness Street facility entailed 14 tons of PCB contaminated soil > 100 ppm incinerated in Utah and 3,750 tons of < 100ppm contaminated soil was disposed of in off-site hazardous waste land fill. No long-term action other than monitoring was required.

Fred Felleman also addressed oil spills. The largest oil spill in Washington State, 2.3 million gallons of heavy fuel oil along the shores of Olympic National Park, was from a Navy vessel. From 1990 to 1997 the U.S. Navy spilled 181,453 gallons in U.S. ports including 56,674 gallons in Puget Sound during the eight-year period. On average, there was a spill every two days. Some of the larger incidents included 70,000 gallons of diesel which spilled at the Manchester Naval Supply Depot, 11,000 gallons of Jet Fuel at the Whidbey NAS, and 10,000 gallons of diesel at the U.S. Naval Supply Center. Nationwide, Navy spillage increased from 17,370 gallons in fiscal 1990 to 66,404 in '97. The service says improved record-keeping may make the situation look worse than it really is. The Navy has been improving in their ability to prevent oil spills.

New studies underscore the sensitivity of herring to weathered oil, especially after it comes in contact with sunlight. These findings elevate the importance of protecting the herring beds at Cherry Point and March Point from the chronic release of refinery effluent as well as the increasing risk from catastrophic oil spills due to expanding vessel traffic to the region. People can keep oil off the streets and out of our watersheds. The public needs to take part in decisions affecting public lands and resources, and lead to a consolidation of public commitment to filling well defined gaps in our maritime safety net.

One of the most valuable tools to advance maritime safety is an informed public. The Prince William Sound Regional Citizen Advisory Committee provides a model that has been established in OPA'90 that needs to be replicated in other high volume ports such as Puget Sound. Their web site is www.pwsrcac.org. One of the most effective prevention tools for all the vessel traffic heading for BC and Washington Ports through the Strait of Juan de Fuca is the dedicated rescue tug stationed for the past four winters in Neah Bay. The Navy provided funding for the first season and should be looked to for future funding (www.ecy.wa.gov/pubs/0008023.pdf).

IV B. Scientific Discussions of Toxins and Disease

IV B 1. Prevailing Beliefs

Toxins were recognized as a potential problem for Southern Residents. High levels of PCB's and DDT's have been found, along with high levels of heavy metals such as mercury. Toxins may affect both fecundity and mortality rates.

IV B 2. Uncertainties

There are some uncertainties in measuring toxin concentrations. The effects of decomposition are unknown for samples taken from dead animals. Loss of lipid from the blubber as body condition declines may lead to artificially high levels. Toxins may not be equally concentrated in all parts of the blubber, so there may be systematic bias resulting from where samples are

taken. There may be some loss of lipid and toxin during collection, and this may vary with the size of the sample. There is also some difference in measurement techniques among labs, but the consequences of this can be minimized by calibrating with measurements of standards.

IV B 3. Future Work

A number of approaches were identified to determine the role of toxins in the decline of Southern Residents. It was noted that some populations (e.g., Transients) had higher levels of toxins than Southern Residents, while other populations had lower levels (e.g., Northern Residents). This suggested using a comparative approach would be productive. Although data for Transients are not as comprehensive as those for Residents, techniques for estimating population size and trends from imperfect data exist.

Relative concentrations vary geographically. This suggests that measuring ratios may be useful in identifying sources of the toxins, leading to the development of more effective clean-up strategies. It was also suggested that a wider range of toxins be screened when possible (e.g., polyaromatic hydrocarbons, heavy metals) than the PCB's and DDT's that were discussed at this meeting.

It was suggested that a workshop be convened to discuss biopsy sampling. The workshop would address the development of testable hypotheses regarding effects of toxins on fecundity and mortality and identifying the minimal set of individuals to sample to accomplish these tests.

Methods could be standardized by using NIST controls and the large samples that could be obtained from dead stranded orcas. It was also suggested that species that strand more frequently than orcas be used for studies of the effects of decomposition on measurement.

A comparison of toxin levels in mothers and fetuses could be used to examine pre-natal toxin transfer. Sampling a pregnant female, then resampling her and her weaned calf, could also be used to examine toxin transfer. It was suggested that other species such as harbor porpoises be used, since pregnant female orcas rarely die.

Since it is not obvious how a toxin whose dumping was banned in the mid-1970's could have effects that did not become apparent until the mid-1990's, it was suggested that a model timeline be developed to determine whether toxins were a credible cause of the current decline.

Cytochrome P450 levels could be tested in biopsy samples to test for evidence that toxins have been mobilized.

Visual inspection and hormone levels in biopsy samples could be used to detect pregnancies. These data would help clarify whether reproductive failure occurs before or after conception.

The standard protocol for collecting data from stranded marine mammals should be made more extensive to allow better research on disease. A necropsy workshop should be held to help develop and implement this new protocol. In addition to Southern Residents themselves, sympatric cetaceans should be screened for diseases.

IV C. Organization and Agency Discussion of Toxins and Disease

It was recognized that **orcas need clean water**.

A long list of actions were identified that needed to be taken to deal with the toxins problem. These include: identifying sources of toxins that reach Southern Residents, taking steps to prevent introduction of additional toxins to the environment, cleaning up toxins that are already in the environment, and research to better understand the impact of toxins.

Consumers were identified as an on-going source of new toxins. Education about the impact of lawn chemicals and household chemicals both on fish and whales would be an important step. In addition, education about the impact of water usage, both as part of everyday life and for the generation of hydroelectric power was recognized as important. Vessels were also recognized as a source of toxins, and regulation and education regarding discharge of sewage and other chemicals (e.g., bilge water, chemicals used in photography and dry-cleaning, grey water, medical waste), both from cruise ships and small vessels, could be an important step. Pump-out stations were noted as a place where education could occur.

On a larger scale, banning PCB production and use worldwide was identified as important. Continuing to require the military to comply with environmental protection laws was also recognized as important. Expedited federal funding for clean up of military toxic sites was encouraged. Funding for rescue tugboats to prevent catastrophic oil spills was recognized as a priority. Paying attention to new persistent bioaccumulative toxins (PBT's) now so that problems similar to those currently experienced with PCB's and DDT's don't arise was recognized as important. Pulp mills and fish farms were recognized as sources of pollutants. Dead orcas were noted to be highly contaminated, and it was suggested that NMFS and DFO be required to dispose of them as toxic waste.

Sharing of information was also recognized as important. The IWC was identified as an important source of information. Clean-up efforts, such as the campaign on the Hudson River, could serve as a model for other clean-up efforts. Research identifying toxic "hot spots" and superfund sites that contain toxins known to occur in the tissues of Southern Residents could be used to focus clean-up efforts. Continued monitoring of toxins in stranded and wild whales was encouraged. Monitoring heavy metals like mercury that do not accumulate in blubber would be an important component of toxin screening in stranded animals.

Research was suggested to determine the impact of a wider range of chemicals, including those contained in sludges, biosolids, landfills, and surface water run-off. PCB transport mechanisms were also identified as a subject area where a better understanding could lead to better control of impact.

Support for the Washington Department of Ecology's Persistent Bioaccumulative Toxins (PBT) initiative was suggested.

In summary, the toxic contamination found in the Southern Resident Orca whales comes from both historical and contemporary sources. This contamination has migrated up the food chain to the orcas. Studies of other marine mammals with similar toxic loads have shown severe impacts on reproduction, immunology and survival. Salmon still accumulate substances such as PCBs long after their production and dumping into the Southern Resident habitat ceased. Since it

appears that many toxic substances in the orcas' food supply also come from distant sources, there must be international cooperation in solving this threat. The Southern Residents need a consistently abundant supply of uncontaminated prey to survive. Only a coordinated, well-funded attack on the historical and current sources of pollution, already identified in part by the U.S. Environmental Protection Agency (EPA) and Fisheries and Oceans Canada (DFO), can we hope to reduce the toxic contamination of Southern Residents. This is essential to the survival of Southern Resident Orcas.

V. Whale Watching

V.A. Presentations

Rich Osborne reviewed the history of whale watching in Haro Strait. A small number of commercial vessels operated during the 1980's. The number slowly increased in the early 1990's and then rapidly in the mid-1990's before leveling off. He estimated the commercial fleet carries approximately 250,000 passengers per year. He indicated that at Lime Kiln Lighthouse, more private than commercial vessels followed whales.

Rob Williams indicated that although vessels can disturb whales, but sometimes whales seem undisturbed by their presence. He presented results from experimental studies on Northern Residents that showed that whales generally responded to an approaching vessel by changing their direction of travel—a reaction he termed “horizontal avoidance.” He reviewed a model linking the energetic consequences of these behavior changes, plus masking effects of boat noise, to population decline. He presented data indicating that leap-frogging (speeding up to place one's boat in a whale's predicted path) caused stronger behavioral change than whale watching in accordance with Northern Resident whale watching guidelines. He suggested that impact could be reduced by reducing noise (observing from greater distances and at lower engine speeds) and avoiding leap-frogging. He also felt that large reserves closed to whale watching were valuable. He stressed the value of taking an experimental approach to studying the impact of whale watching.

Jodi Smith reported that horizontal avoidance responses in Southern Residents were similar to those in Northern Residents, although her data set was smaller and not as well controlled. Compliance with voluntary guidelines by commercial operators regarding distance offshore was about 80% when vessels were not monitored by Soundwatch, but over 90% when Soundwatch was present. Compliance by recreational whale watchers was much lower, but also improved when Soundwatch was present.

Marsha Green provided comparative data on the effects of vessels on humpback whales. She used a design with opportunistic observations using a 2 mile criterion for boats being absent. She characterized humpback behavior as including vertical avoidance (long dives, and remaining underwater after vessels left) and little horizontal movement. She also conducted experimental work and found whales swam faster with boats present (in contrast to the observation in the opportunistic study). She indicated parasailing could exclude humpback whales from an area.

Mike Bennett and Bill Wright spoke of their industry's willingness to do the right things for the right reasons, and reported proactive steps the Whale Watch Operators Association Northwest had taken to revise its guidelines to reduce impact, and pointed out these guidelines provide more

protection than Federal guidelines. They cited the role commercial operators could play as an educational platform to encourage people to participate in salmon stream restoration and cleaning up toxins. They pointed out that whale watching had been recommended as an alternative to consumptive use, such as whaling and removal for public display. They indicated their objective was to provide responsible platforms for sustainable long-term viewing (currently by about 200,000 people a year).

V B. Scientific Discussions of Whale Watching

V B 1. Prevailing Beliefs

A variety of studies showing that whale watching does increase energy expenditure in both Northern and Southern Residents were discussed (work by Kruse, Bain, Kriete, Williams, Smith and their colleagues). Noise from whale watching and other vessels may have from little or no impact to a severe impact on foraging efficiency, depending on whether whales can use knowledge of where fish are likely to be to offset reduced echolocation range caused by masking or threshold shifts. Balcomb's point that the population grew in the presence of high levels of disturbance was well taken. However, the model by Bain linking energetic effects to population effects predicts that energetic effects will have negligible population consequences when a population depleted by collection for public display has a more than adequate food supply. In contrast, a larger population facing reduced food resources would experience substantial population level effects due to the same energetic impact. The growth of the commercial whale watching fleet regularly involved in whale watching correlates well with population trends in Southern Resident population dynamics. Experiments with whales that had been exposed to whale watching for 15 years suggested that if habituation occurs at all, it is far from complete.

V B 2. Uncertainties

There was discussion of whether greater distances traveled implied greater energy expenditure. One hypothesis was that shallower dives might offset greater distances traveled as measured at the surface. However, this alternative hypothesis is inconsistent with respiration data. Nevertheless, tracking of tagged whales might allow a more rigorous analysis.

The long-term studies of effects of vessel traffic were generally limited to a small portion of the range, and to a single behavior state. Caution was recommended when extrapolating results to other contexts.

The sample size in Southern Resident studies is small. One study by Kriete compared behavior in a high vessel traffic regime to behavior in a low vessel traffic regime. Although the two data sets were significantly different, the data were collected more than a decade apart, so many factors besides vessel traffic (food availability; population composition, size and status; condition of individuals; climate; etc.) were not controlled. However, this study showed a larger difference between behavior when boats are present than when boats are absent than other studies. If the other factors did not affect the results, this raises the possibility that recent studies are comparing degrees of disturbance rather than true baselines to behavior in the presence of

vessels. Another study had a very limited sample of no vessel tracks, so it was impossible to control for factors such as tide, current, and individual differences.

The model estimating the impact of noise was very sensitive to foraging tactics, which are unknown. Thus the actual impact of noise cannot be estimated at this time. As with any model, tests are still required to determine whether it applies to the real world.

It was pointed out that the absence of a significant response to vessel traffic could reflect non-response as a tactic rather than tolerance or habituation, as well as an insufficient sample size.

V B 3. Future Work

Individuals recommended a variety of studies.

First, a continuation of theodolite tracking studies was highly recommended to determine whether small sample issues might account for the findings indicating vessels impact whale behavior. Tracking whales tagged with TDR's and velocity meters would allow assessment of underwater behavior.

A comparison of the magnitude of response to whale watching using a design that uses each individual as its own control over several seasons to test for habituation or increasing tolerance of whale watching was thought useful.

Biopsy samples to measure stress taken throughout the year to determine whether stress is correlated with vessel traffic were a recommended component of biopsy studies.

A better understanding of noise from commercial and recreational whale watching vessels and its potential impact on foraging was considered highly valuable. Such a study should include measuring source levels from a wide range of vessels at a variety of operating speeds and orientations. These readings would need to be supplemented by noise levels measured near whales. To place these readings in context, ambient noise measurements would be needed. Shore-based measurements that are correlated with actual exposure would be valuable for long-term monitoring. In addition, studies of the differences in directional effects of masking noise would be important to determining overall impact.

Use of tags including audio and video sensors to study foraging tactics would be important to understanding the impact of noise.

Comparing data from Northern and Southern Residents would allow determining the likelihood that the more detailed and rigorous results of studies in the north could be extrapolated to the south.

It was suggested that the cost of aerial or other energetically demanding behavior patterns be estimated to place in context the excess energy expenditure suggested by vessel impact studies.

Another potential mechanism for impact of whale watching on whales is exposure to pollutants. It was suggested that air and water quality measurements be conducted to determine what whales may be exposed to.

V C. Organization and Agency Discussion of Whale Watching

The discussion emphasized the importance of understanding the impact of whale watching from the orcas' perspective. There were a variety of suggestions for limiting impact. These could be divided into codes of conduct, time and area closures, and limitation of noise and discharges that adversely impact the environment.

It was recommended that the whale watch community continue to develop and honor best practices guidelines that include limiting time with a whale to 30 minutes, limiting operating speed to 7 knots near whales, and not approaching within 100 meters. Restricting the number of vessels around whales at any time was also suggested. The commercial operators set the example of appropriate behavior for recreational boaters, and having standards applicable to all vessels could be useful. As a result, it would be good for all commercial operators to be part of the same professional organization. Having independent parties such as Soundwatch and M3 observe whale watchers was encouraged.

Time closures such as limiting whale watching to the hours from 9 a.m. to 5 p.m. and limiting whale watching to the summer season were offered for consideration. Boat free zones (closed to non-whale oriented traffic as well as whale oriented traffic) to protect critical habitat for feeding, resting and socializing behaviors were suggested (these zones would need to be determined in the future). These would be in addition to zones already established on a voluntary basis by commercial operators. There were also suggestions that time and area closures within the whale watching season be implemented to allow experimental assessment of impacts of whale watching.

Limited entry was offered as an approach to limit impact. A related approach was to encourage the use of larger boats with quieter engines to increase the efficiency of allowing people to observe whales while limiting impact. Replacement of motors which adversely impact the environment could be expedited by a buy-out program.

Limiting total impact is another approach that could be taken. For example, a functional goal such as preventing degradation of sonar could be established and met as operators see fit (e.g., by limiting approach distances, operating speeds, or using quiet motors).

Boater education was recognized as an approach for limiting impact from recreational boaters. Boaters could be educated by commercial operators, through the boat licensing process, and programs like Soundwatch and the Marine Mammal Monitoring Program (M3). The education program could include the codes of conduct mentioned above, development of expectations for the orca experience that do not require close approaches, and encouragement to seek alternatives such as listening from a distance on a hydrophone and land-based whale watching. Whale watch operators have a unique opportunity to educate the public about issues beyond whale watching practices, and their efforts to do so should be supported. They should be provided with educational packets on best practices and other issues to distribute. Improved communication between researchers and boaters was also identified as a need.

Better enforcement of existing regulations is another approach to limiting impact.

Additional studies to clarify the impact of whale watching on whales and place this in context with other sources of impact such as prey availability and toxins were suggested.

In summary, everyone, the whale watch operators, the public, NGOs and government agencies, will benefit from working together and being responsible for vessel impacts of all kinds.

VI. Other Factors

VI A. Presentations

Scott Smith indicated invasive species could have devastating ecosystem impacts. He cited a case of a comb jelly that damaged zooplankton, leading to a crash of anchovy and krill stocks, in turn impacting the fishermen and seal population that depended on them. He cited zebra mussels that can hitch-hike both on marine debris and in ballast water as a major problem. They reach population sizes that are capable of filter feeding on a volume of water equal in size to the entire body of water they have invaded each day, devastating plankton and other benthic life. To reduce the frequency of invasions, he suggested making exchanges at sea mandatory, until water treatment capability is installed. Even with exchange there is some risk, but it is lower than without exchange. He indicated voluntary exchange requirements were ineffective, as compliance increased from about 50% to 93% with enforcement and fines. Existing treatment technology can kill about 95% of zooplankton and 99% of phytoplankton. He recommended that: 1) research be carried out to classify non-native animal releases; 2) rapid response plans be developed to stop invasive species before they spread out of control; 3) use of infested waters be limited; and 4) boaters inspect their vessels (hulls and anchor chains are a major source of potential invasive organisms) to ensure that all weeds are removed, as the weeds and the animals growing on them are a potential source of contamination. A stable, long-term source of funding is needed to limit the damage caused by invasive species.

Helena Symonds summarized results of her work with Alexandra Morton. They monitored use of adjacent areas (Johnstone Strait and the inlets north of there, respectively) for use by Northern Residents during the years prior to installation of acoustic harassment devices (AHD's) in the inlets, the years AHD's were in use, and following the termination of the use of AHD's. They found use of the inlets (near fish farms) was similar in years before and after AHD's were in operation at fish farms in the experimental area. In contrast, use of the inlets declined in years when AHD's were in operation. An adjacent area (Johnstone Strait), not exposed to AHD noise, was used consistently throughout the study period, suggesting that non-noise related factors like changes in fish abundance were unlikely to be the cause of the change in distribution. Short-term displacement of harbor porpoises was also observed in a previous study of these devices by Olesiuk and colleagues.

Mark Palmer discussed sources of sounds sufficiently loud to cause immediate injury. These include offshore oil drilling, air guns, and sonar. The impact of these sounds depends on source level, distance and frequency. He mentioned source levels over 240 dB are produced, but 180 dB is often used as a cut-off for expectation of immediate injury. Lower levels are suspected of having lethal consequences in some cases.

David Bain echoed concerns raised by the previous speakers about loud noise (noise of sufficient intensity to cause immediate injury). He indicated that physical factors associated with acoustic trauma from Navy sonar in beaked whales could also be relevant in the narrow channels occupied by Southern Residents. He noted that since seismic surveys had been scheduled to avoid orcas, no data were available on the impact from this source. He noted that resonance was a phenomenon that could lead to amplification of sound levels from “safe” to “harmful.” He also pointed out that chronic exposure to levels of noise low enough that it would not cause immediate injury could be harmful. Examples of such effects include temporary and permanent threshold shifts, loss of habitat due to avoiding noise that could cause immediate injury, and missed prey due to masking.

VI B. Scientific Discussions of Other Factors

The Discussion of Other Factors was wide ranging.

Fish farms were recognized as a potential problem, and one that could be expected to grow now that British Columbia has lifted its moratorium on new farms. Noise from acoustic harassment devices; Atlantic salmon as an invasive species; introduction of excess nutrients, sediments, and pesticides; and providing hosts for parasites that infest wild salmon, were all listed as mechanisms for impact.

The group felt that raising the noise standard for protection under MMPA to 180 dB would be a serious mistake. The 180 dB level was intended only to prevent immediate serious injury and was based on extrapolations from terrestrial mammals. However, lethal impacts were observed on beaked whales in the Bahamas that were believed to be exposed only to lower levels. Orcas have exhibited strong behavioral responses to levels as low as 135 dB, and data and models presented at this conference suggested chronic exposure to levels below the current standard of 120 dB may have accelerated the decline of the Southern Resident population. Dangerous levels of noise may be a factor in the decline of the population, as an adult female was found dead near the site of a concurrent explosion. Her death also led to the loss of one of her offspring.

The group took the unusual step of making policy statements regarding noise. The group recommended that 1) maximum noise exposure be limited; 2) noise exposure at levels above 120 dB still require a permit; 3) the duration of exposure should be taken into account (whether short exposure that may result in unexpectedly high levels due to resonance or long-term exposure that may lead to energetic consequences); 4) mechanisms for impact in addition to hearing damage and immediate injury be considered; and 5) production of high levels of noise be avoided in areas used by large numbers of marine mammals.

Several noise related projects were recommended. When possible, ear histology and tissues bordering air spaces should be examined for evidence of acoustic trauma in stranded cetaceans. Noise should be monitored using calibrated recording systems. A catalog of loud noise sources, such as airguns, sonars, explosives, etc., should be developed. The catalog should contain spectra and source levels of the noise, as well as dates and locations of use. It should also contain information on marine mammals present at the time, and any records of impact.

Ballast water and floating plastics were recognized as mechanisms for transporting invasive species. While the ecosystem effects of invasive species cannot be predicted ahead of time, it

was recognized that in some cases they can be devastating. It was estimated that perhaps 50 non-native species had already established themselves in Puget Sound.

Monitoring and surveying for invasive species should be carried out to determine the effectiveness of efforts to prevent introduction of and to remove invasive species.

Global warming was recognized as a potential problem. Mechanisms for impact due to changes in species distribution include: change in prey availability, dispersal of invasive species, and emerging diseases.

An examination of middens for marine mammal parts may contribute to better understanding the consequences of climate change on marine mammal populations. The parasites and other pathogens carried by invasive species should be studied for their potential impact on native species.

VI C. Organization and Agency Discussion of Other Factors

Sound was recognized as a form of pollution. It should be regulated by international treaty as other pollutants are. Additional research on sources and effects of sound was recommended. Sponsorship of this research by government agencies was suggested. A campaign focusing on sound pollution, including military sources of noise, was proposed.

The US should also be encouraged to abide by international treaties for environmental protection such as the Kyoto Agreement.

It was proposed that Southern Residents such as Lolita and L98 should be returned to the community.

Orcas could be used as the focal point to discuss the health of the marine environment. Recognition of politicians who support orca recovery is another action that could be used to build public support for orca recovery. Engaging in educational activities outside the marine environment (e.g., at shopping centers) may be needed to reach enough people.

Studies showing Southern Residents are distinct from other populations would help them gain protection under the ESA and should be supported. Enforcement of existing laws and regulations would also help.

There was a suggestion to fund responsible science that is non-intrusive.

There was a need to commit to meeting again. Future discussions would benefit from the addition of more land-oriented conservation groups and participation by representatives of Tribal and First Nations governments. All need to be part of the recovery planning process.

In summary, though much of this discussion group content focused on the impacts of noise, there was a strong theme of the need to connect and coordinate resources and stakeholders on local, regional and international levels. The threats to the Southern Resident Orca whales and the ecosystem that ails them are not unlike other environmental crises. We recognize the need to work together in the context and framework of international standards while involving everyone

in the region. It is recognized that the participation of the public can only be harnessed with public outreach and education efforts.

VII. Concluding Remarks

The following remarks reflect the individual views of the individual editors and may not reflect the views of other participants of the conference.

VII A. Remarks by Will Anderson

The Need to Recognize Where the Solution Lies

The Orca Recovery Conference was created for the express purpose of creating a recovery plan for the Southern Resident orca whales. Organizers and participants at the conference recognized that the threats to the Southern Residents' survival are vast because we cannot "save" the orcas without "saving" the ecosystem. It appears that most of the critical assaults on the Georgia Basin-Puget Sound ecosystem and its southern resident orcas come from human activity that drives our economy.

Broad ecosystem solutions can not be found in a single agency or organization. Therefore, our response must be structured like an ecosystem of agencies, organizations and individuals.

The National Marine Fisheries Service failed to list the Southern Residents under the Endangered Species Act (ESA) choosing instead inadequate provisions of the Marine Mammal Protection Act. Only the ESA can provide the essential coordination and implementation of resources needed to prevent extinction of the Southern Residents.

Nongovernment agencies (NGOs) and state and local government are left to remedy faulty federal government decisions, advocate for the environment and to also educate and motivate the public to take action. The Orca Recovery Campaign of the Earth Island Institute has focused on public education with motivational content as well as worked to support and enhance the long-term efforts of other NGOs campaigning for the environment essential to the orcas.

The consumer currently holds the balance of power to prevent the decline and extinction of the Southern Residents. The increasing human population, the poisons running down household drains and off of lawns, the lack of water and energy conservation, unsustainable agricultural practices driven by the meat industry, the dearth of organic farmers and the relentless increase of noise pollution in the sea contribute to the degradation of the Southern Residents' environment. The consumer can fix these problems. Our consumer choices drive our economy and the environmental impacts that result. Consumers must understand and then take control of the cause and effect that each purchase has upon the environment (see www.saveorcawhales.org). A recovery plan needs to address the environmental impacts of consumer choice.

The Orca Recovery Conference goal to create a recovery plan is still a job that is only half done. If we are able to organize ourselves and function as a healthy ecosystem that reflects the diversity of the environment we seek to help heal, then the orcas will have a chance.

The conference hosts will be soon be announcing four workshops in the coming months to complete the recovery plan. We intend to identify goals and objectives, team leaders in both government and nongovernment fields, and the resources needed. On behalf of the Orca Recovery Campaign of Earth Island Institute, I want to thank you for your continued efforts and look forward to seeing further collaboration on behalf of the Southern Resident orcas.

Regards,

Will Anderson
Orca Recovery Campaign/Earth Island Institute
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Seattle, WA 98109

VII B. Remarks by David Bain

This conference was an excellent opportunity for people with a common goal, the recovery of Southern Resident Orcas, to come together and express divergent views. While great strides were made toward finding common ground, there are a few points that will need lengthy discussion to resolve.

One is the need for additional data. As a rule, to date scientists have taken a “gentle” approach to studying Southern Resident Orcas. As a result, some approaches have not been utilized extensively or at all, resulting in gaps in our knowledge. We now need to re-examine the trade-offs among non-invasive versus invasive methods, costs, and the urgency with which new data are needed.

For example, more data are needed on feeding behavior. These data could be collected by attaching video cameras to whales, or following at close range to collect fish scales after feeding events. These options are much more intrusive than waiting for a whale to pop up near a boat with a fish in its mouth, but will yield new and perhaps more reliable information at a faster rate than traditional methods.

Another example is biopsy sampling. Biopsy samples could provide important new data on toxin loads, pregnancy rates, stress, diet, genetics and perhaps physical condition. To date, this approach has been used sparingly with Southern Residents, but applying this invasive technique more extensively could significantly advance our understanding of what is happening to this population, and expedite its recovery.

An even more intrusive technique would be satellite tagging. This would be a cost-effective approach to determining ranging patterns. Whether this critical information can be obtained non-invasively with available funds remains to be seen. It is important for funding sources to realize that their ability to make funds available will help determine the impact of research on the population.

Thus the course of future research needs to be determined not only by scientific merit, but also by moral decisions regarding the appropriateness of proposed methods, priorities for allocating

limited resources, and what unproven assumptions society is willing to accept as the basis for management.

The area of unproven assumptions is particularly applicable to the whale watching issue. Short-term behavioral changes in the presence of vessels are well demonstrated, as is the vulnerability of orca hearing to masking. Nevertheless, until recently, it seemed to be a safe assumption that whale watching had no population-scale effects on whales. However, recent studies have shown a strong correlation between the size of the commercial whale watching fleet and population trends in Southern Residents. Energetic consequences of whale watching have been identified as a potential mechanism for this correlation.

While correlation and mechanism do not constitute proof of a causal relationship between whale watching and population decline, they do suggest that a dismissive attitude toward whale watching being a factor in the decline is no longer appropriate. PCB's probably peaked in the environment in the 1960's and 1970's. It is possible that peak concentrations early in life disrupted development, and we began to see the consequences of that in the mid-1990's. The onset of these problems may have appeared more suddenly than expected due to most of the 1960's cohort having been removed for public display. There is also little sign of a temporal correlation between changes in fish population size and changes in whale population size, although there is room for much better work on the subject. It would be productive to undertake more sophisticated modeling of these three mechanisms to generate testable hypotheses about what the population would be expected to do if each cause acted alone, or they acted synergistically. Additional data could be collected to test the hypotheses.

The population scale consequences of behavior changes and masking can only be modeled at this time. Like the models for population viability, these models require unproven assumptions to make specific predictions. Managers might choose precautionary assumptions that would give incentives to user groups to provide data to show managers are being overprotective, or managers might use other assumptions that would give incentives to protection groups to generate new data. It would seem wise for all groups to sponsor research so that managers can rely on facts to reach the right decisions rather than forcing them to rely on unproven assumptions to reach decisions that could be disputed endlessly.

While there was not agreement on what form whale watching should take in the future, the reasons people gave for their positions point in the general direction of an appropriate form. For example, concern was raised about effects of noise. This concern was responded to by modifying practices to reduce noise. Concern was raised about behavior changes caused by close approaches. This concern was responded to by modifying practices to increase the minimum approach distance. Benefits through educational efforts were claimed and these have been met with a proposal to develop material to improve the educational programs. At the same time, research was proposed to determine what impact whale watching actually has, and how impact could be reduced to levels that will not affect population viability. While this approach (Adaptive Management) does not immediately eliminate all impact from whale-watching as the Precautionary Principle would require, it does reflect a pro-active and interactive process designed to reduce harm while at the same time increasing benefits. Moving expeditiously along this path may be the best way to resolve the issue and give the best chance for the recovery of the population.

Finally, it is important to emphasize the need for bilateral cooperation between the United States and Canada, and it was encouraging to see representatives of both governments endorsing this. While voluntary actions can get recovery off to a quick start, a treaty will be needed to make recommendations enforceable. This conference was a good start to discussions of the issues such a treaty would need to address. These discussions need to be continued in the near future, and concrete actions need to start now.

VII C. Remarks by Michael Harris

President of the Board, Orca Conservancy



Orca Conservancy was a proud co-sponsor of last spring's extraordinary three-day Orca Recovery Conference, conceived and conducted as a unique opportunity for agencies, marine scientists and non-governmental organizations [NGOs] to collaborate directly and intensively on creating a cohesive recovery plan for Puget Sound's endangered Southern Resident Community. Nothing like this has ever been attempted in the region, and despite the assembly of otherwise odd bedfellows, the participants found more common ground than differences. The Conference delivered unprecedented agreement on what needs to be done to save our orcas.

The first shared premise is that the decline of Southern Resident orcas is directly linked to *human activities*. The entire ecosystem is endangered, and only an **ecosystem approach** to addressing the orca crisis will yield results. We cannot save the whales without saving the habitats on which they depend.

A key concern brought to the Conference is **vessel impacts**. Although the discussion of potential whale watching impacts elicited the most emotion and media attention, the consensus among the participants was that these boats are only small part of the overall concern about potential vessel impacts to orcas. Over 10,000 freighters and tankers transit Haro Strait each year, and without better cross-border cooperation and oversight the risks to the region's wildlife increase exponentially. As we sleep each night, a vessel carrying three times the amount of oil spilled in the *Exxon Valdez* spill transits this remarkable marine habitat, through strong currents and narrow passages. **The threat of a catastrophic spill** in the region was identified as a very real and serious one to be addressed, concurring with the finding of the Biological Review Team report of the The National Marine Fisheries Service [NMFS] which noted a potential oil spill as the foremost acute threat to the survival of Southern Resident orcas. Yet, participants concurred it was one that could be easily addressed. A full-time rescue tug stationed at the entrance to the Strait of Juan de Fuca was noted as one of several important mitigation measures. Better citizen oversight of industry and state and federal agencies also would provide a level of protection against catastrophe.

Perhaps the most serious synergetic impact currently caused by humans on the water is **noise pollution**, a cacophony created by the churning propellers of freighters and tankers, the buzz of whale watch boats, the pings of fish finders and depth sounders, the blast of seismic surveys and increased and recently deregulated Navy sonar, which has proven to be lethal to whales and dolphins. Jacques Cousteau called the oceans "The Silent Realm," but the more we learn about

the undersea world the more we discover it to be a din of man-made sounds. Participants noted that these sounds could be masking the echolocation of orcas, making it more difficult for them to find food. The increased energy expenditure now required by the whales to simply make a living amongst this clatter may very well be contributing directly to the decline of the population. It's hard enough to find the fewer fish without them being made harder to find by noise. These factors combine to create food stress, which in turn leads to the release of PCBs and other accumulative toxins stored in the orcas' blubber.

The region's burgeoning vessel traffic also raises serious concerns about ecosystem changes due to the introduction of **invasive species**, carried in the cargo and ballast of ships calling to local ports. These problems continue to plague other sensitive wildlife habitats around the world, namely The Galapagos Islands and Australia. In all, our primary means of interacting with orcas, vessels, are perhaps the most pressing challenge to conserving them. A specific proposal presented by Orca Conservancy called for the establishment of mandatory **licensing of recreational boaters**, an idea supported by The U.S. Coast Guard, and in that a comprehensive instruction on operating vessels safely around marine mammals. We believe this is a concrete and immediately achievable measure to mitigate impacts on orcas.

Every boat on the water is contributing to the crisis. Whereas whale watching is an issue that needs to be considered and addressed, simply targeting that industry diminishes the discussion, promises primarily an esthetic mitigation [eliminating the optics of boats on orcas], and goes after the whale watch community, letting polluters, shipping and Big Oil off the hook. It essentially divides the orcas' constituency. And as the Conference concluded, when it comes to addressing the orca decline, divided we fall.

In summary, the Conference made clear that addressing the orca decline on such a broad **ecosystem** level can only be achieved through collective action, involving many of the same players participating in this three-day gathering. Federal agencies, scientists, researchers and activists on both sides of the border need to continue the collaborative work undertaken at the Conference, concur on constructive measures, and take concrete action now to restore the population. No one party can or will accomplish this critical objective, as demonstrated by NMFS's shameful failure to list the Southern Resident population as Endangered under the Endangered Species Act [in which Orca Conservancy was a co-petitioner]. We simply cannot rely on the federal agencies to do the right thing, particularly in the Pacific Northwest where nearly all the research and protection of marine mammals has been left to private organizations. And as Sen. Maria Cantwell so eloquently called for at the Conference, a better cross-border collaboration between NMFS and the Department of Fisheries and Oceans Canada needs to be established, namely a **Bilateral Commission** that will eliminate the historically poor communication and cooperation that has hampered conservation and recovery strategies in the region. Orcas recognize no boundaries. Nor should humans trying to save them.

Like many of the groups and individuals participating in the Orca Recovery Conference, Orca Conservancy is energized by the discussions and strategies presented during these three important days in Seattle. We departed the Conference with far better information about the ecosystem, the orcas and most importantly, *ourselves*. We know what must be done. Now, we need to take action.

VII D. Concluding Remarks by Paul Spong

Scientific proposals for evaluating and addressing the problems faced by the Southern Resident orca community relied heavily on invasive techniques. Indeed, it was difficult to discern the presence of non-invasive proposals among the clamour for invasive methodology. Tagging proposals included the suggestion that bolted tags requiring capture would assist definition of winter ranges; biopsy proposals included the suggestion that repeated sampling of mothers and offspring would help definition of toxin impacts; instrumentation proposals included the placement of "critter cams" to determine prey species, and acoustic monitoring devices to aid assessment of noise impacts. The proponents of invasive methodology made NO comments related to the impacts of their techniques on targeted individuals or the population at large, nor did they address alternatives. It was nevertheless clear from audience reaction that invasive methodology carries the downsides of negative public perception and additional burdens of stress on an already overly stressed population.

VIII. Acknowledgements

The conference depended upon the help of the many volunteers. Melinda Graetz, Jennifer Johnson, Molly Bailey, and Kelly Balcomb-Bartok provided extensive notes that improved the quality of this report. We also thank the many people who provided helpful comments on drafts of this report. We are especially grateful for the effort Stephanie Buffum and Marc Pakenham put into preparing the end-of-conference PowerPoint summary. Though we greatly appreciate their work, they are not responsible for the final content or omissions or errors that may be in this Conference Report.

We would also like to thank the hosting organizations whose support made the conference possible: Earth Island Institute, Orca Conservancy, Center for Conservation Biology at the University of Washington, and the Canadian Consulate General, Seattle. We also thank the supporting organizations whose financial contributions significantly improved the quality of the conference: The Humane Society of the United States, Russell Family Foundation, People for Puget Sound, and the Puget Sound Water Quality Action Team/Office of the Governor.

Jennifer Marsh, Nancy Pennington, Melissa Milburn, DJ Mar and Erin O'Connell also made important contributions to the success of the conference.

We wish to give a special thanks to the Discussion Group Moderators: Patrick Higgins, Canadian Consulate; Stephanie Buffum, Friends of the San Juans; and Marc Pakenham, Fisheries and Oceans Canada.

IX. Addendum

IX. A. Several broad overviews were available on the World Wide Web at the time this report was prepared. Readers are advised to see:

Status of Killer Whales in Canada by Robin Baird (the "COSEWIC Report") at www.earthisland.org/immp/orca/doc1.pdf

Status Review under the Endangered Species Act: Southern Resident Killer Whales (*Orcinus orca*) by NMFS Biological Review Team at www.earthisland.org/immp/orca/doca2.pdf

Petition to List the Southern Resident Killer Whale (*Orcinus orca*) as an Endangered Species under the Endangered Species Act by the Center for Biological Diversity and co-petitioners at www.earthisland.org/immp/orca/doca3.pdf

Southern Resident Killer Whale Workshop 2000 by Marilyn Dahlheim, David Bain, Christy Sims, and Douglas Demaster at www.earthisland.org/immp/orca/doca4.pdf

Georgia Basin-Puget Sound Ecosystem Indicators Report by the Georgia Basin-Puget Sound Environmental Indicators Working Group at www.earthisland.org/immp/orca/doca5.pdf

IX. B. In addition, several more specific documents are available at the conference website

Evaluation Of Factors Influencing The Population Dynamics Of The Southern Resident Population Of Killer Whales (*Orcinus Orca* [L.] by Carlos Alvarez-Flores and Glenn VanBlaricom at www.earthisland.org/immp/orca/docb1.pdf

A Model Linking Energetic Effects of Whale Watching to Killer Whale (*Orcinus orca*) Population Dynamics by David Bain at www.earthisland.org/immp/orca/docb2.pdf

Population Trends of Southern Resident Killer Whales (*Orcinus orca*) From 1960-1999 by David Bain and Kenneth Balcomb III at www.earthisland.org/immp/orca/docb3.pdf

The Navy's Relative Contribution to Puget Sound Pollution by Fred Felleman at www.earthisland.org/immp/orca/docb4.pdf

A Review of Potential Infectious Disease Threats to Southern Resident Killer Whales (*Orcinus orca*) by Joseph Gaydos, Kenneth Balcomb, III, Richard Osborne and Leslie Dierauf at www.earthisland.org/immp/orca/docb5.pdf

Bioenergetic Changes From 1986 To 2001 In The Southern Resident Killer Whale Population, *Orcinus Orca* by Birgit Kriete at www.earthisland.org/immp/orca/docb6.pdf

Addressing Non-Point Toxic Effluent: One Possible Solution to the Decline, A Proposal by Project SeaWolf by Michael Kundu at www.earthisland.org/immp/orca/docb7.pdf

Wave of the Future: Orca Pass International Stewardship Area by Bryan Nichols at www.earthisland.org/immp/orca/docb8.pdf

Short- and long-term effects of whale watching on killer whales (*Orcinus orca*) in British Columbia by Andrew Trites and David Bain at www.earthisland.org/immp/orca/docb9.pdf

Behavioural Responses of killer whales (*Orcinus orca*) to whale-watching boats: Opportunistic Observations and Experimental Approaches by Rob Williams, Andrew Trites and David Bain at www.earthisland.org/immp/orca/docb10.pdf

Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act by Fish and Wildlife Service and National Marine Fisheries Service at www.earthisland.org/immp/orca/docb11.pdf

Recovery Planning Guidelines by NMFS Office of Protected Resources at www.earthisland.org/immp/orca/docb12.pdf

Endangered and Threatened Wildlife and Plants: 12-Month Finding for a Petition to List Southern Resident Killer Whales as Threatened or Endangered Under the Endangered Species Act (ESA) by NMFS at www.earthisland.org/immp/orca/docb13.pdf

Regulations Governing the Taking and Importing of Marine Mammals; Eastern North Pacific Southern Resident Killer Whales by NMFS at www.earthisland.org/immp/orca/docb14.pdf

IX. C. Conference Press Release

6 June 2002

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Bilateral Cooperation Key to Orca Protection and Recovery

Enhanced bilateral cooperation is needed to protect and assure the recovery of the Southern Resident Orca population. This finding was made in a powerful joint statement at the conclusion of a three-day Orca Recovery Conference in Seattle, Washington. The purpose of the conference was to draft a recovery plan for the orcas of Puget Sound and Georgia Strait whose population has declined by 20% since 1996.

Participants in the conference included international scientists, representatives of the National Marine Fisheries Service (NMFS), the Government of Canada, U.S. Senators Maria Cantwell and Patty Murray, former Secretary of State Ralph Munro, environmental organizations and members of the Washington Whale Watch Operators Association (WWWOA).

Formally known as the "Southern Resident Community", the entire population is down to just 79 whales. They are being impacted by declines in salmon, high levels of PCB poisoning, acoustic pollution from vessel traffic and Navy activities and the general decline of the Puget Sound ecosystem. Their continued survival is also threatened by the risk of a catastrophic oil spill.

The Conference kicked off with a remarkable call to action by Washington's Senator Maria Cantwell. "While there are existing treaties between our countries on orcas, I believe that what

is missing is an established protocol for decision making between U.S. and Canadian agencies to quickly respond to situations like the orphaned orca off Vashon Island," says Sen. Cantwell. "Ultimately, cooperation between the U.S. and Canada is a vital component in the overall recovery of the Southern Resident Orcas. The time for taking action to save the orcas is now. There can be no doubt that the Southern Resident Orcas are a population in deep trouble."

The government of Canada listed them as an Endangered Species in 1999. A majority of participants called on the National Marine Fisheries Service to list the Southern Resident Orcas under the U.S. Endangered Species Act, and endorsed the creation of an International Advisory Council for Orca Recovery.

"The Government of Canada has already begun work on a recovery strategy for Southern Resident Orcas and Canadian scientists are among the world's leading marine mammal researchers. Canada welcomes the suggestion from Senators Cantwell and Murray to expand bilateral cooperation on this important effort," said Patrick Higgins of the Canadian Consulate.

"We already have enough data on the Southern Resident population as an endangered orca stock and to define it critical habitat with a high level of confidence," said Dr. Martin Taylor of the Center for Biological Diversity, co-author of the ESA petition.

Dr. Paul Spong, director of British Columbia's renowned land-based research institution OrcaLab and co-founder of Greenpeace's Save the Whales campaign some 30 years ago, said, "We have to lower people's expectations. Instead of encroaching ever closer to the whales, we need to encourage a more benign, non-invasive interaction. We need to appreciate them in their natural habitat, to allow them the freedom to make a living. Perhaps no other group has contributed to building the public's understanding of orcas than whale watchers. And here in Washington and British Columbia, commercial operators have done a pretty good job so far regulating themselves, but clearly we all need to do more."

The draft report of the NMFS Biological Review Team found the risk of an oil spill to be the most acute threat to the continued survival of the Southern Resident Community. "Commercial vessel traffic bound to ports in British Columbia and Washington State make the waters shared with the Southern Resident Community among the busiest in North America. The lack of strategically placed rescue tugs along the vessel traffic lanes, as is done in Prince William Sound since the spill, makes the likelihood of a catastrophic accident an inevitability in Washington," said Fred Felleman, MSc. of Orca Conservancy.

"There are many forms of pollution. Noise is toxic if you make your living listening for your prey," said Mark Palmer of the Earth Island Institute.

"If you're an orca, "home security" translates to an abundant food supply free from toxins and harassing sound. It should come as no surprise that the orca are following the fate of their primary prey, salmon, which are listed as threatened under the Endangered Species Act. We need to ensure that salmon and their prey (herring, surf smelt and sand lance) are protected and their habitat restored if we want to create a secure home for the orcas. One of the States last great herring spawning grounds, Cherry Point, is still under assault and barriers to salmon such as the Elwha Dam need to be removed," said Stephanie Buffum, Executive Director of Friends of the San Juans.

"Every person has an essential role to play in the recovery of these whales because every person is contributing to their decline. How we live and what we consume are impacts we can modify and control. Information on how to act and help these whales now can be found at www.saveorcawhales.org," concluded Will Anderson of Earth Island Institute's Orca Recovery Campaign.

The Conference was sponsored by Earth Island Institute/Orca Recovery Campaign; the Center for Conservation Biology, Department of Zoology, University of Washington; Orca Conservancy; and the Canadian Consulate General, Seattle.

Participants included: International orca experts, Center for Biological Diversity, Earth Island Institute, Fisheries and Oceans Canada, The Russell Family Fund, OrcaLab, Friends of the San Juans, Georgia Strait Alliance, People for Puget Sound, Natural Resources Defense Council, Humane Society of the U.S., Oceans Blue Foundation, The Whale Museum, Washington Toxics Coalition, Washington Whale Watch Operators Association, Prince of Whales Charters, Orca Relief Citizens' Alliance, Olympic Environmental Foundation, Marine Ecosystem Health Program, American Cetacean Society/Puget Sound Chapter, Shoreline Schools.

IX. D. Readers are encouraged to visit web sites of participating organizations for more details and opportunities to support and participate in recovery efforts. These include:

American Cetacean Society Puget Sound Chapter at www.acspugetsound.org and www.acsonline.org

Center for Biological Diversity at www.biologicaldiversity.org

Center for Whale Research at www.whaleresearch.com

Colorado College OVAL Project at www2.coloradocollege.edu/environment/research/OVALItems/newOVAL_Project.html

Department of Fisheries and Oceans Canada at www.pac.dfo-mpo.gc.ca

Earth Island Institute Orca Recovery Campaign at www.saveorcawhales.org

Friends of the San Juans at www.sanjuans.org

Georgia Strait Alliance at www.GeorgiaStrait.org

The Humane Society of the United States at www.hsus.org

Marine Ecosystem Health Program (MEHP) at <http://mehp.vetmed.ucdavis.edu/>

Marine Mammal Monitoring Program (M3) at www.salishsea.ca/M3home.html

National Marine Fisheries Service Northwest Regional Office at www.nwr.noaa.gov/mmammals/whales/srkw.htm

Natural Resources Defense Council Oceans Program at www.nrdc.org

Oceans Blue at www.oceansblue.org

Olympic Environmental Council at www.olympus.net/community/oec/

Orca Conservancy at www.orcaconservancy.org

Orca Free at www.orcafree.org

Orcalab at www.orcalab.org

Orca Network at www.orcanetwork.org

Orca Relief Citizens' Alliance at <http://www.orcarelief.org>

People for Puget Sound at www.pugetsound.org

Prince of Whales Charters at www.princeofwhales.com

Project Sea Wolf at www.projectseawolf.com

Russell Family Foundation at www.russellfamilyfdn.org

Save Our Wild Salmon at <http://www.wildsalmon.org>

Shoreline Schools at www.shorelineschools.org

Washington Toxics Coalition at www.watoxics.org/toxmenu

Whaleman Foundation at www.whaleman.org

The Whale Museum at www.whalemuseum.org

Whale Watch Operators Association Northwest at www.nwwhalewatchers.org

The final version of this report is available at www.earthisland.org/immp/orca/orcreportfinal.pdf. Please check www.saveorcawhales.org from time to time for new developments in the recovery process.