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Science in the Service of Washington State

Washington State Academy of Sciences
Committee on Underwater Acoustics and Disturbance
Q&A prepared for the WDFW Advisory Committee

The Washington State Department of Fish and Wildlife (WDFW) has contracted with the Washington State Academy of Sciences (WSAS) to facilitate a scientific and technical review of the best available science for disturbance and noise impacts to Southern Resident Killer Whales (SRKW) from small vessels and commercial whale watching, as requested by SSSB 5577 (2019).

WDFW's Advisory Committee tasked with developing new whale watching rules per SSSB 5577 has asked WSAS's Committee on Underwater Acoustics and Disturbance (Appendix A) to answer the following specific questions about underwater acoustics and disturbance to inform their proposals for rulemaking. This work product, one of several under contract 19-14506, also includes a draft full reference list (Appendix B). This document should be considered as preliminary and as part of a larger summary review that will be prepared by the end of the Summer of 2020.

Many of the questions posed by the Advisory Committee cannot be answered with certainty with current evidence. However, given the inherent uncertainties in knowledge due to research gaps, and the dire condition of the Southern Resident Killer Whale (SRKW) population, the committee recommends defining every interaction as an opportunity to disturb a whale and taking a precautionary management approach. According to the precautionary principle, when an activity threatens harm then measures should be taken—even if certain cause-and-effect relationships are not fully established scientifically.

SRKW Use of Habitat

(1) What do we know about the historical occurrence of SRKW?

- The SRKW population is composed of the J, K and L pods of extended family members. They travel in these pods from central Southeast Alaska to central California, with extended stays in the Salish Sea—the collective waters of the Puget Sound, Straits of Georgia and Juan de Fuca—and along the outer coasts of Washington and southern Vancouver Island.
- Each pod has different patterns of habitat use [Hauser et al 2007]. J-pod's range is more Salish Sea focused, with winter use of the northern Strait of Georgia noted by NOAA satellite tagging [research by B. Hanson and team], while K and L pods range more widely. Between 1976 and 2014, a database collected by The Whale Museum in Friday Harbor, Wash., showed sightings were concentrated in the central Salish Sea near the San Juan Islands during the summer months [Olson et al 2018]. Between 2009 and 2011, SRKW were detected acoustically at Swiftsure Bank, off the southwest coast of Vancouver Island on 24% of recorded days [Riera et al 2019], with detection rates averaging 42% between May and September. SRKW have also been observed in the lower Puget Sound area, outside the SRKW core summer habitat [Hauser et al. 2007, Noren & Hauser 2016].
- Out of 74 days of monitoring in 2019, Soundwatch detected SRKW on 15 days and transients on 50 days [Soundwatch 2019], and in 2018 Soundwatch observed SRKW on

34 of 65 monitoring days [Soundwatch 2018]. The 2019 observations of SRKW show a lower-than-typical occurrence in a historical perspective [Olson et al 2018]. While the number of Salish Sea sightings are lower in recent years, sightings data continues to point to the west side of San Juan Island (including Salmon Bank) as an area of habitat preference.

- The latest data suggest that the Strait of Juan de Fuca has become increasingly important for foraging, yet most published studies have not included data outside the SRKW core summer habitat near the San Juan Islands. Other areas such as southwestern Vancouver Island (including Swiftsure and Perouse banks) were proposed as habitats of special importance for the population [Ford et al 2017] and are now formally considered Canadian Critical Habitat. As prey availability changes, whale distribution is expected to change - thus, adaptive management will be important to tie regulations to observed animal distribution rather than a small geographic area.
- Ongoing and future studies of underwater acoustic data may further decipher current regions of SRKW foraging. As a whole, data suggest that SRKW currently spend only a small, yet biologically relevant, portion of their total time in the central Salish Sea, and that time is generally in the summer months. Restricting mitigation measures exclusively to that area may not fully protect the future of the species in Washington State.

(2) What are critical foraging areas and movement patterns of Southern Resident orcas? Would it be valuable for the recovery of the SRKW to identify historical and current foraging hot spots and apply restrictions to them? If so, please provide those locations.

- Noren and Hauser 2016 identified the key foraging locations as the southern region of Haro Strait southwest of San Juan Island; foraging locations are also highlighted in Ashe et al 2010 and Hanson et al 2010. In pursuit of migrating salmon, SRKWs were also found to forage further south in Puget Sound proper during the fall and early winter. These main foraging areas have persisted for several decades, as has their typical daily travel of 75 miles [Center for Whale Research; Noren & Hauser 2016]. The latest data suggest that the Strait of Juan de Fuca has become increasingly important for foraging, yet most published studies have not included data outside the SRKW core summer habitat near the San Juan Islands.
- A historical perspective on foraging locations indicates that historical foraging locations match recent foraging locations [Heimlich-Boran 1988, Hoelzel 1993] and indicate that SRKW foraging locations and patterns of habitat use are related to salmon abundance [Felleman et al 1991, McCluskey 2006]
- Data from the most recent studies were collected over a decade ago, and SRKW habitat use has changed in recent years. Data collection for the most recent studies were in the core summer habitat in inland waters, while some of the older studies included an expanded area into south Puget Sound. Most studies relied on surface observations of SRKW behavior, rather than verification of prey pursuit/capture. Recent studies that collected prey remains and studied underwater activity via DTAGs may corroborate the surface behavior descriptions. Systematically collected data on recent foraging hotspots is currently lacking. Reportedly, Frances Robertson, Marine Program Coordinator for San Juan County, is currently working on a report about critical foraging areas.
- Impact assessment studies suggest that reducing SRKW exposure to vessels when they forage will have beneficial effects for the individuals to continue fully contributing demographically to their population. Since reduced foraging in the presence of vessels has been observed, it would be valuable to protect key foraging hotspots. Adaptive management will allow vessel spatial restrictions to be reviewed regularly to accommodate any changes in SRKW foraging patterns.

(3) What should "vicinity of SRKW" mean? How many boats should be within vicinity?

- Studies have defined the "vicinity of SRKW" differently. Most studies report distances as rings emanating from whales. Soundwatch counts vessels within 1000 m, other studies include vessel counts up to 400m and 1000m [examples: Soundwatch 2019, Lusseau et al 2009, Holt et al 2009]. Given current data collection protocols, 1000 m can be used as a rough estimate of "vicinity," but vessel radiated noise, depending on vessel size, speed, and propulsion system, and environmental factors, can be detectable by orca beyond this distance. Given behavioral response data, 400m appears to be the vicinity range in which orca show behavioral responses; more research is needed to define the distance in vicinity of SRKW that boats can travel without negative effects.
- There is evidence with killer whales and other cetaceans that the effect of vessel presence increases with vessel numbers, particularly for three or more vessels.[Williams et al 2002, Williams et al 2009, Williams & Ashe 2007]

Vessel Presence and Behavior

(4) How has the quantity of small vessels around the SRKW changed over the past couple of decades?

(a) What is the speed, distance, time of day, numbers of vessels, and behavior of recreational vessels with and without whale watching boats present?

- The number of active commercial whale watching vessels increased from 63 in 1999 to 106 in 2018. The number dropped slightly in 2019 to 100, according to the Soundwatch Boater Education Program by The Whale Museum. The number of people kayaking near whales also significantly increased between 2004 and 2015, before dropping steadily over the last five years [Seely et al 2017, Soundwatch 2018, Soundwatch 2019].
- The number of vessel incidents or violation of regulations and guidelines has fluctuated in recent years, ranging from a low of 398 in 1998 to a high of 2621 in 2012. Incidents and violations dropped to 1,117 in 2018 and further to 749 in 2019 [Seely et al 2017, Soundwatch 2018, Soundwatch 2019].
- Vessel speed data is subjective and has not been collected. There are no published data on behavior of recreational vessels with/without whale watching boats, although there are reports of some data having been collected by Soundwatch.

(b) Are there studies on the % of time that SRKWs spend with or without small vessels in their vicinity in the inland waters of WA, and how that has changed over the last 5-10-20 years?

- The general increase in vessels over the last two decades has translated to an increase in traffic around SRKW—within 1000 meters. However, researchers also measured fewer vessels within 100 meters in 2018 and 2019. [Vancouver Fraser Port Authority (ECHO) 2019].
- There are limited data to answer this question. Two studies have three years of data on killer whales without vessels present [Lusseau et al 2009, Williams et al 2009], and much earlier data from observations from Lime Kiln Lighthouse in the 1980's and 1990's is maintained by the Whale Museum [Otis & Osborne 2001].
- Boat presence information is skewed by the data limitation that data is only available for the pods that are found, and that once a pod is detected by ecotour vessels, it is likely that vessels will remain in proximity for the remainder of the day.

(c) Is it possible to differentiate those trends by
(i) recreational versus commercial whale-watching versus other types of vessels,

- Soundwatch data provides vessel counts by type (recreational vs commercial whale watching) but does not have differentiation of data of the sound coming from each type of vessel.

(ii) behavior of whale watching boats with and without enforcement present, and

- The 2018 Soundwatch report found a reduction in regulation incidents with the presence of a law enforcement vessel.

(iii) corresponding behavior of the whales?

- Studies have found that effect size is related to the distance between vessels and whales, with larger effects closer to whales, and that leapfrogging increases severity of behavioral responses [Williams et al 2002].

(5) What is the relevance of past studies – how much do various previous study results apply to the current situation, given changes in vessel regulations?

- Many older studies report orca behavioral changes within certain distances, including distances that are beyond the current regulations, and with other vessel behaviors that have changed over time. As data were collected at greater distances than the guidelines/regulations at the time, some of that information could still be valid for interpretation. For example, Lusseau et al. 2009 showed reduced foraging when vessels were within 400 m of whales in any direction/orientation, not only the front and back. Predictions of cumulative effects that are based on outdated proximity regulations (including Tollit et al 2017) should be viewed with caution, as recent restrictions are predicted to reduce noise levels received by killer whales.
- It is important to differentiate studies that explored and described patterns in whale and vessel space use, for example, from those that aimed to infer insight about the mechanistic relationships between human exposure and whale response. The latter do not have an expiration date.

(6) Can you comment on the ecological benefits or potential impacts of electric engines to decrease underwater noise?

- Improved vessel technologies could reduce noise in the long term, but would take a long time to implement. Electrification of boats, which Washington State Ferries is currently pursuing for their fleet, could reduce some of the acoustic disruption. A newly published case study finds reduced noise from a solar electric ferry in the Swan River in Western Australia [Parsons et al 2020]; given the many environmental factors that affect noise propagation, ideally studies would be conducted in the Salish Sea. Electrification will not eliminate the need for propellers, however. Cavitation from propellers is the main source of vessel noise. Other technologies in development could result in boats that reduce cavitation and vibration; other propulsion mechanisms such as air-jets could increase broad-spectrum underwater noise.
- It is important to recall that while noise pollution is a factor mediating the way by which vessel interactions get in the way of killer whales, it is not the only one. Simply the presence of vessels (including non-motorised vessels such as kayaks) elicits behavioral disruptions as well [Williams et al 2011].

(7) Please provide analyses of the Soundwatch and any other relevant data over multiple years (at least 2011 – 2019) on (a) The sentinel effect of ecotour vessels and WA DFW vessels (Sentinel effect = reduction in the violations of recreational vessels) and (b) The magnet effect and/or anti-magnet effect of ecotour vessels and WA DFW vessels (Magnet

effect = attraction of recreational vessels; anti-magnet = reduction in recreational vessels)

- There currently is little published empirical evidence of a sentinel or magnet effect of ecotour vessels. The panel is aware that Todd Hass is currently analyzing Soundwatch data. The panel also suggests additional analysis of Straitwatch data.

Disturbance to SRKW

(8) Please comment on disturbance from vessel presence, in addition to noise; is there a number of vessels within 300, 400, and 650 yards that makes a difference for orca behavior?

- The presence of kayaks has also been found to increase the chances that killer whales show traveling behavior, suggesting silent boats can elicit avoidance responses in killer whales [Williams et al 2011]. Other studies suggest vessel presence is a concern [Pirotta et al 2015, Lusseau et al 2006 Mar. Mammal Sci.]
- When in close proximity to boats, SRKW appear to increase their surface-active behaviors [Noren et al 2009], increase call amplitude [Holt et al. 2009], modify respiration rate/surfacing patterns, change swim patterns and increase swim speed [Williams et al. 2009]. SRKW and NRKW also reduce their foraging behavior when in close proximity to boats [Lusseau et al 2009, Williams et al 2006, Lusseau et al 2007, Williams et al 2016]. While these studies were based on older federal marine mammal viewing regulations, two [Lusseau et al 2009, Williams et al 2009] assessed impacts of vessels at distances of 400 meters and 1000 meters. Similarly, vessel counts to 1000 meters correlated with ambient noise levels in Holt et al. 2009, and SRKW increased call amplitude with increasing ambient noise levels.
- The committee is not aware of further studies that tease out vessel noise from vessel presence or report how different numbers of vessels within the range of distances in this question impact killer whale behavior.

(9) In terms of disturbance to SRKW, is a single, larger boat better than several, smaller boats?

- More boats appear to create greater radiated noise levels around killer whales. A study of Northern Resident killer whales (NRKW) found that the animals changed their activity state when in the presence of more than 3 boats [Williams et al 2007]. Noise levels received by SRKW are correlated with the number of vessels within 1000 meters [Holt et al 2009]. While there are methodological constraints that limit the interpretation of the results and conclusions, the cumulative effect of large numbers of vessels was a contributor to physiological stress in SRKWs, particularly during years of relatively low Fraser River Chinook abundance [Ayres et al. 2012].
- Generally, fewer vessels around whales is better for the whales. Larger vessels are less likely than small vessels to behave unpredictably around the whales, and tend to have lower-frequency noise features that are less likely to overlap with SRKW vocalizations. Research results about the intensity of vessel noise is less clear.

(10) What is an acceptable level of sound for SRKW? What is the carrying capacity of vessel noise and disturbance on marine mammal populations? How should that be influenced by conservation concern (e.g. population status)?

- The question of the acceptable level of sound and carrying capacity of vessel noise and disturbance for SRKW is very difficult to study and thus answer. Specifying an acceptable level of sound would not be well-founded given the inherently fluctuating range of background levels of underwater noise.

    - A summary of problems that make specifying a noise threshold unrealistic and unenforceable are as follows:
        - The threshold would need both specificity to the SRKW hearing frequency range, along with higher frequencies of echolocation (20-60 kHz). Such a large bandwidth poses challenges to acoustic sampling.
        - The threshold would need specificity in terms of measurement depths as SRKW acoustically use the entire water column when foraging [Holt et al. 2019]
        - Statistically reliable estimates of the noise requires continuous measurement on the scale of days, not hours, but mammalian auditory processing requires shorter averaging times; however, short time estimates will be encumbered with huge variability. The relevancy of the enforcement monitoring will be highly questionable.
    - One study indicated behavioral changes of NRKW at broadband received levels of 130 dB [Williams et al 2014b]
- There is currently uncertainty about the maximum sustainable level of vessel noise and disturbance for the SRKW population, especially because the maximum disturbance is contextual and dependent on ecological factors (e.g., if there is more food, SRKW can better handle disturbance). Some estimates can be made by reviewing population consequences of disturbance (PCOD) models. Adaptive management plans can stipulate changes in the plan based on changes in population status over time. One example is the IWC Revised Management Procedure (https://iwc.int/rmp), which introduced a ban on extractive activities until populations recover, similar to addressing bycatch conservation issues.
- The conservation status should be considered in estimating cumulative interaction exposure that can be permitted now. (See management section below for more detail)

Impacts on SRKW Foraging

(11) Studies have been cited that state SRKW lose substantial foraging time due to vessels and vessel noise (Lacey 2019, SMRU/ECHO 2017)

(a) please address the circumstances of these studies (eg vessels at speed or slowed to 7 knots or less, distance from SRKW, etc)

- Lacy et al 2019: Current noise disturbance was estimated to reduce orca feeding by 16.6%. This estimate was based on observed reduced orca foraging behavior within 400m proximity of whale watch vessels (by 25%, documented by Lusseau et al. 2009), affecting times only when orca are foraging (estimated to be 78% of time) and in the presence of vessels (estimated to be 85% of the time).The study thus uses an estimate of a summer day-time in which whale watch boats affect all pods to model year-round effects; the inputs used in this approach likely overestimates noise effects.
    - Lacy et al. suggested the effects of Chinook prey abundance had a greater effect on population growth rate than noise disturbance. A 2019 DF0-CSAS report by Murray et al. highlighted a similar result, noting noise disturbance as having a 3.5% effect on foraging, increasing to 10% under “high noise” scenarios.
- SMRU/ECHO 2017 report (unpublished): This model predicted whale watching boats (both commercial and recreational, May through September) reduced prey detection

range through masking of echolocation clicks by 5% to 34%, and potentially impacted foraging for 5.4% of each day or 8.5% of days when whales are present. The per day 5.4% value best represents average summer boat noise effects if one assumes that little whale small-boat interaction occurs when pods are not sighted in the inshore Salish Sea study area. When combined with noise from commercial vessels, the values were 13% and 20% for the summer period assessed.

  - This unpublished study uses multiple different datasets and assumptions to estimate cumulative noise effects. It undertakes sensitivity analyses on several key assumptions but does not assess the effects of boat presence.
  - The effect of noise by whale watching boats was assessed mainly through click masking which was estimated through back-calculation of noise from 5 vessels, moving at 3 to 10 knots and approaching within 100 meters. The communicative sounds used as metrics can communicate movement while foraging, facilitating prey-sharing.
  - The authors [Tollit et al, 2017] highlight high uncertainty, especially in converting range reduction of clicks through boat noise masking to a unifying impacted foraging time metric.

(b) whether the issues would have been addressed with WA state's 2019 regulations.

- Regarding whether issues would have been addressed with WA 2019 regulations, we can only offer opinions based on previous studies. Since regulations at various jurisdictional levels have changed every few years and compliance is variable, it is difficult to assess whether issues have been addressed by previous or current regulations.
- Speed reductions:
  - Speed reductions appear to reduce acoustic disturbances for whales. A speed reduction from 5-6 knots down to 0-2 knots reduced levels received by whales by an average of 4 to 5 dB, according to a study using digital acoustic recording tags (DTAGs) [Houghton et al 2015]. Another study found similar results using an expanded DTAG dataset [Holt et al 2017]. Vessels operating at moderate-to-high speeds produce greater masking effects than lower speeds [Houghton et al 2015, Holt et al 2017]. Researchers have found large-scale reductions in noise levels when comparing speeds of greater than 15 knots versus speeds below 7 knots, across a variety of boat types [Wladichuk et al 2019]. Noise levels have been found to increase with speed for small boats [JASCO 2019]. A voluntary slowdown trial in the Salish Sea to 11 knots showed reduced underwater noise in the slowdown area, to a predicted overall 22% reduction in 'potential lost foraging time' for SRKW, with 40% reductions predicted under 100% participation scenarios. [Joy et al 2019]
  - Studies suggest a stronger speed-sound correlation in the SRKW echolocation band than in lower-frequency bands, which is likely due to propeller cavitation noise rather than engine noise.
  - While faster speeds increase the intensity of noise and the risk of vessel strikes, slower speeds expose orcas to noise for longer periods of time and potentially risk longer masking periods.
- Distance increases:
  - SRKW increase surface-active behaviors, change swimming patterns, reduce foraging behavior, and increase call amplitude in the presence of boats [Lusseau et al 2009, Williams et al 2009, Lusseau et al 2007, Williams et al 2016]. These studies are based on older federal marine mammal viewing regulations, with resulting close proximity of boats for some of the analyses. However, both [Lusseau et al 2009] and [Williams et al 2009] assessed impacts of vessels at

greater distances—400 meters and 1000 meters—which may still be relevant with updated regulations. A forthcoming report for Transport Canada by JASCO will report on call and click masking levels caused by 10, 17 and 27 whale watch vessels at ranges of 200, 400, 600, and 800 meters.

(12) Can the committee compare salmon fishing catch/effort to whale presence?

- This kind of comparison is not possible at the current time because salmon catches are compiled over large fishing areas, so data resolution is insufficient. However, research suggests that the impact of boat presence on the orcas is greater during a poor salmon year than in years when prey is ample [Ayres et al 2012].
- Despite the potential for low prey availability to be a major SRKW stressor, alleviating impacts on foraging behavior would be important in order to maximize the foraging opportunities that these whales have.

(13) Can the committee examine factors that cause SRKW to leave an area where prey is available?

- Reduced foraging, lower food availability, evasive behaviors and the production of louder calls have the potential to impact a whale's energy balance. SRKWs may increase energy expenditure by performing surface-active behaviors in the presence of boats [Noren et al 2009]. Foraging typically occurs during the day, when whale-watching vessels are most likely to be present [Baird et al 2005]. Noise disturbance from vessels reduces SRKW feeding by an estimated 16.6%, according to one study [Lacy et al 2017, discussed above)]. Though SRKW switch activity state away from foraging when disturbed, they do not necessarily depart the area entirely.

(14) Are there patterns in foraging effectiveness by time of day, time since arrival to a site, etc., or are there boat-independent conditions when SRKW are most vulnerable to disturbance? Can the committee provide guidance on critical times/areas for potential closures?

- Maximum dive depth [Baird et al 2005] and vocalization rate [Thornton et al 2019] data suggest that foraging typically occurs more during the day, when whale-watching vessels are most likely to be present. However, deep dives don't necessarily result in prey capture [Tennessen et al. 2019]. A current NOAA DTAG study is collecting data to understand foraging behavior and activity patterns throughout both day and night. However, many foraging factors are unknown and there is a dearth of research that addresses this particular question.

Management Strategies

(15) How could we best use existing data to look at effectiveness of the most recent (2019) regulations on SRKW?

- Not enough time has passed to evaluate the impacts of the latest regulations. But even if the restrictions prove to protect SRKW, they are only as effective as they are adhered to.

(16) Can the panel provide guidance on how to reduce daily impacts to SRKW? How to reduce cumulative impacts?

- The panel has two interrelated lines of thinking on this.
    - Gathering data about daily impacts is needed to assess cumulative impacts. However, given the myriad interacting risk factors these whales face, plus their

longevity and relatively low and slow reproductive output, attributing the relative contribution of daily vessel impacts to cumulative impacts, such as reduced body condition or diminished reproductive success, will be difficult, given the current tools/models.
    - Assessing cumulative impacts that confer population benefit vs. individual benefit is more in line with the goal of the intended regulations and provides room for more flexible management options.
- Reducing the amount of time vessels spend around whales would reduce both daily and cumulative exposure to noise and disturbance, which would reduce daily and cumulative impact. A quota system designed to manage cumulative interactions, could be combined with shorter timeframe measures such as a limits on the number of boats or time those boats spent in close proximity to SRKW.
- The practice of leap-frogging involves letting whales swim past boats and then speeding the boat ahead to get in front again. Research suggests this practice is more disturbing to whales than moving parallel to them from the side. [Williams et al. 2002a, Williams et al 2002b]. The Pacific Whale Watch Association's best practices no longer allow leap frogging.
- Canadian regulators have taken a precautionary approach in which recreational boaters must stay 400m away from all killer whales, whereas ecotour companies cannot approach any SRKW pods but can approach transients at a 200m distance. Consistent transboundary regulation would have value in terms of boater education.
- Permits could be used to require education to increase regulation compliance and require that operators record orca encounters (where, when, how long, behavior).
- Slow-go zones could be created in areas and times of expected high SRKW presence, as speed is a critical factor in noise output, as noted above.

(17) Is there justification for a mandatory no-go zone (e.g. West side of San Juan Island)?
- Boats could be altogether banned from entering areas where SRKW are currently known to spend substantial time foraging and limited to areas where little or no foraging takes place and where whales generally only travel through. In addition, if an exclusion zone is implemented for whale watching vessels, it could readily become an exclusion zone for other vessels in the future. In addition to conferring protection, exclusion zones could also offer an experimental control area for research studies.
- However, given the documented changes in SRKW's choice foraging spots over the recent years, such no-go areas may become outdated within a few years if no-go zones were to be spatially fixed for a period of years. For example, SRKW have not been present in the San Juan Island region as much in recent years as they historically had been. A more flexible approach could be temporary exclusion zones where exclusions are implemented adaptively, reviewed periodically, and lifted after data show a period of no SRKW presence. A 'slow-go'/slowdown approach could have similar noise reduction potential but may increase the amount of time SRKW spend with boats.

(18) Which programs/elements of other commercial whale watch licensing programs (on any marine mammal) or fisheries programs throughout the world could be a suitable fit for us to consider?
The following bullets are intended to be illustrative for the purposes of this Q&A, rather than exhaustive.
- Comprehensive overview of management approaches. A comprehensive overview of management approaches around the world is available from the international whaling commission: https://wwhandbook.iwc.int/en/

- Regulate density of whale watching vessels. Regulating the density of whale watching vessels is one way to achieve a reduction in SRKW exposures to vessels. This approach could allow industry to develop new business models to maintain operations. In 2017, a limited entry system was imposed for the whale shark watching industry in La Paz, Mexico. The effort decreased the number of boats and, reportedly, improved the experience of tourists. On the other hand, a licensing program that limits the duration and number of vessels near SRKWs could have the unintended negative consequences of distributing the effects of noise and disturbance across a greater number of orca groups or individuals. Such unknowns lend themselves ongoing monitoring and adaptive management.
- Education. Licensure could require education on a variety of behaviors that could reduce SRKW exposures such as staying downwind from the whales to reduce vessel exhaust, turning off echosounders when in proximity of whales, and reducing changes in speed, starts, stops and gear shifts. Changes in speed are likely to create maximum cavitation and should be particularly discouraged.
- Special protections for specific SRKW demographic groups. Programs could have additional protections for specific demographic groups that are most likely to be negatively affected by disturbance. For example:
    - In Australia, extra protective rules apply to mothers and calves to protect lactating mothers with high energetic demands.
    - In Saguenay-St. Lawrence Marine Park (Québec, CA), regulations were developed in collaboration with users and include maximum navigation speed in the park, lower speeds when marine mammals are present, a minimum distance from marine mammals, maximum time boats can spend in an observation zone, and temporary exclusion areas. Permits are required for activities in the park, the number of permits is capped, and there are training (on behavior to avoid disturbing blue and beluga whales) and reporting requirements for whale-watch operators as well as education requirements for passengers.
    - Pelagos Sanctuary (Ligurian Sea) developed a management plan and requirements for conduct by tour operators. Some of the requirements include a 300-meter vigilance zone around whales where only one boat is allowed at a time, observation time is limited to ½ hour per boat and 15 minutes if other boats are waiting, and where sounders and sonar must be switched off.
    - In Doubtful Sound, New Zealand, the NZ Department of Conservation has worked in collaboration with the tourism industry to introduce interaction avoidance (no-go zones) in critical areas for a population of bottlenose dolphins listed as critically endangered [Lusseau 2004]. This has resulted in a significant reduction in the time dolphins spent with boats and a significant reduction in the length of interactions [Guerra & Dawson 2016].

(19) Can the panel provide guidance on best proxies for measuring impacts, given the limited scope of these regulations, and how to translate short-term metrics into long-term impacts (what is the relationship)?

- Given the complexity and interconnectivity of risk factors, it would be challenging to relate positive changes in body condition, reproductive success, calf survival, or population growth rate solely to vessel regulations.
- Daily foraging rates and the daily number of successful foraging events (from tag data), are a metric that would be a proxy for orca energy balance that would link to condition of health.
- Bioenergetic studies are one way to translate short-term metrics such as behavioral changes into long-term impacts like changes in condition and reproduction.

- The National Academies' study references body condition, particularly calf condition, as a metric that reflects on population growth rate [National Academies 2017]. However, using this metric would require a longer timescale to see impacts, and other risk factors can potentially impact body condition.

(20) What are appropriate rubrics to consider for our adaptive management strategy, e.g. population parameters? What metrics should be used for adaptively managing these regs? Could body condition be used as a nimble adaptive management metric, and if so, how could that be measured and what might the triggers be?

- Management metrics are most useful when they are clear, simple, explicit, easy to enforce and associated with a specific assessable goal. For example, the number of boats or speed is easier to regulate than a vessel's noise output.
- It will be difficult to link population changes to management actions, especially in the short term. Given the unlikely event of any significant birthing between now and 2026 for SRKW, short-term behavioral and physiological changes are likely better measures of success for SRKW.
- Examples of metrics include, but are not limited to:
    - Habitat use, measured by SRKW distribution and frequency,
    - Foraging time (as in Q19, above),
    - Stress and hormone levels,
    - Body condition, particularly the condition of females and juveniles, with the following caveats to using this metric:
        - It represents a metric of cumulative effects (including salmon availability, contaminant loads, etc.), not vessel effects alone.
        - Killer whales have a thick blubber layer that can buffer periods of low food availability, so body condition changes will not be observable on a short time scale.
        - It is unclear what body condition values represent good condition, especially for lactating females and juveniles, as eye patch ratio changes with growth until 15 years of age, and lactating females decline in condition relative to their pregnant "bulked up" condition.

(21) What do we even focus on reducing from? Or do we reduce to? That is, do we focus on what the target noise and disturbance levels should be and how to get there, or what the baseline is and how much it should be decreased from there?

- This question is challenging to answer. The current level of disturbance has been recognized by policymakers as unsustainable. Future adaptive management schemes could address the "reduce to" issue by adjusting management strategies on a regular periodic cycle based on new data and analyses.

(22) Will the Science Panel use a scoring matrix, similar to what TC/DFO did last year, that evaluates feasibility, effectiveness, etc. of the Advisory committee package proposals and/or individual measures?

- The panel may consider this strategy to provide feedback that is useful to the Advisory Committee's proposed regulations (forthcoming July 2020), with the caveats that we would not want to replicate what has already been done, and that this can be a challenging proposition. Determining effectiveness depends on where and when measures are imposed and feasibility is difficult to gauge without socio-economic considerations which are beyond the charge of this committee.

(23) Can the panel identify specific data gaps that would best inform this process going forward?

The topics noted below are areas identified by the Advisory Committee as examples of where more data are needed. As the WSAS panel continues its review and summary of research, it likely will identify knowledge gaps that need to be filled in order for adaptive management to occur. One of the core research issues is that much of the SRKW data is disparate and difficult to access.

- ***Boats and boat noise:*** Little is known about the directivity of boat noise, and how the type of propeller or motor a vessel uses might affect the noise it generates.
- ***Foraging areas:*** A clear understanding of where SRKW forage successfully will be important. We are aware that local researchers have unanalyzed data on the density and distribution of boats, particularly in core foraging areas, but no analyses have been published yet. In addition, there are some data on foraging success and location from studies using DTAG and post-foraging scale-collection; however, it could be helpful to generate bounded monthly or seasonal use estimates of a large sub-area of the SRKW range by pooling acoustic, sighting, and other data, and match this with some estimate of boat interaction in the sub-area. We are also aware that the San Juan County Marine Program is currently teaming up with Oceans Initiative sites to evaluate how SRKW group size and group dispersion has varied over the last 18 years and how Chinook salmon abundance may play a role in determining the grouping behavior of SRKW.
- ***SRKW-specific studies***: Few studies have looked directly at noise and disturbance effects on SRKWs, including their echolocation clicks, the degree of impact from sound exposure levels versus sound type variation and the physical presence of boats. It remains unclear what an acceptable level of sound might be for this population.
- ***Defining management values:*** Research is needed to define how much interactions should be reduced, and by corollary the SRKW maximum sustainable tourism yield. The approach used could be similar to the Potential Biological Removal (PBR) estimation procedure of bycatch conservation strategies.
- ***Filling in critical context:*** Using only sound levels as proxies for vessel impacts and ignoring the total presence, proximity, and relative orientation and movement of disturbances relative to the orcas will fall short of fully evaluating impacts from many sources and achieving science-based conservation.
- ***Disentangling factors to measure impacts***: Quantifying and observing cumulative effects on cetaceans is difficult and currently not possible, especially in light of changing baselines (e.g., regulations, ecologies of prey and whales). For example, vessels and noise generally occur together. No study of killer whales has teased apart vessel presence from noise generated by vessels, with the exception of the observational study on kayaks. A study is needed in which vessel noise is broadcasted and responses are measured in the absence of any physical vessel.
- ***Current events***: It is not clear whether the COVID-19 pandemic has decreased ocean noise and thus creates an opportunity for study. Anecdotal evidence suggests recreational and commercial vessel traffic has shifted, but not declined.

APPENDIX A – Q&A prepared for the WDFW Advisory Committee
WSAS Committee for Underwater Acoustics and Disturbance

Peter Dahl – Senior Principal Engineer, Acoustics Department, Applied Physics Laboratory; Professor, Mechanical Engineering, University of Washington – dahl@apl.washington.edu

Dr. Peter H. Dahl is a Senior Principal Engineer with the University of Washington Applied Physics Laboratory, and a Professor of Mechanical Engineering at the University of Washington.
His research focuses on underwater sound. He has published extensively on the physics of acoustic propagation as influenced by the sea surface and seabed, vector acoustic properties of underwater and airborne sound, and studies on underwater noise from explosives and marine pile driving.
Dr. Dahl has conducted several ocean-going experiments in underwater acoustics, sponsored by the U.S. Office of Naval Research involving international collaborative teams, and is currently a Principal Investigator for two projects under the purview of the Navy's Living Marine Resource program concerning the effects of sound on marine life. Dr. Dahl received his Ph.D. from the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution Joint Program in Ocean Engineering. He is a Fellow of the Acoustical Society of America (ASA), has served as the chair of the ASA technical committee on Underwater Acoustics (2002-2005), on its Executive Council (2008-2011), and was the ASA Vice President (2013-2014). (link)

Marla Holt – Research Wildlife Biologist, NOAA Fisheries – marla.holt@noaa.gov

Dr. Marla Holt is a Research Wildlife Biologist for the Marine Mammal Ecology Team; she joined the Northwest Fisheries Science Center as a National Research Council (NRC) Postdoctoral Associate for the Marine Mammal Program. Dr. Holt's postdoctoral research was an investigation on the effects of vessel noise on the acoustic signals of Southern Resident killer whales. She also wrote a review paper which focused on sound exposure in Southern Resident killer whales. Dr. Holt received her Ph.D. from the University of California, Santa Cruz in Ocean Sciences. Her dissertation focused on pinniped spatial acoustics including sound localization and auditory masking in captive seals and sea lions and call directionality in free-ranging northern elephant seals. Dr. Holt also has an M.S. in Marine Sciences and a B.A. in Marine Biology from the University of California, Santa Cruz. Her current research focuses on marine mammal acoustics including the effects of noise on the acoustic signals and behavior of Southern Resident killer whales, their use of sound during different activity states, and the cost of sound production in odontocetes. Dr. Holt's research interests include marine mammal sound production and acoustic communication, sensory ecology (including hearing capabilities and auditory scene analysis), sound exposure and acoustic risk factors, and passive acoustic monitoring. (link)

David Lusseau – Professor, School of Biological Sciences, University of Aberdeen – d.lusseau@abdn.ac.uk

Dr. David Lusseau works at the intersection of life, formal, and social sciences to understand how individuals make decisions when uncertain and what the consequences of those decisions are for their health, social life, and demographic contributions. He has been at the University of Aberdeen since 2007. He obtained his BSc in marine biology at the Florida Institute of Technology and his PhD in

Zoology at the University of Otago (New Zealand). He then received a Killam fellowship for postdoctoral work at Dalhousie University. He was elected member of the Young Academy of Scotland in 2007, Fellow of the Royal Statistical Society in 2009, and Fellow of the Royal Society of Biology in 2016. Dr. Lusseau has worked on sustainable wildlife management since his PhD at Otago, particularly focussing on developing quantitative methods to detect and avoid wicked problems when managing these socioecological systems. He is a member of IUCN's Cetacean Specialist Group and Sustainable Use and Livelihoods Specialist Group and recently convened the marine mammal assessment chapter of the 2nd UN World Ocean Assessment. (link)

Dawn Noren – Research Fish Biologist, Conservation Biology Division, National Oceanic and Atmospheric Administration – dawn.noren@noaa.gov

Dr. Dawn Noren is a research fishery biologist, with expertise in physiological ecology, at the NOAA Fisheries Northwest Fisheries Science Center in Seattle, WA. She is currently a member of the International Whaling Commission Scientific Committee and primarily works with the environmental concerns and whale watching sub-committees. Her research includes energetics and metabolism, assessment of body condition, diving physiology, and anthropogenic impacts. Her recent work focuses on killer whale prey requirements, the effects of vessels and sound on cetacean behavior and energetics, factors influencing killer whale body condition indices, the transfer of contaminants from female dolphins and killer whales to their calves, and Southern Resident killer whale habitat use patterns. Her earlier research focused on Steller sea lion, northern elephant seal, and bottlenose dolphin physiology. Previously, Dr. Noren was a National Research Council (NRC) Postdoctoral Research Associate at the National Marine Mammal Laboratory at the NOAA NMFS Alaska Fisheries Science Center in Seattle, WA. Dr. Noren earned a M.S. in Marine Sciences and a Ph.D. in Ecology and Evolutionary Biology, both from the University of California, Santa Cruz. She earned a B.S. in Biological Sciences with an emphasis in Marine Sciences from the University of Maryland, College Park. (link)

Susan Parks – Associate Professor, Biology, Syracuse University – sparks@syr.edu

Dr. Susan Parks' research focuses on the ecology and evolution of acoustic signaling. Diverse research topics in the lab span the fields of behavioral ecology, bioacoustics, biological oceanography, and conservation biology. Current projects in the lab involve studies of marine and terrestrial animals ranging from observational studies characterizing the acoustic behavior of species to experimental studies investigating behavioral functions of sounds and the impacts of noise on communication. Dr. Parks holds a PhD from Massachusetts Institute of Technology/ Woods Hole Oceanographic Institution and a BA from Cornell University (link)

Ron Thom *(chair)* – Staff Scientist Emeritus, Coastal Sciences Division, Pacific Northwest National Laboratory – ron.thom@pnnl.gov

Dr. Ron Thom has conducted applied research in coastal and estuarine ecosystems since 1971. His research includes coastal ecosystem restoration; adaptive management of restored systems; benthic primary production; ecosystem monitoring; climate change and adaptation; carbon storage in restored coastal systems, and ecology of fisheries resources. Dr. Thom has directed approximately 200 multidisciplinary ecological studies and worked on systems in California, Washington, Oregon, Alaska, Massachusetts, New York, Nebraska, and Alabama. He chaired the original Technical Advisory Committee of the EPA's Puget Sound Estuary Program, was appointed by the Governor of Washington to the 2015 Northwest Straits Commission, and served as a member of US EPA Science Advisory Board panel reviewing the Great Lakes Restoration Program in 2011. Dr. Thom served on the National Academy panel that developed recommendations for monitoring the effectiveness recovery actions in the Gulf of Mexico coastal ecosystem following the 2010 oil spill. He co-chaired the 2015 conference of the Coastal and Estuarine Research Federation (CERF), and co-chaired the 2016 Salish Sea Ecosystem Conference. In 2010, he was elected to the Washington State Academy of Sciences, and in 2016 was elected president-elect of the Academy to serve in 2018-2020. Dr. Thom managed the Coastal Ecosystem technical group at PNNL until 2013. He currently serves as the Senior Science Advisor to the Puget Sound Partnership, which is the EPA National Estuary Program in Puget Sound. (link)

Dom Tollit – Senior Research Scientist, SMRU Consulting – djt@smruconsulting.com

Dr. Dom Tollit is a Principal Scientist with SMRU Consulting. He has over 28 years of experience studying the behavioural ecology, foraging, and population dynamics of marine predators. His primary research interests are to understand the ecological role of pinnipeds in coastal habitats and to define key parameters within multi-species environmental risk assessment frameworks. Following a PhD at the University of Aberdeen in Scotland, Dr. Tollit worked for SMRU in St. Andrews University, the University of Tasmania and the National Trust for Fiji, before leading a Steller sea lion foraging ecology research program at the University of British Columbia. Since 2009, Dr. Tollit has undertaken a variety of North American based consultancy projects, including noise impact assessment, environmental and acoustic-based monitoring programs and pinniped ecological research. His collaborative research has led to more than 35 journal publications in the field of marine mammal science. Recent project experience includes working with industry, NGOs, federal and local regulators (DFO, NOAA, CSLC) and a variety of academic institutions in Canada and the USA. He is currently the technical advisor to Vancouver Fraser Port Authority's ECHO program and actively involved in improving Population Consequences of Disturbance (PCOD) assessments. (link)

APPENDIX B – Q&A prepared for the WDFW Advisory Committee Draft Bibliography

Objective

The purpose of this document is to track literature that the WSAS Underwater Acoustics and Disturbance Committee may consider in reviewing the best available science on underwater acoustics and disturbance of Southern Resident Killer Whales (SRKW) by small vessels. The committee is reviewing literature from species beyond *Orinus orca* due to the dearth of information on SRKW directly. The committee has excluded multiple studies on responses to specific sound types such as pile-driving and naval sonar that are not relevant to the scope of this review. This list of literature reflects suggestions made by scientists participating in the April 27, 2020 workshop and stakeholders participating in the May 6, 2020 workshop.

Topics

- Comparative connection of taxa
  - Patterns of behavior and abandonment in other cetaceans
  - Stress physiology
- Effects of
  - Physical disturbance of vessels
  - Underwater noise
  - Echo sounders
  - Acute vs Chronic exposure
  - Numbers of vessels and amount of time spent
  - Interacting stressors – relative effects
- Boat density and distribution – Small vessels, Whale watch vessels
  - Especially around San Juans
- Vessel noise generation – cavitation, technology
- Ocean ambient noise; masking
- Sound propagation
- Marine mammal hearing
- Types of effects
  - Physiology
  - Behavior
- Whale watch customers
  - What customers want (outreach, closeness to whales, # of whales)
  - Demographics
- Whale watching
  - Effects on conservation
  - Best practices for conservation
  - Effects of public perception
  - Sentinel effect
- Adaptive management of regulations

Tags:

[Orca] = Killer Whales
[Comparative] = evidence for comparable effects between species
[Vessel] = Focus on vessel effects
[Disturbance] = Disturbance
[Cumulative] = compounding effects of multiple stressors
[Boats] = Focus on the boat sounds, density, distribution
[Acoustics] = Sound propagation; focus on the acoustic stimuli or hearing
[Physiology] = Physiology and/or energetics effects
[Behavior] = Behavioral effects
[Communication] = Changes in echolocation/acoustic behavior
[Customers] = Info about whale watch customer demographics, desires
[WhaleWatch] = sentinel or conservation effect of whale watching; effects of public perception
[Management] = pertaining to management/regulations
[NPR] = not peer reviewed

Bibliography

1. Aktas, B., Atlar, M., Turkmen, S., Shi, W., Sampson, R., Korkut, E., & Fitzsimmons, P. (2016). Propeller cavitation noise investigations of a research vessel using medium size cavitation tunnel tests and full-scale trials. Ocean engineering, 120, 122-135. [Vessels][Acoustics]
2. Andersen, M.S., Miller, M.L. (2006) Onboard Marine Environmental Education: Whale Watching in the San Juan Islands, Washington. Tourism in Marine Environments 2:2 p 111-118 [WhaleWatch]
3. Arcangeli, A., and Crosti, R. (2009). "The short-term impact of dolphin-watching on the behaviour of bottlenose dolphins (Tursiops truncatus) in western Australia," J. Mar. Anim. Ecol. 2, 3-9. [Vessels][Behavior]
4. Ashe E., Noren D.P., Williams R. (2010) Animal behaviour and marine protected areas: Incorporating behavioural data into the selection of marine protected areas for an endangered killer whale population. Animal Conservation.13:196-203. [Orca][Behavior]
5. Ashe, E., Wray, J., Picard, C. R., & Williams, R. (2013). Abundance and survival of Pacific humpback whales in a proposed critical habitat area. PloS one, 8(9). [Behavior]
6. Au, J. K. Ford, J. K. Horne and K. A. Newman Allman, "Echolocation signals of free-ranging killer whales (Orcinus orca) and modeling of foraging for Chinook salmon (Oncorhynchus tshawytscha).," Journal of the Acoustical Society of America, vol. 115, no. 2, pp. 901-909, 2004. [Orca][Communication]
7. Au, W. W., & Hastings, M. C. (2008). Principles of marine bioacoustics (pp. 121-174). New York: Springer. [Acoustics]
8. Ayres, K.L., R.K. Booth, J.A. Hempelmann, K.L. Koski, C.K. Emmons, R.W. Baird, K. Balcomb-Bartok, M.B. Hanson, M.J. Ford, and S.K. Wasser. 2012. Distinguishing the impacts of inadequate prey and vessel traffic on an endangered killer whale (Orcinus orca) population. PLoS ONE 7:e36842. [Cumulative] [Vessel] [Orca]
9. Bahtiarian, M., & Fischer, R. (2006). Underwater radiated noise of the NOAA ship Oscar Dyson. Noise control engineering journal, 54(4), 224-235. [Vessels][Acoustics]
10. Bailey, H., & Thompson, P. M. (2009). Using marine mammal habitat modelling to identify priority conservation zones within a marine protected area. Marine Ecology Progress Series, 378, 279-287.
11. Bain and Dahlheim, "Effects of masking noise on detection thresholds of killer whales.," in Marine mammals and the "Exxon Valdez", San Diego, CA, Academic Press, 1994, pp. 243-256. [Communication]
12. Bain, D., Smith, J., Williams, R., Lusseau, D., (2006) Effects of vessels on behavior of southern resident killer whales (*Orcinus spp.*). NMFS Contract Report. [NPR][Vessels][Behavior]
13. Baird, R. W., Hanson, M. B., & Dill, L. M. (2005). Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and interannual variation in diving rates. Canadian Journal of Zoology, 83(2), 257-267
14. Bassett, C., Polagye, B., Holt, M., & Thomson, J. (2012). A vessel noise budget for Admiralty Inlet, Puget Sound, Washington (USA). The Journal of the Acoustical Society of America, 132(6), 3706-3719. [Vessels][Acoustics]
15. Baumann-Pickering, S., Frasier, K. E., Roch, M. A., McKenna, M. F., Fristrup, K. M., Stanley, J., ... & Hatch, L. (2019). Discrimination of chronic and transient sound sources in marine soundscapes. The Journal of the Acoustical Society of America, 146(4), 2885-2885. [Acoustics] [NPR]
16. Bechshoft, T., Wright, A. J., Weisser, J. J., Teilmann, J., Dietz, R., Hansen, M., Björklund, E., & Styrishave, B. (2015). Developing a new research tool for use in free-ranging cetaceans: recovering cortisol from harbour porpoise skin. *Conservation physiology*, *3*(1), cov016. https://doi.org/10.1093/conphys/cov016 [Physiology]
17. Bejder, L., A. Samuels, H. Whitehead, and N. Gales. 2006. Interpreting short-term behavioural responses to disturbance within a longitudinal perspective. Animal Behaviour 72(5):1149-1158. [Behavior] [Disturbance]

18. Bejder, L., A. Samuels, H. Whitehead, H. Finn, and S. Allen. 2009. Impact assessment research: Use and misuse of habituation, sensitisation and tolerance in describing wildlife responses to anthropogenic stimuli. Marine Ecology Progress Series 395:177-185.
19. Bejder, Lars and David Lusseau (2008) Valuable Lessons from Studies Evaluating Impacts of Cetacean-Watch Tourism, Bioacoustics, 17:1-3, 158-161, DOI:10.1080/09524622.2008.9753800 [WhaleWatch][Vessels]
20. Bejder, Samuels, Whitehead, Gales, Mann, Connor, Heithaus, Watson-Capps, Flaherty, Krutzen. 2006. Decline in Relative Abundance of Bottlenose Dolphins Exposed to Long-Term Disturbance. Conservation Biology 20:6, 1791-1798. [Disturbance][Behavior]
21. Bentz, J., Lopes, F., Calado, H., Dearden, P. (2016) Enhancing satisfaction and sustainable management: Whale watching in the Azores. Tourism Management 54:p 465-476 [Customers]
22. Blair, H. B., Merchant, N. D., Friedlaender, A. S., Wiley, D. N., & Parks, S. E. (2016). Evidence for ship noise impacts on humpback whale foraging behaviour. *Biology letters*, *12*(8), 20160005. [Vessels][Behavior]
23. Booth CG, Sinclair RR and Harwood J (2020) Methods for Monitoring for the Population Consequences of Disturbance in Marine Mammals: A Review. Front. Mar. Sci. 7:115. doi: 10.3389/fmars.2020.00115
24. Branstetter BK, St. Ledger J, Acton D, Stewart J, Houser D, Finneran J, Jenkins K (2017) Killer whale (Orcinus orca) behavioral audiograms. J Acoust Soc Am 141: 2387–2398 [Acoustics][Orca]
25. Brooker, A., & Humphrey, V. (2016). Measurement of radiated underwater noise from a small research vessel in shallow water. Ocean Engineering, 120, 182-189. [Vessels][Noise]
26. Buckstaff, K.C. 2004. Effects of watercraft noise on the acoustic behavior of bottlenose dolphins (Tursiops truncatus) in Sarasota Bay, Florida. Marine Mammal Science 20:709-725. doi: 10.1111/j.17487692.2004. tb01189.x. [Communication]
27. Burgin, S., and N. Hardiman. 2015. Effects of non-consumptive wildlife oriented tourism on marine species and prospects for their sustainable management. Journal of Environmental Management 151:210-220. [WhaleWatch]
28. Canadian Science Advisory Secretariat. (2017) Evaluation of the Scientific Evidence to Inform the Probability of Effectiveness of Mitigation Measures in Reducing Shipping-Related Noise Levels Received by Southern Resident Killer Whales. Science Advisory Report. [Orca] [Vessels] [Management] [NPR]
29. Caro, T.M., and G. O'Doherty. 1999. On the use of surrogate species in conservation biology. Conservation Biology 13(4):805-814. [Comparative]
30. Castellote, M., C.W. Clark, and M.O. Lammers. 2012. Acoustic and behavioural changes by fin whales (Balaenoptera physalus) in response to shipping and airgun noise. Biological Conservation 147(1):115-122. [Communication] [Behavior]
31. Chan, A.A., Y.H. Chan, W.D. Stahlman, D. Garlick, C.D. Fast, D.T. Blumstein, and A.P. Blaisdell. 2010. Increased amplitude and duration of acoustic stimuli enhance distraction. Animal Behaviour 80:1075-1079. [Acoustics]
32. Chion C , Lagrois D , Dupras J. A Meta-Analysis to Understand the Variability in Reported Source Levels of Noise Radiated by Ships From Opportunistic Studies; 2019 Frontiers in Marine Science [Acoustics][Boats]
33. Chion C., Cantin G., Dionne S., Dubeau B., Lamontagne P., Landry J.-A., Marceau D., Martin C.C.A., Ménard N., Michaud R., Parrott L & Turgeon S. (2013) Spatiotemporal modelling for policy analysis: Application to sustainable management of whale-watching activities. Marine Policy 38: 151-162. [WhaleWatch][Management]
34. Chion C., Lagrois D., Dupras J., Turgeon S., McQuinn I.H., Michaud R., Ménard N. & Parrott L. (2017) Underwater acoustic impacts of shipping management measures: Results from a social-ecological model of boat and whale movements in the St. Lawrence River Estuary (Canada). Ecological Modelling 354: 72-87. [Acoustics][Vessel][Behavior]

35. Cholewiak, D., Clark, C.W., Ponirakis, D., Frankel, A., Hatch, L.T., Risch, D., Stanistreet, J.E., Thompson, M., Vu, E. and Van Parijs, S.M., (2018). Communicating amidst the noise: modeling the aggregate influence of ambient and vessel noise on baleen whale communication space in a national marine sanctuary. Endangered Species Research, 36, pp.59-75.
36. Christiansen, F., and D. Lusseau. 2015. Linking behavior to vital rates to measure the effects of non-lethal disturbance on wildlife. Conservation Letters 8(6):424-431. [Behavior]
37. Christiansen, F., Lusseau, D., Stensland, E., & Berggren, P. (2010). Effects of tourist boats on the behaviour of Indo-Pacific bottlenose dolphins off the south coast of Zanzibar. *Endangered Species Research*, *11*(1), 91-99. [Behavior][Vessels]
38. Christiansen, F., Rasmussen, M., & Lusseau, D. (2013). Whale watching disrupts feeding activities of minke whales on a feeding ground. *Marine Ecology Progress Series*, *478*, 239-251. [Behavior]
39. Clark, C.W., W.T. Ellison, B.L. Southall, L.T. Hatch, S.M. Van Parijs, A. Frankel, and D. Ponirakis. 2009. Acoustic masking in marine ecosystems: Intuitions, analysis, and implications. Marine Ecology: Progress Series 395:201-222. [Acoustics]
40. Cominelli, S., Devillers, R., Yurk, H., MacGillivray, A., McWhinnie, L., & Canessa, R. (2018). Noise exposure from commercial shipping for the southern resident killer whale population. Marine pollution bulletin, 136, 177-200. [Orca][Vessels]
41. Conn, P.B., and G.K. Silber. 2013. Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales. Ecosphere 4(4):43.
42. Constantine, R. 2001. Increased avoidance of swimmers by wild bottlenose dolphins (Tursiops truncatus) due to long-term exposure to swim-with-dolphin tourism. Marine Mammal Science 17(4):689-702. [Disturbance]
43. Constantine, R., Brunton, D.H., and Dennis, T. (2004). “Dolphin-watching tour boats change bottlenose dolphin (Tursiops truncatus) behavior,” Biol. Cons. 117, 299-307. [Vessels][Behavior]
44. Corkeron, P.J. (1995) Humpback whales (Megaptera novaeangliae) in Hervey Bay, Queensland: behaviour and responses to whale-watching vessels. Canadian Journal of Zoology 73:7 p 1290-1299 [Behavior][Vessels]
45. Courbis, S., Timmel, G., (2008) Effects of vessels and swimmers on behavior of Hawaiian spinner dolphins (Stenella longirostris) in Kealake‘akua, Honaunau, and Kauhako bays, Hawai‘i. Marine Mammal Science. DOI: 10.1111/j.1748-7692.2008.00254.x [Vessels][Behavior]
46. Cox, T.M., T.J. Ragen, A.J. Read, E. Vos, R.W. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, L. Crum, A. D’Amico, G. D’Spain, A. Fednandez, J. Finneran, R. Gentry, W. Gerth, F. Gulland, J. Hildebrand, D. Houser, T. Hullar, P.D. Jepson, D. Ketten, C.D. MacLeod, P. Miller, S. Moore, D.C. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead, and L. Benner. 2006. Understanding the impacts of anthropogenic sound on beaked whales. Journal of Cetacean Research Management 7:177-187.
47. Crain, C.M., K. Kroeker, and B.S. Halpern. 2008. Interactive and cumulative effects of multiple human stressors in marine systems. Ecology Letters 11:1304-1315. [Cumulative]
48. Cranford, T.W., and P. Krysl. 2015. Fin whale sound reception mechanisms: Skull vibration enables low-frequency hearing. PLoS ONE 10:1-17 [Acoustics]
49. Dahl, P. H., Miller, J. H., Cato, D. H., & Andrew, R. K. (2007). Underwater ambient noise. Acoustics Today, 3(1), 23-33. [Acoustics] [NPR]
50. De Robertis, A. and Handegard, N. O. 2013. Fish avoidance of research vessels and the efficacy of noise-reduced vessels: a review. – ICES Journal of Marine Science, 70:34–45. [Vessels][Acoustics]
51. Deng, Z Daniel et al. “200 kHz commercial sonar systems generate lower frequency side lobes audible to some marine mammals.” *PloS one* vol. 9,4 e95315. 15 Apr. 2014, doi:10.1371/journal.pone.0095315 [Acoustics]
52. Diefenderfer, HL, GE Johnson, RM Thom KE Buenau, LA Weitkamp, CM Woodley, AB Borde, and RK Kropp (2016) Evidence-based evaluation of the cumulative effects of ecosystem restoration. Ecosphere 7(3):e01242 [Management]

53. Dimmock, K., Hawkins, E.R., Tiyce, M., (2014) Stakeholders, industry knowledge and adaptive management in the Australian whale-watching industry. Journal of Sustainable Tourism 22:7, p 1108-1121. [WhaleWatch]
54. Donovan, C.R., C. Harris, J. Harwood, and L. Milazzo. 2013. A simulation-based method for quantifying and mitigating the effects of anthropogenic sound on marine mammals. Proceedings of Meetings on Acoustics 17:070043. [NPR]
55. Dyndo, M., Wiśniewska, D. M., Rojano-Doñate, L., & Madsen, P. T. (2015). Harbour porpoises react to low levels of high frequency vessel noise. Scientific reports, 5, 11083. [Vessels][Behavior]
56. Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel. 2011. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology 26:21-28. [Behavior]
57. Erbe, C. (2013). Underwater noise of small personal watercraft (jet skis). The Journal of the Acoustical Society of America, 133(4), EL326-EL330. [Vessels]Acoustics]
58. Erbe, C. 2013. International regulation of underwater noise. Acoustics Australia 41:12-19.
59. Erbe, C., Liong, S., Koessler, M., Duncan, A., Gourlay, T. (2016) Underwater sound of rigid-hulled inflatable boats. J. Acoust. Soc. Am. 139: 6. [Vessels]
60. Erbe, C., MacGillivray, A., & Williams, R. (2012). Mapping cumulative noise from shipping to inform marine spatial planning. *The Journal of the Acoustical Society of America*, *132*(5), EL423-EL428. [Vessels][Noise]
61. Erbe, C., Marley, S., Schoeman, R., Smith, J., Trigg, L., Embling, C. (2019) The Effects of Ship Noise on Marine Mammals – A Review. Frontiers in Marine Science 6:606. [Vessel][Acoustics]
62. Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K., & Dooling, R. (2016). Communication masking in marine mammals: A review and research strategy. *Marine pollution bulletin*, *103*(1-2), 15-38. [Communication]
63. Erbe, Christine (2002) Underwater noise of whale-watching boats and potential effects on killer whales (Orcinus orca) based on an acoustic impact model (2002) Marine Mammal Science, Volume 18 Issue 2 Page 394-418 [Orca] [Vessel]
64. Farmer N.A., Baker K., Zeddies D.G., Denes S.L., Noren D.P., Garrison L.P., Machernis A., Fougères E.M., Zykov M. (2018) Population consequences of disturbance by offshore oil and gas activity for endangered sperm whales (Physeter macrocephalus). Biological Conservation 227:189-204. [Disturbance]
65. Farmer N.A., Noren D.P., Fougères E.M., Machernis A., Baker K. (2018) Resilience of the endangered sperm whale *Physeter macrocephalus* to foraging disturbance in the Gulf of Mexico, USA: A bioenergetic approach. Marine Ecology Progress Series 589:241-261. [Disturbance][Physiology]
66. Felleman FL, Heimlich-Boran JR, Osborne RW (1991) Feeding ecology of the killer whale (Orcinus orca). In: Pryor K, Norris KS (eds) Dolphin societies. University of California Press, Berkeley, CA, p 113–147
67. Ferrara, Grace A., Teresa M. Mongillo, Lynne M. Barre. Reducing disturbance from vessels to Southern Resident killer whales: Assessing the effectiveness of the 2011 federal regulations in advancing recovery goals. NOAA Tech. Memo. NMFS-OPR-58 [NPR]
68. Fischer, R. W., & Brown, N. A. (2005, September). Factors affecting the underwater noise of commercial vessels operating in environmentally sensitive areas. In *Proceedings of OCEANS 2005 MTS/IEEE* (pp. 1982-1988). IEEE. [Vessels][Acoustics]
69. Foote, Andrew D., Osborne, Richard W., Hoelzel, A. Rus (2004) Whale-call response to masking boat noise. Nature; Vol 428, 910 https://doi.org/10.1038/428910a [Orca] [Vessel] [Communication]
70. Ford, "Acoustic behaviour of resident killer whales (Orcinus orca) off Vancouver Island, British Columbia," Canadian Journal of Zoology, pp. 67(3): 727-745, 1989. [Communication] [Orca]

71. Ford, J. K., Ellis, G. M., Olesiuk, P. F., & Balcomb, K. C. (2010). Linking killer whale survival and prey abundance: food limitation in the oceans' apex predator? *Biology letters*, *6*(1), 139-142. [Orca]
72. Ford, J.K.B., Pilkington, J.F., Reira, A., Otsuki, M., Gisborne, B., Abernethy, R.M., Stredulinsky, E.H., Towers, J.R., and Ellis, G.M. 2017. Habitats of Special Importance to Resident Killer Whales (Orcinus orca) off the West Coast of Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/035. viii + 57 p. [Orca][NPR]
73. Francis, C.D., and J.R. Barber. 2013. A framework for understanding noise impacts on wildlife: An urgent conservation priority. Frontiers in Ecology and the Environment 11:305-313. [Comparative][Acoustics]
74. Friedlaender, A.S., E.L. Hazen, J.A. Goldbogen, A.K. Stimpert, J. Calambokidis, and B.L. Southall. 2016. Prey-mediated behavioral responses of feeding blue whales in controlled sound exposure experiments. Ecological Applications 26(4):1075-1085. [Behavior]
75. Fromm, D.M. 2009. Reconstruction of acoustic exposure on orcas in Haro Strait. NRL Review 2009:127-129. [Acoustics]
76. García-Cegarra, A.M., Pacheco, A.S. (2017) Whale-watching trips in Peru lead to increases in tourist knowledge, pro-conservation intentions and tourist concern for the impacts of whale-watching on humpback whales. Aquatic Conservation, Vol 27:5, p 1011-1020. [WhaleWatch]
77. Gassmann, M., Wiggins, S. M., and Hildebrand, J. A. (2017). "Deep-water measurements of container ship radiated noise signatures and directionality," The Journal of the Acoustical Society of America 142, 1563-1574. [Boats][Acoustics]
78. Giles, D. A. (2014). Southern Resident Killer Whales (Orcinus orca): The effect of vessels on group cohesion and behavior of southern resident killer whales (Orcinus orca). University of California, Davis. (Thesis) [Vessels][Orca] [NPR]
79. Giles, D.A., Koski, K.L., (2012) Managing Vessel-Based Killer Whale Watching: A Critical Assessment of the Evolution From Voluntary Guidelines to Regulations in the Salish Sea. Journal of International Wildlife Law & Policy 15:2 p 125-151 [WhaleWatch]
80. Gill, J.A., K. Norris, and W.J. Sutherland. 2001. Why behavioural responses may not reflect the population consequences of human disturbance. Biological Conservation 97:265-268.
81. Gillespie, A. 2010. Noise pollution, the oceans, and the limits of international law. Yearbook of International Environmental Law 21:114-139.
82. Gisiner, R., S. Harper, E. Livingston, and J. Simmen. 2006. Effects of Sound on the Marine Environment (ESME): An underwater noise risk model. IEEE Journal of Oceanic Engineering 138(4):1067-1081
83. Gomez, C., Lawson, J. W., Wright, A. J., Buren, A. D., Tollit, D., & Lesage, V. (2016). A systematic review on the behavioural responses of wild marine mammals to noise: the disparity between science and policy. *Canadian Journal of Zoology*, *94*(12), 801-819. [Behavior][Comparative]
84. Goodwin, L., and Cotton, P. A. (2004). "Effects of boat traffic on the behaviour of bottlenose dolphins (Tursiops truncatus)," Aquat. Mamm. 30, 279-283. [Vessels][Behavior]
85. Gospić, N. R., and Picciulin, M. (2016). "Changes in whistle structure of resident bottlenose dolphins in relation to underwater noise and boat traffic," Mar. Pollut. Bull. 105, 193-198. [Communication][Vessels]
86. Gray, D.L., Canessa, R.R., Keller, C.P., Dearden, P., Rollins, R.B. (2011) Spatial characterization of marine recreational boating: Exploring the use of an on-the-water questionnaire for a case study in the Pacific Northwest. Marine Policy 35(3) 286-298 [Boats]
87. Guerra M. & Dawson S.M. (2016) Boat-based tourism and bottlenose dolphins in Doubtful Sound, New Zealand: The role of management in decreasing dolphin-boat interactions. Tourism Management 57:3-9. [WhaleWatch][Management]
88. Hamlin, H., (2016) An interview-based cognitive analysis of stakeholder perceptions of whale watching in Puget Sound, Washington. University of Washington (Thesis) [WhaleWatch][NPR]

89. Hanson, B., M., Emmons, C. K., Ward, E. J., Nystuen, J. A., & Lammers, M. O. (2013). Assessing the coastal occurrence of endangered killer whales using autonomous passive acoustic recorders. The Journal of the Acoustical Society of America, 134(5), 3486-3495. [Orca]
90. Harris, C.M., D. Sadykova, S.L. DeRuiter, P.L. Tyack, P.J.O. Miller, P.H. Kvadsheim, F.P.A. Lam, and L. Thomas. 2015. Dose response severity functions for acoustic disturbance in cetaceans using recurrent event survival analysis. Ecosphere 6(11):236.
91. Hatch, L.T., C.W. Clark, S.M. Van Parijs, A.S. Frankel, and D.W. Ponirakis. 2012. Quantifying loss of acoustic communication space for right whales in and around a U.S. National Marine Sanctuary. Conservation Biology 26:983-994 [Communication] [Acoustics]
92. Hauser, D. D. W., Logsdon, M. G., Holmes, E. E., VanBlaricom, G. R., & Osborne, R. W. (2007). Summer distribution patterns of southern resident killer whales (Orcinus orca): Evidence of core areas and spatial segregation of social groups. Marine Ecology Progress Series, 351, 301-310. http://dx.doi.org/10.3354/meps07117 [Orca]
93. Hauser, D.D.W. Summer space use of Southern Resident killer whales (Orcinus orca) within Washington and British Columbia inshore waters. University of Washington (Thesis) [Orca][NPR]
94. Hauser, D.D.W., VanBarlicom, G.R., Holmes, E.E., Osborne, R.W. (2006). Evaluating the use of whalewatch data in determining killer whale (Orcinus orca) distribution patterns. J. Cetacean Res. Manage. 8(3):273-281 [WhaleWatch]
95. Haver, S.M., Gedamke, J., Hatch, L.T., Dziak, R.P., Van Parijs, S., McKenna, M.F., Barlow, J., Berchok, C., DiDonato, E., Hanson, B. and Haxel, J., 2018. Monitoring long-term soundscape trends in US Waters: the NOAA/NPS Ocean noise reference station network. Marine Policy, 90, pp.6-13. [Acoustics]
96. Haviland-Howell, A. Frankel, C. Powell, A. Bocconcelli, R. Herman and L. Sayigh, "Recreational boating traffic: a chronic source of anthropogenic noise in the Wilmington, North Carolina Intracoastal Waterway.," J Acoust Soc Am, pp. 122(1): 151-160, 2007. [Vessel]
97. Heenehan H.L., Basurto X., Bjeder L., Tyne J.A., Higham J.E.S. & Johnston D.W. (2015) Using Ostrom's common-pool resource theory to build toward an integrated ecosystem-based sustainable cetacean tourism system in Hawai`i. Journal of Sustainable Tourism 23: 536-556. [WhaleWatch][Management]
98. Heenehan H.L., Van Parijs S.M., Bejder L., Tyne J.A. & Johnston D.W. (2017) Using acoustics to prioritize management decisions to protect coastal dolphins: A case study using Hawaiian spinner dolphins. Marine Policy 75: 84-90. [Management]
99. Heiler, J., Elwen, S. H., Kriesell, H. J., and Gridley, T. (2016). "Changes in bottlenose dolphin whistle parameters related to vessel presence, surface behaviour and group composition," Anim. Behav. 117, 167-177. [Communication][Vessels]
100. Heimlich-Boran, J. R. (1988). Behavioral ecology of killer whales (Orcinus orca) in the Pacific Northwest. Canadian Journal of zoology, 66(3), 565-578.
101. Heise, K. (2016, January). The Effects of Underwater Noise on Marine Animals. In SNAME Maritime Convention. The Society of Naval Architects and Marine Engineers. [NPR]
102. Heise, K., Barrett-Lennard, L., Chapman, R., Dakin, T., Erbe, C., Hannay, D. E, Merchant, N.D., Pilkington, J.S., Thornton, S.J., Tollit, D.J., Vagle, S., Veirs, V.R., Vergara, V., Wood, J.D., Wright, B.M., Yurk, H.. (2017). Proposed metrics for the management of underwater noise for southern resident killer whales. *Coastal Ocean Report Series*, Ocean Wise, Vancouver [Orca][NPR]
103. Higham J.E.S., Bejder L., Allen S.J., Corkeron P.J. & Lusseau D. (2016) Managing whale-watching as a non-lethal consumptive activity. Journal of Sustainable Tourism 24: 73-90. [WhaleWatch][Management]
104. Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395:5-20.

105. Hill, H.M., Guarino, S., Dietrich, S., St. Leger, J., (2016) An Inventory of Peer-reviewed Articles on Killer Whales (Orcinus orca) with a Comparison to Bottlenose Dolphins (Tursiops truncatus). Animal Behavior and Cognition. 3:3 p135-149 [Comparative][Orca]
106. Hoelzel, A. R. (1993). Foraging behaviour and social group dynamics in Puget Sound killer whales. Animal Behaviour, 45(3), 581-591.
107. Holt M.M., Noren D.P., Emmons C.K. (2011) The effects of noise levels and call types on the source levels of killer whale calls. Journal of the Acoustical Society of America 130:3100-3106. [Orca] [Acoustics][Communication]
108. Holt M.M., Noren D.P., Emmons C.K. (2012) Does vessel noise affect the use of sound by foraging *Orcinus orca* (killer whales)? In: Anthony Hawkins and Arthur N. Popper, Eds. The Effects of Noise on Aquatic Life, pages 327-330. [Communication][Vessel][NPR]
109. Holt, B. Hanson, C. Emmons, J. Houghton, D. Giles, R. Baird and J. Hogan, Using acoustic recording tags to investigate anthropogenic sound exposure and effects on behavior in endangered killer whales (Orcinus orca), 2018. [Boats] [Orca] [Behavior]
110. Holt, D. Noren and C. Emmons (2012)"Does vessel noise affect the use of sound by foraging Orcinus orca (killer whales)?," Adv Exp Med Biol, pp. 730: 327-30. doi: 10.1007/978-1-4419-7311-5_73. [Vessel] [Orca] [Communication]
111. Holt, M. B. Hanson, D. A. Giles, C. K. Emmons and J. T. Hogan, "Noise levels received by endangered killer whales (Orcinus orca) before and after the implementation of vessel regulations," Endangered Species Research, pp. 15-26, 2017. [Orca] [Vessel]
112. Holt, M. M. (2008). Sound exposure and Southern Resident killer whales (Orcinus orca): A review of current knowledge and data gaps. NOAA Technical Memorandum NMFS-NWFSC-89 [Orca][NPR]
113. Holt, M. M., Hanson, M. B., Emmons, C. K., Haas, D. K., Giles, D. A., & Hogan, J. T. (2019). Sounds associated with foraging and prey capture in individual fish-eating killer whales, Orcinus orca. *The Journal of the Acoustical Society of America*, *146*(5), 3475-3486. [Orca][Communication]
114. Holt, M. M., Tennessen, J. B., Hanson, B., Emmons, C., Giles, D., Hogan, J., Wright, B.M. & Thornton, S. (2019). How acoustics informs understanding of foraging behavior and effects of vessels and noise on killer whales. *The Journal of the Acoustical Society of America*, *146*(4), 2897-2897. [NPR][Acoustics][Vessels][Orca]
115. Holt, M. M., Veirs, V., and Veirs, S. (2008). "Noise effects on the call amplitude of southern resident killer whales (Orcinus orca)," Bioacoustics. 17, 164-166. [Orca][Communication]
116. Holt, M.M., D.P. Noren, R.C. Dunkin, and T.M. Williams. 2015. Vocal performance affects metabolic rate in dolphins: Implications for animals communicating in noisy environments. Journal of Experimental Biology 218:1647-1654. [Physiology][Communication]
117. Holt, M.M., D.P. Noren, V. Veirs, C.K. Emmons, and S. Veirs. 2009. Speaking up: Killer whales (Orcinus orca) increase their call amplitude in response to vessel noise. Journal of the Acoustical Society of America 125:EL27-32. [Orca] [Communication] [Vessel]
118. Holt. ,M.M., Hanson, B., Emmons, C. (2018) Effects of vessels and noise on the subsurface behavior of endangered killer whales (Orcinus orca). Journal of the Acoustical Society of America 144:p 1886 [Orca][Vessels][Behavior][NPR]
119. Honjo K. & Kubo T. (2020) Social Dilemmas in Nature-Based Tourism Depend on Social Value Orientations. Scientific Reports 10: art. 3730 [WhaleWatch]
120. Houghton, M. M. Holt, D. A. Giles, M. B. Hanson, C. K. Emmons and J. T. Hogan, "The relationship between vessel traffic and noise levels received by killer whales (Orcinus orca)," PLos ONE, vol. 10, no. 12, 2015. [Orca] [Vessel] [Boats]
121. Hovem, J. M., Vågsholm, R., Sørheim, H., & Haukebø, B. (2015, May). Measurements and analysis of underwater acoustic noise of fishing vessels. In *OCEANS 2015-Genova* (pp. 1-6). IEEE. [Vessels][Acoustics]

122. Hoyt, E. (1995). The worldwide value and extent of whale watching 1995. Bath, UK: Whale and Dolphin Conservation Society.[WhaleWatch][NPR]
123. Hoyt, E. (2005). Sustainable ecotourism on Atlantic islands, with special reference to whale watching, marine protected areas and sanctuaries for cetaceans. In Biology and environment: proceedings of the Royal Irish Academy (pp. 141-154). Royal Irish Academy.[WhaleWatch]
124. ICES. 1995. Underwater noise of research vessels: review and recommendations. ICES Cooperative Research Report No. 209. pp. 61. https://doi.org/10.17895/ices.pub.5317 [Boats][Acoustics]
125. International Whaling Commission. *Whalewatching handbook.* International Whaling Commission Secretariat. https://wwhandbook.iwc.int/en/
126. Jacobs, M., Harms, M. (2014) Influence of interpretation on conservation intentions of whale tourists. Tourism Management, 42: p 123-131. [WhaleWatch]
127. Janik, V. M., "Source levels and the estimated active space of bottlenose dolphin (Tursiops truncatus) whistles in the Moray Firth, Scotland," Journal of Comparative Physiology A, pp. Volume 186, Issue 7-8, pp 673-680, 2000.
128. Jelinski, D.E., Krueger, C.C., Duffus, D.A. (2002) Geostatistical analyses of interactions between killer whales (Orcinus orca) and recreational whale-watching boats. Applied Geography 22 (2002) 393-411. [Orca][Boats],
129. Jensen, F. H., Bejder, L., Wahlberg, M., Soto, N. A., Johnson, M., & Madsen, P. T. (2009). Vessel noise effects on delphinid communication. Marine Ecology Progress Series, 395, 161-175. [Vessel][Acoustics][Communication]
130. Jessica I. Lundin, Gina M. Ylitalo, Rebecca K. Booth, Bernadita Anulacion, Jennifer A. Hempelmann, Kim M. Parsons, M. Bradley Hanson, and Samuel K. Wasser (2016). Modulation in Persistent Organic Pollutant Concentration and Profile by Prey Availability and Reproductive Status in Southern Resident Killer Whale Scat Samples. Environmental Science & Technology. 50 (12), 6506-6516 DOI: 10.1021/acs.est.6b00825 [Cumulative][Orca]
131. Joy, R., Tollit, D. J., Wood, J., MacGillivray, A., Li, Z. L., Trounce, K., & Robinson, O. (2019). Potential benefits of vessel slowdowns on endangered southern resident killer whales. Frontiers in Marine Science, 6, 344. [Orca]
132. Kassamali-Fox, A., Christiansen, F., May-Collado, L. J., Ramos, E. A., & Kaplin, B. A. (2020). Tour boats affect the activity patterns of bottlenose dolphins (Tursiops truncatus) in Bocas del Toro, Panama. *PeerJ*, *8*, e8804. [WhaleWatch]
133. Ketten, D. R. (1998). Marine mammal auditory systems: a summary of audiometric and anatomical data and its implications for underwater acoustic impacts. NOAA NMFSC-256. [NPR]
134. Kight, C. R., & Swaddle, J. P. (2011). How and why environmental noise impacts animals: an integrative, mechanistic review. *Ecology letters*, *14*(10), 1052-1061. [Comparative]
135. King, S.L., R.S. Schick, C. Donovan, C.G. Booth, M. Burgman, L. Thomas, and J. Harwood. 2015. An interim framework for assessing the population consequences of disturbance. Methods in Ecology and Evolution 6:1150-1158. [Disturbance]
136. Kleist, N. J., Guralnick, R. P., Cruz, A., Lowry, C. A., & Francis, C. D. (2018). Chronic anthropogenic noise disrupts glucocorticoid signaling and has multiple effects on fitness in an avian community. *Proceedings of the national academy of sciences*, *115*(4), E648-E657. [Physiology]
137. Kok, Engelberts., Kastelein., Helder-Hoek, Van de Voorde, Visser and Slabbekoorn, "Spatial avoidance to experimental increase of intermittent and continuous sound in two captive harbour porpoises," Environmental Pollution, pp. Volume 233, Pages 1024-1036, 2018. [Behavior]
138. Kragh, I. M., McHugh, K., Wells, R. S., Sayigh, L. S., Janik, V. M., Tyack, P. L., & Jensen, F. H. (2019). Signal-specific amplitude adjustment to noise in common bottlenose dolphins (Tursiops truncatus). *Journal of Experimental Biology*, *222*(23). [Communication]

139. Kruse, S. (1991). “The interactions between killer whales and boats in Johnstone Strait, B.C.” in Dolphin Societies: Discoveries and Puzzles, edited by K. S. Norris and K. Pryor (University of California Press, Berkeley, CA), pp. 149-159. [Orca][Vessels][NPR]
140. Kudryavtsev, A. A., Luginets, K. P., & Mashoshin, A. I. (2003). Amplitude modulation of underwater noise produced by seagoing vessels. *Acoustical Physics*, *49*(2), 184-188. [Vessels][Acoustics]
141. Lachmuth CL, Barrett-Lennard LG, Steyn DQ, Milsom WK. Estimation of southern resident killer whale exposure to exhaust emissions from whale-watching vessels and potential adverse health effects and toxicity thresholds. *Mar Pollut Bull*. 2011;62(4):792-805. doi:10.1016/j.marpolbul.2011.01.002 [Cumulative][Orca]
142. Lacy, R.C., Williams, R., Ashe, E., Balcomb III, K.C., Brent, L.J., Clark, C.W., Croft, D.P., Giles, D.A., MacDuffee, M. and Paquet, P.C., 2017. Evaluating anthropogenic threats to endangered killer whales to inform effective recovery plans. Scientific reports, 7(1), pp.1-12. [Orca][Cumulative]
143. Lemon, M., Cato, D., Lynch, T., and Harcourt, R. (2008). “Short-term behavioural response of bottlenose dolphins Tursiops aduncus to recreational powerboats,” Bioacoustics. 17, 171-173. [Vessels][Behavior]
144. Lemon, M., Lynch, T. P., Cato, D. H., and Harcourt, R. G. (2006). “Response of travelling bottlenose dolphins (Tursiops truncatus) to experimental approaches by a powerboat in Jervis Bay, New South Wales, Australia,” Biol. Conserv. 127, 363-372. [Vessels][Behavior]
145. Lindenmayer, D.B., and G.E. Likens. 2009. Adaptive monitoring: A new paradigm for long-term research and monitoring. Trends in Ecology & Evolution 24:482-486.
146. Lopez, G; Pearson, H. C. (2017) Can Whale Watching Be a Conduit for Spreading Educational and Conservation Messages? A Case Study in Juneau, Alaska. Tourism in Marine Environments, 12:2 p95-104 [WhaleWatch]
147. Luís, A. R., Couchinho, M. N., and dos Santos, M. E. (2014). “Changes in acoustic behavior of resident bottlenose dolphins near operating vessels,” Mar. Mammal Sci. 30, 1417-1426. [Communication][Vessels]
148. Luksenburg, J.A., Parsons, E.C.M., (2013) Attitudes towards marine mammal conservation issues before the introduction of whale-watching: a case study in Aruba (southern Caribbean). Aquatic Conservation 24:1 p135-146. [WhaleWatch]
149. Lundin et al., 2018. Pre-oil spill baseline profiling for contaminants in Southern Resident killer whale fecal samples indicates possible exposure to vessel exhaust. Marine Poll. Bull. 136:448-453 [Orca]
150. Lusseau D. & Higham J.E.S. (2004) Managing the impacts of dolphin-based tourism through the definition of critical habitats: the case of bottlenose dolphins in Doubtful Sound, New Zealand. Tourism Management 25: 657-667. [WhaleWatch][Management]
151. Lusseau, Bain, Williams and Smith, (2009) Vessel traffic disrupts the foraging behavior of southern resident killer whales Orcinus orca, Endangered Species Research, pp. Vol 6: 211-221,. [Vessel] [Orca]
152. Lusseau, D. (2003). “Effects of tour boats on the behavior of bottlenose dolphins: using Markov chains to model anthropogenic impacts,” Conserv. Biol. 17, 1785-1793. [Behavior][Vessels]
153. Lusseau, D. (2003). “Male and female bottlenose dolphins Tursiops spp. have different strategies to avoid interactions with tour boats in Doubtful Sound, New Zealand,” Mar. Ecol. Prog. Ser. 257, 267-274. [Behavior][Vessel]Lusseau, D., and L. Bejder. 2007. The long-term consequences of short term responses to disturbance experiences from whalewatching impact assessment. International Journal of Comparative Psychology 20:228-236. [Disturbance] [WhaleWatch]
154. Lusseau, D. (2006). “The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand,” Mar. Mammal Sci. 22, 802-818. [Behavior] [Vessel]
155. Lusseau, D., E. Slooten, and R.J.C. Currey. 2006. Unsustainable dolphin watching tourism in Fiordland, New Zealand. Tourism in Marine Environments 3:173-178. [WhaleWatch]

156. Lusseau, D., L. New, C. Donovan, B. Cheney, G. Hastie, and J. Harwood. 2012. The Development of a Framework to Understand and Predict the Population Consequences of Disturbances for the Moray Firth Bottlenose Dolphin Population. Scottish Natural Heritage Commissioned Report No. 468. Available at http://www.snh.org.uk/pdfs/publications/commissioned_reports/468.pdf. [NPR]

157. Lusseau, David. 2005. Residency pattern of bottlenose dolphins *Tursiops* spp. in Milford Sound, New Zealand, is related to boat traffic. Marine Ecology Progress Series 295:265-272 [Vessels][Behavior]

158. Malcolm C.D., Chávez Dagostino R.M. & Cornejo Ortega J.L. (2017) Experiential and Learning Desires of Whale Watching Guides Versus Tourists in Bahía de Banderas, Puerto Vallarta, Mexico.Human Dimensions of Wildlife 22(6): 524-537. [WhaleWatch][Customers]

159. Malinowski, S. J., & Gloza, I. (2002). Underwater noise characteristics of small ships. *Acta Acustica United with Acustica*, *88*(5), 718-721. [Vessels][Noise]

160. Mancini F., Coghill G.M. & Lusseau D. (2017) Using qualitative models to define sustainable management for the commons in data poor conditions. Environmental Science & Policy 67: 52-60. [Management]

161. Mancini F., Leyshon B., Manson F., Coghill G.M. & Lusseau D.(revised) Monitoring tourist specialisation and implementing adaptive governance is necessary to avoid failure of the wildlife tourism commons. Tourism Management [NPR][WhaleWatch][Management]

162. Mancini, Francesca; Lusseau, David. (2015) Policy Brief: Sustainable management of wildlife tourism targeting the bottlenose dolphin interest of the Moray Firth Special Area of Conservation. [Management] [WhaleWatch] [NPR]

163. Marine Mammal Commission (2006) Advisory Committee on Acoustic Impacts on Marine Mammals Report to the Marine Mammal Commission. [NPR][Acoustics][Behavior]

164. Marine Mammal Commission (2007) Marine Mammals and Noise: A Sound Approach to Research and Management. [NPR] [Management]

165. Marley, S.A., Salgado Kent, C.P., Erbe, C., Parnum, I.M.. Effects of vessel traffic and underwater noise on the movement, behaviour and vocalisations of bottlenose dolphins in an urbanised estuary. *Sci Rep* **7,** 13437 (2017). https://doi.org/10.1038/s41598-017-13252-z [Vessels][Behavior][Communucation]

166. Mattson, M. C., Thomas, J. A., and St. Aubin, D. (2005). "Effects of boat activity on the behavior of bottlenose dolphins (Tursiops truncatus) in waters surrounding Hilton Head Island, South Carolina," Aquat. Mamm. 31, 133-140. [Vessels][Behavior]

167. Matzner, S., Maxwell, A., Myers, J., Caviggia, K., Elster, J., Foleyy, M., Jones, M., Ogdenz, G., Sorensenz, E., Zurkz, L. and Tagestady, J., 2010, September. Small vessel contribution to underwater noise. In OCEANS 2010 MTS/IEEE SEATTLE (pp. 1-7). IEEE. [Vessels][Acoustics]

168. Maxwell, S.M., E.L. Hazen, S.J. Bograd, B.S. Halpern, G.A. Breed, B. Nickel, N.M. Teutschel, L.B. Crowder, S. Benson, P.H. Dutton, H. Bailey, M.A. Kappes, C.E. Kuhn, M.J. Weise, B. Mate, S.A. Shaffer, J.L. Hassrick, R.W. Henry, L. Irvine, B.I. McDonald, P.W. Robinson, and D.P. Costa. 2013. Cumulative human impacts on marine predators. Nature Communications 4:2688 [Cumulative]

169. Mayer M., Brenner L., Schauss B., Stadler C., Arnegger J. & Job H. (2018) The nexus between governance and the economic impact of whale-watching. The case of the coastal lagoons in the El Vizcaíno Biosphere Reserve, Baja California, Mexico. Ocean & Coastal Management 162: 46-59. [WhaleWatch][Management]

170. McCauley, R. D., & Cato, D. H. (2001). The underwater noise of vessels in the Hervey Bay (Queensland) whale watch fleet and its impact on humpback whales. *The Journal of the Acoustical Society of America*, *109*(5), 2455-2455. [Vessels][Acoustics][NPR]

171. McCluskey, S. M. (2006). Space use patterns and population trends of southern resident killer whales (Orcinus orca) in relation to distribution and abundance of Pacific salmon (Oncorhynchus

spp.) in the inland marine waters of Washington state and British Columbia (Unpublished master's thesis). University of Washington, Seattle. [NPR]
172. McKenna, M. F., Ross, D., Wiggins, S. M., & Hildebrand, J. A. (2012). Underwater radiated noise from modern commercial ships. *The Journal of the Acoustical Society of America*, *131*(1), 92-103. [Vessels][Noise]
173. McKenna, M., Wiggins, S. & Hildebrand, J. Relationship between container ship underwater noise levels and ship design, operational and oceanographic conditions. *Sci Rep* **3,** 1760 (2013). https://doi.org/10.1038/srep01760 [Vessels][Acoustics]
174. Melcón, Mariana L., Amanda J. Cummins, Sara M. Kerosky, Lauren K. Roche, Sean M. Wiggins, John A. Hildebrand (2012). Blue Whales Respond to Anthropogenic Noise. PLoS ONE 7(2): e32681. doi:10.1371/journal.pone.0032681 [Communication]
175. Merchant, N. D., Pirotta, E., Barton, T. R., & Thompson, P. M. (2014). Monitoring ship noise to assess the impact of coastal developments on marine mammals. Marine Pollution Bulletin, 78(1-2), 85-95. [Vessels][Acoustics]
176. Merchant, N.D., Fristrup, K.M., Johnson, M.P., Tyack, P.L., Witt, M.J., Blondel, P. and Parks, S.E., 2015. Measuring acoustic habitats. Methods in Ecology and Evolution, 6(3), pp.257-265. [Acoustics]
177. Miksis-Olds, J.L., and S.M. Nichols. 2016. Is low frequency ocean sound increasing globally? Journal of the Acoustical Society of America 139(1):501-511. [Acoustics]
178. Miller, J. H., Nystuen, J. A., & Bradley, D. L. (2008). Ocean noise budgets. *Bioacoustics*, *17*(1-3), 133-136. [Acoustics]
179. Miller, L. J., Solangi, M., and Kuczaj, S. A. II. (2008). "Immediate response of Atlantic bottlenose dolphins to highspeed personal watercraft in the Mississippi Sound," J. Mar. Biol. Assoc. UK. 88, 1139-1143. [Vessels][Behavior]
180. Miller, P. J. O. (2002). Mixed-directionality of killer whale stereotyped calls: A direction of movement cue? Behavioral Ecology and Sociobiology, 52(3), 262–270. [Orca][Acoustics][Communication]
181. Miller, P.J.O. Diversity in sound pressure levels and estimated active space of resident killer whale vocalizations. *J Comp Physiol A* **192,** 449 (2006). https://doi.org/10.1007/s00359-005-0085-2 [Orca][Communication][Acoustics]
182. Miller, P.J.O., N. Biassoni, A. Samuels, and P.L. Tyack. 2000. Whale songs lengthen in response to sonar. Nature 405:903. [Communication]
183. Miller, P.J.O., P.H. Kvadsheim, F.P.A. Lam, P.J. Wensveen, R. Antunes, A.C. Alves, F. Visser, L. Kleivane, P.L. Tyack, and L. Doksæter. 2012. The severity of behavioral changes observed during experimental exposures of killer (Orcinus orca), long-finned pilot (Globicephala melas), and sperm (Physeter macrocephalus) whales to naval sonar. Aquatic Mammals 38(4):362-401. [Orca] [Behavior]
184. Miller, P.J.O., R.N. Antunes, P.J. Wensveen, F.I P. Samarra, A.C. Alves, P.L. Tyack, P.H. Kvadsheim, L. Kleivane, F.-P.A. Lam, M.A. Ainslie, and L. Thomas. 2014. Dose-response relationships for the onset of avoidance of sonar by free-ranging killer whales. Journal of the Acoustical Society of America 135:975-993. [Behavior]
185. Mooney, T.A., M. Yamato, and B.K. Branstetter. 2012. Hearing in cetaceans: From natural history to experimental biology. Advances in Marine Biology 63:197-246. [Acoustics]
186. Moore, Sue E, Randall R. Reeves, Brandon L. Southall, Timothy J. Ragen, Robert S. Suydam, Christopher W. Clark, A New Framework for Assessing the Effects of Anthropogenic Sound on Marine Mammals in a Rapidly Changing Arctic, *BioScience*, Volume 62, Issue 3, March 2012, Pages 289–295, https://doi.org/10.1525/bio.2012.62.3.10 [Comparative] [Acoustics]
187. Murray, C.C., Hannah, L.C., Doniol-Valcroze, T., Wright, B., Stredulinsky, E., Locke, A., and R. Lacy. 2019. Cumulative Effects Assessment for Northern and Southern Resident Killer Whale

Populations in the Northeast Pacific. DFO Can. Sci. Advis. Sec. Res. Doc. 2019/056. x. + 88 p [Cumulative] [Orca][NPR]

188. National Academies of Sciences, Engineering, and Medicine. 2017. Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals. Washington, DC: The National Academies

189. National Marine Fisheries Service, "Southern Resident killer whales (Orcinus orca) 5-year review: Summary and evaluation," 2016 [Orca]

190. National Research Council, "Ocean noise and marine mammals," National Research Council (US) Committee on Potential Impacts of Ambient Noise in the Ocean on Marine Mammals, Washington (DC), 2003.

191. New, L.F., A.J. Hall, R. Harcourt, G. Kaufman, E.C.M. Parsons, H.C. Pearson, A.M. Cosentino, and R.S. Schick. 2015. The modeling and assessment of whale-watching impacts. Ocean and Coastal Management 115:10-16. [WhaleWatch]

192. New, L.F., J. Harwood, L. Thomas, C. Donovan, J.S. Clark, G. Hastie, P.M. Thompson, B. Cheney, L. Scott-Hayward, and D. Lusseau. 2013a. Modeling the biological significance of behavioural change in coastal bottlenose dolphins in response to disturbance. Functional Ecology 27:314-322. [Behavior] [Disturbance]

193. Nichol, L.M (1985) Seasonal Movements and Foraging Behavior of Resident Killer Whales (Orcinus orca) In Relation to the Inshore Distribution of Salmon (Oncorhynchus spp.) in British Columbia. University of British Columbia (Thesis) [Orca][NPR]

194. Noren D.P. and Hauser, D.D.W. (2016) Surface-based observations can be used to assess behavior and fine-scale habitat use by an endangered killer whale (*Orcinus orca*) population. Aquatic Mammals 42:168-183.[Orca]

195. Noren D.P., Holt M.M., Dunkin R.C., Williams T.M. (2013) The metabolic cost of communicative sound production in bottlenose dolphins (*Tursiops truncatus*). The Journal of Experimental Biology 216:1624-1629. [Physiology][Behavior][Communication]

196. Noren D.P., Holt M.M., Dunkin R.C., Williams T.M. (2017) Echolocation is cheap for some mammals: Dolphins conserve oxygen while producing high-intensity clicks. Journal of Experimental Marine Biology and Ecology 495:103-109. [Physiology][Behavior][Communication]

197. Noren D.P., Johnson A.H., Rehder D., Larson A. (2009) Close approaches by vessels elicit surface active behaviors by Southern Resident killer whales. Endangered Species Research 8:179-192. [Behavior][Orca][Vessel]

198. Noren DP, Holt MM, Dunkin RC, Thometz NM, Williams TM (2016) Comparative and cumulative energetic costs of odontocete responses to anthropogenic disturbance. Proc. Mtgs. Acoust. 27, 040011 (2016); https://doi.org/10.1121/2.0000357. [Comparative] [Disturbance] [Physiology]

199. Noren, D. P., R. C. Dunkin, T. M. Williams, and M. M. Holt. 2012. Energetic cost of behaviors performed in response to vessel disturbance: one link in the population consequences of acoustic disturbance model. In: Anthony Hawkins and Arthur N. Popper, Eds. The Effects of Noise on Aquatic Life, pp. 427–430. [Physiology][NPR]

200. Nowacek, D.P., L.H. Thorne, D.W. Johnston, and P.L. Tyack. 2007. Responses of cetaceans to anthropogenic noise. Mammal Review 37:81-115. doi: 10.1111/j.1365-2907.2007.00104.x. [Behavior][Communication]

201. Nowacek, S.M., R.S. Wells, and A.R. Solow. 2001. Short-term effects of boat traffic on bottlenose dolphins, Tursiops truncatus, in Sarasota Bay, Florida. Marine Mammal Science 17(4):673-688. [Vessel]

202. Nowacek, Thorne, Johnston and Tyack, "Responses of cetaceans to anthropogenic noise," Mammal Review, pp. Volume 37, No. 2, Pages 81-115, 2007.

203. NRC (National Research Council). 1994. Low-Frequency Sound and Marine Mammals: Current Knowledge and Research Needs. Washington, DC: National Academy Press.

204. NRC. 2000. Marine Mammals and Low-Frequency Sound: Progress Since 1994. Washington, DC: National Academy Press.

205. NRC. 2003a. Ocean Noise and Marine Mammals. Washington, DC: The National Academies Press.
206. NRC. 2005. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects. Washington, DC: The National Academies Press
207. Ohlberger, J., Schindler, D. E., Ward, E. J., Walsworth, T. E., & Essington, T. E. (2019). Resurgence of an apex marine predator and the decline in prey body size. *Proceedings of the National Academy of Sciences*, *116*(52), 26682-26689. [Cumulative]
208. Olesiuk, P.F., L.M. Nicol, M.J. Sowden, and J.B. Ford. 2002. Effects of the sound generated by an acoustic harassment device on the relative abundance and distribution of harbor porpoises (Phocoena phocoena) in Retreat Passage, British Columbia. Marine Mammal Science 18(4):843-862. [Behavior]
209. Olson, J. K., Wood, J., Osborne, R. W., Barrett-Lennard, L., & Larson, S. (2018). Sightings of southern resident killer whales in the Salish Sea 1976–2014: the importance of a long-term opportunistic dataset. *Endangered Species Research*, *37*, 105-118. [Orca]
210. Orams, M.B. (2000) Tourists getting close to whales, is it what whale-watching is all about? Tourism Management 21:6 p561-569. [Customers]
211. OSPAR. 2009. Overview of the Impacts of Anthropogenic Underwater Sound in the Marine Environment. OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic. Available at www.ospar.org. 133 pp. [NPR]
212. Otis, R. E and Osborne, R. W. 2001. Historical trends in vessel-based killer whale watching in Haro Strait along the boundary of British Columbia and Washington State: 1976-2001. Poster presented to the Society for Marine Mammalogy Conference. Vancouver, BC.
213. Pacific Whale Watch Association (Jan 2020). Southern Resident Killer Whale Recovery: 2019 Report and Policy Recommendations. [NPR][Boats][WhaleWatch]
214. Papale, E., Azzolin, M., and Giacoma, C. (2012). “Vessel traffic affects bottlenose dolphin (Tursiops truncates) behaviour in waters surrounding Lampedusa Island, south Italy,” J. Mar. Biol. Assoc. UK. 92, 1877-1885. [Vessels] [Behavior]
215. Parks, S. E., Urazghildiiev, I., & Clark, C. W. (2009). Variability in ambient noise levels and call parameters of North Atlantic right whales in three habitat areas. *The Journal of the Acoustical Society of America*, *125*(2), 1230-1239. [Communication]
216. Parks, S.E., C.W. Clark, and P.L. Tyack. 2007a. Short- and long-term changes in right whale calling behavior: The potential effects of noise on acoustic communication. Journal of the Acoustical Society of America 122:3725-3731. [Communication]
217. Parks, S.E., M. Johnson, D. Nowacek, and P.L. Tyack. 2010. Individual right whales call louder in increased environmental noise. Biology Letters 7:33-35. [Communication]
218. Parsons, K. M., Balcomb Iii, K. C., Ford, J. K. B., & Durban, J. W. (2009). The social dynamics of southern resident killer whales and conservation implications for this endangered population. Animal Behaviour, 77(4), 963-971. [Orca]
219. Parsons, M. J., Duncan, A. J., Parsons, S. K., & Erbe, C. (2020). Reducing vessel noise: An example of a solar-electric passenger ferry. The Journal of the Acoustical Society of America, 147(5), 3575-3583.
220. Patterson, A. M., Spence, J. H., & Fischer, R. W. (2013, July). Evaluation of underwater noise from vessels and marine activities. In 2013 IEEE/OES Acoustics in Underwater Geosciences Symposium (pp. 1-9). IEEE. [Vessels][Acoustics]
221. Peake, S., Innes, P., Dyer, P., (2009) Ecotourism and conservation: factors influencing effective conservation messages. Journal of Sustainable Tourism 17:1 p 107-127. [WhaleWatch]
222. Phillips, Bruce and Kendrick, Andrew. “Echolocation Devices and Marine Mammal Impact Mitigation” Jan 2020. Report prepared for Innovation Centre of Transport Canada by Vard Marine Inc.; accompanied by presentation [NPR]

223. Pine, M. K., Jeffs, A. G., Wang, D., & Radford, C. A. (2016). The potential for vessel noise to mask biologically important sounds within ecologically significant embayments. Ocean & Coastal Management, 127, 63-73. [Vessels][Acoustics]
224. Pirotta E. & Lusseau D. (2015) Managing the wildlife tourism commons. Ecological Applications 25(3): 729-741. [WhaleWatch][Management]
225. Pirotta, E., N.D. Merchant, P.M. Thompson, T.R. Barton, and D. Lusseau. 2015a. Quantifying the effect of boat disturbance on bottlenose dolphin foraging activity. Biological Conservation 181:82-89. [Disturbance] [Behavior]
226. Pirotta, E., P.M. Thompson, B. Cheney, C.R Donovan, and D. Lusseau.2015c. Estimating spatial, temporal and individual variability in dolphin cumulative exposure to boat traffic using spatially explicit capture–recapture methods. Animal Conservation 18:20-31. [Boats]
227. Polagye, B., Wood, J., Bassett, C., Tollit, D., & Thomson, J. (2011). Behavioral response of harbor porpoises to vessel noise in a tidal strait. *The Journal of the Acoustical Society of America*, *129*(4), 2368-2368. [Behavior][Vessel]
228. Press. doi: https://doi.org/10.17226/23479. [Cumulative]
229. Quick, L. Scott-Hayward, D. Sadykova, D. Nowacek and A. Read, "Effects of a scientific echo sounder on the behavior of short-finned pilot whales (Globicephala macrohynchus)," Can. J. Fish. Aquat. Sci., 2016. [Behavior]
230. Richardson, W.J., B. Würsig, and C.R. Greene, Jr. 1986. Reactions of bowhead whales, Balaena mysticetus, to seismic exploration in the Canadian Beaufort Sea. Journal of the Acoustical Society of America 79(4):1117-1128.
231. Riera, A., James F Pilkington, John KB Ford, Eva H Stredulinsky, N Ross Chapman. (2019) Passive acoustic monitoring off Vancouver Island reveals extensive use by at-risk Resident killer whale (Orcinus orca) populations. Endangered Species Research 39:p 221-234 [Orca]
232. Rolland, R.M., S.E. Parks, K.E. Hunt, M. Castellote, P.J. Corkeron, D.P. Nowacek, S.K. Wasser, and S.D. Kraus. 2012. Evidence that ship noise increases stress in right whales. Proceedings of the Royal Society B: Biological Sciences. 279(1737):2363-2368. [Vessel] [Physiology]
233. Romano, T.A., M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and J.J. Finneran. 2004. Anthropogenic sound and marine mammal health: Measures of the nervous and immune systems before and after intense sound exposure. Canadian Journal of Fisheries and Aquatic Sciences 61(7):1124-1134. [Physiology]
234. Rosa and N. Koper, "Integrating multiple disciplines to understand effects of anthropogenic noise on animal communication," Ecosphere, p. 9(2):e02127. 10.1002/ecs2.2127, 2018. [Communication]
235. Scarpaci, C., Bigger, S. W., Corkeron, P. J., and Nugegoda, D. (2000). “Bottlenose dolphins (Tursiops truncatus) increase whistling in the presence of ‘swim-with-dolphin’ tour operations,” J. Cetacean Res. Manage. 2, 183-185. [Communication][Disturbance]
236. Schevill WE, Watkins WA (1966) Sound structure and directionality in Orcinus (killer whale). Zoologica 51:71-76. [Orca][Acoustics][Communication]
237. Seely, Osborne, Koski and Larson, "Soundwatch: Eighteen years of monitoring whale watch vessel activities in the Salish Sea," PLOS One, https://doi.org/10.1371/journal.pone.0189764, 2017. [WhaleWatch] [Boats]
238. Senigaglia V., Christiansen F., Bejder L., Gendron D., Lundquist D., Noren D.P., Schaffar A., Smith J.C., Williams R., Martinez E., Stockin K., Lusseau D. (2016) Meta-analyses of whale-watching impact studies: comparisons of cetacean responses to disturbance. Marine Ecology Progress Series 542:251-263. [Disturbance][Comparative]
239. Shannon, G., M.F. McKenna, L.M. Angeloni, K.R. Crooks, K.M. Fristrup, E. Brown, K.A. Warner, M.D. Nelson, C. White, and J. Briggs. 2015. A synthesis of two decades of research documenting the effects of noise on wildlife. Biological Reviews 91(4):982-1005. doi: 10.1111/brv.12207

240. Shedd, T., Northey, A., Newely, J., Casellas, E., McCaughey, E., & Wold, K. (2019) 2019 Soundwatch Program Annual Contract Report. The Whale Museum. https://whalemuseum.org/pages/soundwatch-boater-education-program [Boats]
241. Shedd, T., Seely, E., Osborne, R., Olson, J., Northey, A., Adams, D., Yuodelis, L. (2018) 2018 Soundwatch Program Annual Contract Report. The Whale Museum. https://whalemuseum.org/pages/soundwatch-boater-education-program [Boats]
242. Siemers, B.M., and A. Schaub. 2011. Hunting at the highway: Traffic noise reduces foraging efficiency in acoustic predators. Proceedings of the Royal Society B: Biological Sciences 278:1646-1652.
243. Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C., & Popper, A. N. (2010). A noisy spring: the impact of globally rising underwater sound levels on fish. *Trends in ecology & evolution*, *25*(7), 419-427. [Acoustics]
244. SMRU Canada and Hemmera Envirochem Inc. (2014) Roberts Bank Terminal 2 Technical Data Report; Marine Mammal Habitat Use Studies (1: SRKW Relative Density and Distribution Network Sighting Synthesis; 2: SRKW Acoustic Detection Study; 3: Shore-based Marine Mammal Observations). Prepared for Port Metro Vancouver. [Orca][NPR]
245. Southall, B. L., Moretti, D., Abraham, B., Calambokidis, J., DeRuiter, S. L., & Tyack, P. L. (2012). Marine mammal behavioral response studies in southern California: advances in technology and experimental methods. Marine Technology Society Journal, 46(4), 48-59. [Behavior]
246. Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. Aquatic Mammals 33:411-521. [can't find]
247. Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr, C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E. and Richardson, W.J., 2008. Marine mammal noise-exposure criteria: initial scientific recommendations. *Bioacoustics*, *17*(1-3), pp.273-275.
248. Southall, Brandon L., James J. Finneran, Colleen Reichmuth, Paul E. Nachtigall, Darlene R. Ketten, Ann E. Bowles, William T. Ellison, Douglas P. Nowacek, Peter L. Tyack. Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals, 2019; 45 (2): 125 DOI: 10.1578/AM.45.2.2019.125
249. Southern Resident Orca Task Force Report and Recommendations. November 2018 [Orca] [NPR]
250. Southern Resident Orca Task Force Report and Recommendations. November 2019 [Orca] [NPR]
251. Spence, J.H. and R. W. Fischer, "Requirements for Reducing Underwater Noise From Ships," in IEEE Journal of Oceanic Engineering, vol. 42, no. 2, pp. 388-398, April 2017. [Vessels][Acoustics]
252. Stafford, Kate. (2013). Anthropogenic Sound and Marine Mammals in the Arctic. Prepared for The Pew Charitable Trusts' U.S. Arctic Program [NPR]
253. Stamation, K., Croft, D., Shaughnessy, P., Waples, K., Briggs, S. (2007) Educational and conservation value of whale watching. Tourism in Marine Environments, Vol 4:1. [WhaleWatch]
254. Stamation, K.A., D.B. Croft, and P.D. Shaughnessy. 2009. Behavioral responses of humpback whales (Megaptera novaeangliae) to whalewatching vessels on the southeastern coast of Australia. Marine Mammal Science 26(1):98-122. doi: 10.1111/j.1748-7692.2009.00320.x [Behavior] [Vessel]
255. Steckenreuter, A., Möller, L., and Harcourt, R. (2012). "How does Australia's largest dolphin-watching industry affect the behaviour of a small and resident population of Indo-Pacific bottlenose dolphins?" J. Environ. Manage. 97, 14-21. [Vessels][Behavior]
256. Stensland, E., and Berggren, P. (2007). "Behavioural changes in female Indo-Pacific bottlenose dolphins in response to boat-based tourism," Mar. Ecol. Prog. Ser. 332, 225-234. [Vessels][Behavior]

257. Sullivan, F.A..(2017) Fine Scale Foraging Behavior of Gray Whales in Relation to Prey Fields and Vessel Disturbance Along the Oregon Coast. Oregon State University (Thesis) [Behavior][Vessel][NPR]

258. Swaddle, J.P., C.D. Francis, J.R. Barber, C.B. Cooper, C.M. Kyba, D.M. Dominoni, G. Shannon, E. Aschehoug, S.E. Goodwin, A.Y. Kawahara, D. Luther, K. Spoelstra, M. Voss, and T. Longcore. 2015. A framework to assess evolutionary responses to anthropogenic light and sound. Trends in Ecology & Evolution 30(9):550-560.

259. Symons, J., E. Pirotta, and D. Lusseau. 2014. Sex differences in risk perception in deep-diving bottlenose dolphins leads to decreased foraging efficiency when exposed to human disturbance. Journal of Applied Ecology 51:1584-1592. [Behavior]

260. Tasker, M.L., M. Amundin, M. Andre, A.D. Hawkins, W. Lang, T. Merck, A. Scholik-Schlomer, J. Teilman, F. Thomsen, S. Werner, and M. Zakharia. 2010. Marine Strategy Framework Directive: Task Group 11 Report: Underwater Noise and Other Forms of Energy. JRC Scientific and Technical Report No. EUR 24341 EN-2010, European Commission and International Council for the Exploration of the Sea, Luxembourg [NPR]

261. Tenan, S., Hernández, N., Fearnbach, H., de Stephanis, R., Verborgh, P., & Oro, D. (2020). Impact of maritime traffic and whale-watching on apparent survival of bottlenose dolphins in the Strait of Gibraltar. Aquatic Conservation: Marine and Freshwater Ecosystems. [Vessels][Behavior]

262. Tennessen, J. B., Parks, S. E., & Langkilde, T. (2014). Traffic noise causes physiological stress and impairs breeding migration behaviour in frogs. *Conservation Physiology*, *2*(1). [Physiology] [Behavior]

263. Tennessen, J. B., Holt, M. M., Hanson, M. B., Emmons, C. K., Giles, D. A., & Hogan, J. T. (2019). Kinematic signatures of prey capture from archival tags reveal sex differences in killer whale foraging activity. Journal of Experimental Biology, 222(3), jeb191874.

264. Thompson, P.M., D. Lusseau, T. Barton, D. Simmons, J. Rusin, and H. Bailey. 2010. Assessing the responses of coastal cetaceans to the construction of offshore wind turbines. Marine Pollution Bulletin 60:1200-1208.

265. Thornton, S., Gavrilchuk, K., Towers, J., DeRoos, M., Identifying diel variation in Northern Resident killer whale vocal activity, call type, and temporal frequency of echolocation using digital acoustic recordings from DTAGs. Poster. World Marine Mammal Conference Dec 2019. Barcelona, Spain. [NPR]

266. Tollit, Joy and Wood, "Estimating the effects of noise from commercial vessels and whale watch boats on Southern Resident killer whales," SMRU Consulting NA, 2017. [Orca] [Vessel] [NPR]

267. Tollit, Joy, and Wood. “Advancing anthropogenic noise risk and noise mitigation assessments for endangered Southern Resident Killer Whales” SMRU Consulting. Poster WMMC 2019. [NPR]

268. Trickey, J.S., B.K. Branstetter, and J.J. Finneran. 2010. Auditory masking of a 10 kHz tone with environmental, comodulated, and Gaussian noise in bottlenose dolphins (Tursiops truncatus). Journal of the Acoustical Society of America 128:3799-3804. [Acoustics]

269. Tyack, P.L., and C.W. Clark. 1998. Quick-Look Report: Playback of Low-Frequency Sound to Gray Whales Migrating Past the Central California Coast. Woods Hole, MA: Woods Hole Oceanographic Institution. [NPR]

270. Tyack, P.L., and V.J. Janik. 2013. Effects of noise on acoustic signal production. Pp. 251-271 in Animal Communication and Noise, H. Brumm, ed. Berlin: Springer. [Communication]

271. Tyack, Peter L., Implications for Marine Mammals of Large-Scale Changes in the Marine Acoustic Environment, *Journal of Mammalogy*, Volume 89, Issue 3, 5 June 2008, Pages 549–558, https://doi.org/10.1644/07-MAMM-S-307R.1 [Acoustics]

272. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-126, “The US Whale Watching Industry of Greater Puget Sound: A Description and Baseline Analysis” 2014. 199 pp. [Customers][WhaleWatch] [NPR]

273. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-55. "Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts". 2016. [Acoustics] [NPR]
274. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-59, "2018 Revision to: Technical Guidance for Assessing the Effects on Anthropogenic Sound on Marine Mammal Hearing" 2016. 178 pp. [Acoustics] [NPR]
275. Vagle, S., & Burch, H. (2005). Acoustic measurements of the sound-speed profile in the bubbly wake formed by a small motor boat. The Journal of the Acoustical Society of America, 117(1), 153-163. [Acoustics][Vessels]
276. Vagle, S., O'Neill, C., Thornton, S., & Yurk, H. (2018). Soundscape characteristics in Southern Resident Killer Whale critical habitats. The Journal of the Acoustical Society of America, 144(3), 1846-1846. [Acoustics] [NPR]
277. Van der Graaf, A.J., M.A. Ainslie, M. André, K. Brensing, J. Dalen, R.P.A. Dekeling, S. Robinson, M.L. Tasker, F. Thomsen, and S. Werner. 2012. European Marine Strategy Framework Directive–Good Environmental Status (MSFD GES): Report of the Technical Subgroup on Underwater Noise and Other Forms of Energy. Available at http://ec.europa.eu/environment/marine/pdf/MSFD_reportTSG_Noise.pdf. [NPR]
278. van Dorp and J. W. Merrick, "Vessel traffic risk assessment 2015: Updating the VTRA 2010, a potential oil loss comparision of scenario analyses by four spill categories," 2017. [Boats] [NPR]
279. Vancouver Fraser Port Authority (June 2019) 2018 Voluntary vessel slowdown in Haro Strait: Summary findings. ECHO Program, Port of Vancouver. https://www.flipsnack.com/portvancouver/2018-voluntary-vessel-slowdown-in-haro-strait/full-view.html [NPR][
280. Veirs, S. R., & Veirs, V. R. (2011). Masking of southern resident killer whale signals by commercial ship noise. *The Journal of the Acoustical Society of America*, *129*(4), 2606-2606. [Orca][Acoustics]
281. Veirs, S., et al., "A key to quieter seas: Half of ship noise comes from 15% of the fleet," PeerJ, 2018. [Boats]
282. Veirs, S., Veirs, V., and J. D. Wood, "Ship noise extends to frequencies used for echolocation by endangered killer whales," PeerJ, 2016. [Boats] [Orca] [Communication]
283. Veirs, V., & Veirs, S. (2005). One year of background underwater sound levels in Haro Strait, Puget Sound. The Journal of the Acoustical Society of America, 117(4), 2577-2578. [Acoustics][NPR]
284. Villegas-Amtmann, S., L.K. Schwarz, J.L. Sumich, and D.P. Costa. 2015. A bioenergetics model to evaluate demographic consequences of disturbance in marine mammals applied to gray whales. Ecosphere 6(10):183. [Physiology] [Disturbance]
285. WA SRKW Task Force Vessel Working Group (June 2018) Summary of the Existing Literature and NOAA Rulemaking: Vessel Impacts on Southern Resident Killer Whales. [NPR][Orca]
286. Ward, E. J., Holmes, E. E., & Balcomb, K. C. (2009). Quantifying the effects of prey abundance on killer whale reproduction. Journal of Applied Ecology, 46(3), 632-640. [Cumulative][Orca]
287. Ward, W.D., E.M. Cushing, and E.M. Burns. 1976. Effective quiet and moderate TTS: Implications for noise exposure standards. Journal of the Acoustical Society of America 59(1):160-165. [Acoustics]
288. Ware, H.E., C.J. McClure, J.D. Carlisle, and J.R. Barber. 2015. A phantom road experiment reveals traffic noise is an invisible source of habitat degradation. Proceedings of the National Academy of Sciences of the United States of America 112:12105-12109.
289. Wartzok, D., & Ketten, D. R. (1999). Marine mammal sensory systems. *Biology of marine mammals*, *1*, 117. [NPR]

290. Wartzok, D., Popper, A.N., Gordon, J., Merrill, J. (2003) Factors affecting the responses of marine mammals to acoustic disturbance. Marine Technology Society Journal 37(4) 6-15 [Acoustic][Comparative]
291. Weilgart, L.S., (2007) A Brief Review of Known Effects of Noise on Marine Mammals. International Journal of Comparative Psychology, 20: p159-168 [Comparative]
292. Weilgart, L.S., (2007) The impacts of anthropogenic ocean noise on cetaceans and implications for management. Canadian Journal of Zoology 85(11): 1091-1116 [Behavior][Physiology]
293. Whale-watching: Sustainable Tourism and Ecological Management (2014), J. Higham, L. Bejder, R. Williams (Eds) Cambridge: Cambridge University Press. 387 pp. [WhaleWatch] [NPR]
294. Williams R, O'Hara P. (2010) Modelling ship strike risk to fin, humpback, and killer whales in British Columbia, Canada. J Cetac Res Manag.;11(1):1-8 [Orca][Cumulative]
295. Williams, D. Lusseau and P. Hammond, (2006) "Estimating relative energetic costs of human disturbance to killer whales (Orcinus orca)," Biol. Conserv., pp. 301-311. [Orca] [Physiology]
296. Williams, E. Ashe and D. Sandilands (2011) "Stimulus-dependent response to disturbance affecting the activity of killer whales," Report SC/63/WW5 presented to the 63rd International Whaling Commission Scientific Committee Meeting, Tromso, Norway. [Orca] [Disturbance] [NPR]
297. Williams, R. Bain, D. E., Ford, J. K., & Trites, A. W. (2002a). Behavioural responses of male killer whales to a 'leapfrogging' vessel. Journal of Cetacean Research and Management, 4(3), 305-310. [Vessel][Behavior][Orca]
298. Williams, R., Ashe, E. (2006). Killer whale evasive tactics vary with boat number. Journal of Zoology doi:10.1111/j.1469-7998.2006.00280.x [Boat][Behavior][Orca]
299. Williams, R., Bain, D., Smith, J., Lusseau, D. (2009). Effects of vessels on behaviour patterns of individual southern resident killer whales *Orcinus orca*. Endangered Species Research 6:199-209. [Orca] [Vessels][Behavior]
300. Williams, R., C. Erbe, E. Ashe, and C.W. Clark. (2015). Quiet(er) marine protected areas. Marine Pollution Bulletin 100:154-161.
301. Williams, R., Clark, C. W., Ponirakis, D., & Ashe, E. (2014). Acoustic quality of critical habitats for three threatened whale populations. Animal conservation, 17(2), 174-185. [Comparative][Acoustics]
302. Williams, R., E. Ashe, D. Sandilands, and D. Lusseau, (2010) "Killer whale activity budgets under no-boat, kayak-only, and power-boat conditions." Final report presented to NOAA. [Boat][Behavior] [NPR]
303. Williams, R., E. Ashe, L. Bright, M. Jasny, and L. Nowlan. (2014a). Viewpoint: Marine mammals and ocean noise: Future directions and information needs with respect to science, policy and law in Canada. Marine Pollution Bulletin 86:29-38.
304. Williams, R., Erbe, C., Ashe, E., Beerman, A., & Smith, J. (2014b). Severity of killer whale behavioral responses to ship noise: a dose–response study. Marine pollution bulletin, 79(1-2), 254-260. [Behavior][Orca]
305. Williams, R., Thomas, L., Ashe, E., Clark, C.W. and Hammond, P.S., (2016). Gauging allowable harm limits to cumulative, sub-lethal effects of human activities on wildlife: A case-study approach using two whale populations. Marine Policy, 70, pp.58-64. [Orca][Cumulative]
306. Williams, R., Trites, A., Bain, D. (2002b). Behavioral responses of killer whales (*Orcinus orca)* to whale-watching boats: opportunistic observations and experimental approaches. J. Zool., Lond. 256: 255-270. [Behavior][Orca][WhaleWatch][Vessel]
307. Williams, R., Wright, A.J., Ashe, E., Blight, L.K., Bruintjes, R., Canessa, R., Clark, C.W., Cullis-Suzuki, S., Dakin, D.T., Erbe, C. and Hammond, P.S., (2015). Impacts of anthropogenic noise on marine life: Publication patterns, new discoveries, and future directions in research and management. Ocean & Coastal Management, 115, pp.17-24.
308. Williams, S. Veirs, V. Veirs, E. Ashe and N. Mastick, (2018) "Approaches to reduce noise from ships operating in important killer whale habitats," Marine Pollution Bulletin. [Boat sounds] [Boats]

309. Wilson, C. and Tisdell, C., (2003) Conservation and Economic Benefits of Wildlife-Based Marine Tourism: Sea Turtles and Whales as Case Studies. Human Dimensions of Wildlife 8: 1, p 49-58. [WhaleWatch]
310. Wittekind, D. K. (2014). A simple model for the underwater noise source level of ships. Journal of Ship production and design, 30(1), 7-14.[Vessels][Acoustics]
311. Wladichuk, J., D. Hannay, A. MacGillivray, Z. Li. 2018. *Whale Watch and Small Vessel Underwater Noise Measurements Study: Final Report*. Document 01522, Version 3.0. Technical report by JASCO Applied Sciences for Vancouver Fraser Port Authority ECHO Program. [Vessels][Acoustics][NPR]
312. Wladichuk, JL, Hannay, DE, MacGillivray, AO, Li, Z, Thornton, S. 2019. Systematic source level measurements of whale watching vessels and other small boats. The Journal of Ocean Technology: 14, 3. [Vessels][Acoustics][WhaleWatch]
313. Wood, J., Tollit, D., Joy, R., Koshure, N., MacGilivray, A., Trounce, K., & Robinson, O. (2018). Commercial ship versus whale watch boat noise: relative effects on Southern Resident killer whales. Salish Sea Ecosystem Conference [Orca] [NPR]
314. Wright, A. J., & Robertson, F. C. (2015). New mitigation methods and evolving acoustic exposure guidelines. ECS Special Publication Series, (59). [NPR]
315. Wright, A.J., and L.A. Kyhn. 2015. Practical management of cumulative anthropogenic impacts with working marine examples. Conservation Biology 29:333-340. [Cumulative]
316. Wright, A.J., Deak, T., Parsons, E.C.M., (2011) Size matters: Management of stress responses and chronic stress in beaked whales and other marine mammals may require larger exclusion zones. Marine Pollution Bulletin 63:p5-9 [Physiology]
317. Wright, A.J., Soto, N.A., Baldwin A.L, Bateson, M., Beale, C. M., Clark, C., Deak, T., Edwards, E. F., Fernández, A, Godinho, A., Hatch, L.T., Kakuschke, A., Lusseau, D., Martineau, D., Romero, M. L., Weilgart, L.S., Wintle, B.A., Notarbartolo-di-Sciara, G., Martin, V. (2007) Do Marine Mammals Experience Stress Related to Anthropogenic Noise? International Journal of Comparative Psychology 20:2. [Comparative][Physiology][Behavior]
318. Wright, A.J., Soto, N.A., Baldwin A.L, Bateson, M., Beale, C. M., Clark, C., Deak, T., Edwards, E. F., Fernández, A, Godinho, A., Hatch, L.T., Kakuschke, A., Lusseau, D., Martineau, D., Romero, M. L., Weilgart, L.S., Wintle, B.A., Notarbartolo-di-Sciara, G., Martin, V. (2007) Anthropogenic Noise as a Stressor in Animals: A Multidisciplinary Perspective. International Journal of Comparative Psychology 20:2. [Comparative][Physiology][Behavior]
319. Yazdi, P. (2007). "Impact of tour boats on the behaviour and energetics of bottlenose dolphins (Tursiops truncatus) off Choros Island, Chile." International Whaling Commission SC/59/WW20 [Vessels][Behavior][Physiology][NPR]
320. Zeppel, H. & Muloin, S. (2008) Conservation benefits of interpretation on marine wildlife tours. Human Dimensions of Wildlife, 13:4 p 280-294. [WhaleWatch]