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Ms. Lynne Barre  
NMFS West Coast Region  
7600 Sand Point Way NE  
Seattle, WA 98115

Dear Lynne,

I am writing to comment on the National Marine Fisheries Service's (NMFS) January 12, 2017 Federal Register notice (82 Fed. Reg. 4276) and the November 2016 Orca Relief petition to establish a whale protection zone for southern resident killer whales (SRKWs). The SeaDoc Society is a science-based, non-advocacy program and I have reviewed the proposal, not in an effort to advocate for or against the proposal, but to examine the data used to create the proposal and comment from a science-perspective on the topics requested. Specifically:

**(1) The advisability of and need for regulations to establish a whale protection zone**

There is ample scientific evidence to support taking management actions aimed at reducing underwater noise where southern resident killer whale forage. Chinook salmon abundance strongly correlates with southern resident killer whale demographic rates (Ward et al., 2013). More specifically, the aggregation of all Chinook stocks seems to be most tightly associated with SRKW demographic rates (Ward et al., 2013).

Good scientific evidence suggests that increased levels of underwater noise cause killer whales to increase the amplitude and duration of their communications (Foote et al., 2004, Holt et al., 2009). Additionally, vessel noise may also mask killer whale echolocation signals (Bain & Dahlheim 1994, Erbe 2002) used for finding and capturing salmon. Ambient noise received by whales seems to be significantly correlated to vessel speed and the number of propellers on a vessel (Haughton et al., 2015). Furthermore, it has been shown that both southern (Lusseau et al., 2009) and northern residents (Williams et al., 2006) reduce foraging effort in the face of vessel traffic and that vessel traffic can cause a large range of individual animal behavioral changes depending on the number and proximity of boats (Williams and Ashe, 2007, Williams et al., 2009), which may lead to a reduction in prey capture and alimentation.

Work looking at the interactive effect of salmon availability and vessel stress using fecal glucocorticoid and thyroid hormone (T3) suggested that prey availability has a greater physiological impact on southern residents than does vessel traffic, however the authors also note that sample size may have biased against being able to identify some combination of year (as a metric for salmon abundance), salmon availability, and vessel abundance for explaining increases in glucocorticoids and decreases in T3 (Ayers et al., 2012).

Cumulative effects of multiple stressors on marine mammals are complex and challenging to understand (National Academies, 2016), however it appears that there is ample evidence to suggest that increased

underwater noise from vessels, vessel traffic, and limited salmon availability have an interactive effect on southern resident killer whale health and clearly need to be addressed. The Orca Relief petition to establish a whale protection zone on the west side of San Juan Island, therefore, may benefit southern residents by providing a more quiet area where SRKWs are known to forage and, thus, deserves to be considered.

## **(2) The geographic scope of regulations**

The west side of San Juan Island has been clearly identified as an important area for SRKW summer feeding. In fact, Ashe et al. (2009) proposed a similar location for a marine protected area and modeled that a killer whale observed inside the candidate MPA would be 2.7 times as likely to be engaged in feeding activity than it would if the whale was observed outside the protected area. Using 6 years of sighting data, Hauser et al. (2007) also looked at summer distribution of SRKWs and suggested that while pod-specific habitat use does occur, the west side of San Juan Island represents a hot spot for use by all three SRKW pods. In fact, based on Hauser's (2007) kernel density distributions, NMFS may want to consider expanding the proposed whale protection zone further north to Stuart Island as shown in Hauser et al.'s (2007) Fig. 3.

Data presented at the March 6, 2017 workshop on SRKW body condition and nutrition suggest that, based on photogrammetry data, SRKWs seem to return to the west side of San Juan Island in the spring in less robust body condition compared to when they leave the prior September, and increase in condition over the course of the summer (Matkin et al., 2017). In fact, as measured by head fatness (Eye Patch Ratio, EPR) from September 2015 to May 2016, five of six animals had declines in body condition. From May to September 2016, three of these six animals had increases in EPR over the summer, three had decreases and all three animals that had continued declines in EPR over the summer of 2016 died (Matkin et al., 2017).

Presentations on fecal hormone levels made during workshops culminating in the Hilborn et al. (2012) report argued that the decline in T3 values through spring and summer indicated nutritional stress during this period, but the data were not overwhelmingly convincing. Declines in T3 could be explained by changes in photoperiod, as well as by individual differences in nutritional status, age, sex, reproductive status, stress and PCB exposure of individuals sampled. Unfortunately, the lack of fecal hormone data in winter months due to logistical difficulties associated with sample collection limits the current utility of the available fecal hormone data to assess the nutritional status of the SRKW.

It appears that the west side of San Juan Island is an important location for SRKW feeding on Chinook salmon and fattening after losing weight over the winter. This would suggest that decreasing noise at this location could increase SRKW fishing success and, possibly, simultaneously decrease energy expenditure. On the other hand, the independent science panel in Hilborn et al. (2012) suggest that "given that the density of Chinook salmon in the summer as they migrate to the Fraser River is far higher than the density in the rest of the year when Chinook salmon are spread over a much larger area, it seems unlikely that the summer period would be the most critical period where Chinook salmon abundance affected SRKW vital rates."

Due to the paucity of data on where SRKWs are feeding during the winter and on which stocks or even which species of fish they rely, NMFS is probably unable to address boat noise and food availability during the winter, leaving the summer as the only current option for management action. Uncertainty about the value of this management action makes it critical that a monitoring and adaptive management plan be included as part of any decision to enact a no-go zone for SRKWs.



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### **(3) Alternative management options for regulating vessel interactions with killer whales, including but not limited to the option in the petition**

One slightly alternative management option for regulating vessel interactions with killer whales would be a seasonal, rather than year-round, closure of the recommended area. As detailed above, photogrammetry work discussed at the March 6, 2017 Killer whale nutrition workshop (Matkin et al., 2017) supports that SRKW's arrive in the spring to feed on salmon on the west side of San Juan in worse body condition than when they left the prior September. If the spring and early summer are the key times for SRKW's to feed and gain condition, then NMFS should consider a closure from May through August or some similar period. Data don't exist to support keeping the area closed to boat traffic during other times of the year. From an adaptive management perspective, it would seem that in concurrence with a seasonal closure, NMFS should use photogrammetry to evaluate SRKW body condition at the beginning of each season then again at the end of the closure to ensure that SRKW's are gaining body condition. Interannual variation in body condition for different age and sex classes then could be evaluated based on estimated salmon returns and used to modify the closure as needed to maximize SRKW alimentionation.

### **(4) Scientific and commercial information regarding the effects of vessels on killer whales and their habitat**

Presenting unpublished data at the March 6, 2017 workshop on SRKW nutrition (Matkin et al., 2017), Dr. Durban commented that, while collecting photogrammetry data using a hexicopter, they noted multiple occasions where the mechanical presence of a boat (even with the engine off) seemed to obstruct a SRKW from catching a salmon. The mechanical role that boats may play in reducing occasional SRKW catch of salmon needs to be quantified to determine if the mere presence of boats, without associated noise, can impede SRKW foraging.

### **(5) Information regarding potential economic effects of regulating vessel interactions**

No comment.

### **(6) Additional relevant information that NMFS should consider should it accept the petition**

- The presence of non-motorized vessels in the proposed closure area needs to be more fully examined. Evidence demonstrates that silent vessels like kayaks can elicit avoidance behavior and energetic demands in killer whales (Williams et al., 2015).
- Stakeholder buy-in is critical for management actions to be effective. If NMFS should accept this petition, I strongly recommend investment in a multi-stakeholder process that will address concerns of tribal use of the area, recreational and commercial fishing, whale and wildlife watching and recreational boaters, as part of developing final guidelines that will be respected by all parties.

In summary, there is ample evidence suggesting that elevated underwater noise from vessels, the presence of vessel traffic, and limited salmon availability have an interactive effect on southern resident killer whale health and clearly need to be addressed. The petition to establish a whale protection zone on the west side of San Juan Island provides a management option that may help address concerns related to these stressors. From a geographic perspective, NMFS may want to consider extending the proposed protection zone north to Stuart Island based on Hauser et al.'s work (2007). All data that I have reviewed support a seasonal closure from spring into summer, but do not indicate that a closure during other times of the year is warranted. Finally, should NMFS find just cause in instituting a whale protection zone on the west side of San Juan Island, final actions and guidelines need to address the role of non-motorized vehicles, work through a multi-stakeholder process, and institute a photogrammetry-based body condition monitoring program that examines SRKW body condition at the beginning and end of each seasonal closure to determine if the area closure is having the intended benefit of increasing SRKW nutritional

condition during the summer feedings season and ultimately increasing SRKW fecundity while decreasing SRKW mortality.

Sincerely,



Joseph K. Gaydos, VMD, PhD  
Science Director, SeaDoc Society

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