

## **Review of Proposed Rules for Commercial Whale Watching Licensing Program Washington State Academy of Science Committee on Underwater Acoustics and Disturbance**

### **Summary:**

Compared to the status quo, Proposal L and Proposal J would offer beneficial effects by limiting the number of licensed commercial whale watch (CWW) vessels around Southern Resident killer whales (SRKW). Proposal L is more precautionary and has greater beneficial effects compared to Proposal J, especially when recreational vessel numbers are low. Proposal J may result in a reduction in the number of CWW around SRKW, but the ability to approach multiple sub-groups of the same pod if they are separated by ½ nautical mile may lead to a large number of CWW vessels around a single pod. Proposed codification of the existing voluntary no-go zone on the west side of San Juan Island and a requirement for AIS of CWW vessels is also seen as beneficial.

One issue that remains unaddressed by the proposed rules is the application of regulations to recreational vessels. In particular, restricting CWW vessels without further restricting the movement of all boats around SRKW may lead to situations where the number of CWW may be negligible compared to other boats, leaving recreational vessels as the primary source of interactions and disturbance for SRKW.

### **Clarifications/Interpretations:**

The WSAS committee made the following assumptions in interpreting the proposed rules:

- The Advisory Committee wrote these proposed regulations for licensed CWW vessels, not all vessels.
- Any boat coming into WA waters must be licensed, including Canadian vessels.
- The language of Proposal J is interpreted to mean that up to 3 licensed CWW vessels may be within ½ nautical mile of each SRKW whale for 45 minutes per interaction per vessel.
  - It would be worth clarifying the language in Proposal J to indicate whether this interpretation is correct and not that the language should instead be interpreted as dictating the total number of WA state-licensed CWW vessels each year.
- Specific enforcement strategies are outside the scope of these rules. The WSAS committee notes that there is unpublished scientific evidence for the presence of enforcement reducing infractions.

### **Key Points from Proposals:**

#### **Sentinel effect of CWW**

The WSAS committee notes that there is insufficient scientific evidence to support a sentinel effect (in which the presence of CWW vessels and active outreach by operators serves to alert and slow other vessels) or magnet effect (in which the presence of CWW vessels draws in additional vessels) of CWW vessels. In particular, many of the justifications in Proposal J about the effect of CWW in reducing overall vessel impacts are unsupported by current evidence.

Though Proposal L is more restrictive, it leaves open the possibility that private boaters will continue to view SRKW at numbers that are of concern for causing disturbance. If Proposal J were to mandate requirements that CWW operators serve as sentinels, this change could increase the scope for a sentinel effect but the magnitude of this effect, and therefore its effectiveness, would remain largely unknown.

Caution must be used when assuming a sentinel effect exists without sufficient evidence. Scientific evidence of a sentinel effect would support reasoning for a higher number of CWW vessels near whales. As it is currently known that vessel presence has behavioral and physiological effects on whales, and it is **not** known that there is a sentinel effect due to recreational boater behavior, the precautionary principle would lead us to assume that the sentinel effect is not present until otherwise demonstrated.

There is insufficient evidence to date to support the conclusion that the presence of CWW vessels reduces potential vessel impacts. The WSAS committee did not interpret the findings of Dr. Hass's analysis of Soundwatch data to be consistent with a sentinel effect, due to limitations in data collection and sample size. In addition, Soundwatch reports suggest that even CWW vessels have increased rates of infractions when enforcement vessels are not present, a contraindication to Proposal J's assertion that CWW will self-enforce practices. Self-enforcement is also not well-defined in Proposal J.

Regardless of the Proposal selected, studies would need to be conducted to assess how or if observed, reported, or enforced infractions change with a change in the number of CWW vessels present. In order to establish this connection, additional research would need to be conducted with:

- At least one and preferably more seasons of Soundwatch observations;
- In addition to observations, a controlled study with a sufficiently large sample size of randomized applications of interactions with recreational vessels, tracked over a season or more;
- Combined land-based observation (which biases sampling in the landscape of whale presence) and boat-based observation (which may bias boater behavior);
- Measurement of claims such as reduced recreational vessel interaction, speed, and so on; and
- The WSAS committee's note that encounters with transient killer whales would be appropriate for this type of study because boater behavior (not whales) would be the subject of study.

The WSAS committee notes that regardless of the yet unproven sentinel/magnet effect, management science indicates that industry buy-in to adopted rules can be helpful in ensuring the effectiveness of those rules.

### **Number of vessels around SRKW**

The research suggests that a lower number of vessels would lead to lower levels of disturbance. However, there are limitations in that the literature has not measured differential impacts in fewer than 3 vessels, thus the scientific evidence does not indicate a differential impact to SRKW between 1 (as in Proposal L) and 3 (as in proposal J) vessels.

The core issue is that licensed CWW vessels are not the only boats around whales, and if regulations for other vessels are not in place, their number may be negligible compared to other boats. For example, if there are 20 recreational vessels around whales, the addition of 3 CWW vessels versus 1 CWW would not make an appreciable difference in the level of disturbance. However, as noted in both proposals, often a moving pod separates into matriline and smaller sub-groups, and orcas from a single pod can be spread over multiple miles. In these cases, Proposal J allows 3 boats to approach each sub-group (if they are separated by  $\frac{1}{2}$  nm). As a consequence, there may be occasions where 6-15 CWW boats might be viewing a single spread-out pod. Proposal L allows 0-1 vessels to approach each pod or matriline (if they are separated by  $\frac{1}{2}$  nm) and thus is considered to lead to lower levels of disturbance overall.

### **Recreational vessels**

As noted above, and with the understanding that this may be beyond the scope of these rules, a core issue

in both of these Proposals is that licensed CWW vessels are not the only boats around whales, and if other regulations are not in place, their number may be negligible compared to other boats. Restricting CWW vessels without further restricting the movement of all boats around SRKW may lead to situations where recreational vessels are the primary source of interactions and disturbance for SRKW.

The research to date aligns with increasing the minimum viewing distance and reducing interactions of SRKW with all vessels, not just CWW vessels, and points towards allowing better-regulated CWW vessels to operate at a closer distance than recreational vessels.

With the recognition that it is challenging to restrict and enforce rules on recreational vessels, particularly if it is beyond the scope of this rulemaking, one mechanism to address this issue could be a cap on the total number of boats around SRKW, whether commercial or recreational. Some regulations on CWW could also be easily extended to recreational vessels, such as no-go zones. Both of these potential additions to the proposed rules would align with the research on SRKW disturbance.

### **Distance around SRKW**

The proposed ½ mile distance follows the science, as SRKW react to boats within 400 meters and increase their call amplitude ("volume") with increasing background noise which correlates with the number of vessels within 1000 meters. However, the WSAS committee notes that it is challenging to positively identify SRKW from a ½ mile distance, making it infeasible (when ecotype identification is uncertain) to reasonably enforce the suggestion in Proposal L. This could be possible if a large number of enforcement vessels could identify all present pods of whales. Another, and likely more feasible, option is the presence of a trained observer/monitor on CWW boats to monitor the boat's interactions and also report compliance by recreational vessels in the vicinity. Under Proposal L, if no CWW enforcement or monitoring boats are present, one CWW vessel can approach a pod or matriline closer than ½ mile for identification purposes. Ideally, this vessel would have a means to communicate whether it is approaching SRKW (in which case no other CWW boats can subsequently approach) or if it is with transient whales – potentially by use of flags visible from ½ mile.

As noted in both Proposals J and L, SRKW pods can change behavior quickly, fusing groups in certain geographic areas and splitting in others. The patterns of fusion/fission are observed by experienced vessel operators, but this behavior has also changed in recent years and is likely to continue to change over time. It is not clear in Proposal J what the process would be to manage which CWW vessels would need to leave when SRKW groups become closer together than ½ nautical mile or fuse to socialize or rest. Because of this complexity in SRKW behavior, ½ nautical mile may be too close a distance between subgroups of SRKW to treat as separate for the purposes of CWW presence.

The WSAS committee notes that while the low-visibility conditions as defined in the Proposals are not easy to measure or enforce because there is variability in visibility conditions over the water, the ½ mile visibility rule is reasonable – and one has to be able to see whales in order to stay out of their way. Regarding distance requirements, the WSAS committee agreed that micromanaging individual vessel interactions with whales is difficult and it is often easier to take a holistic approach to reducing the overall impact of interactions.

### **Time limits for presence**

The WSAS committee notes that there is no scientific evidence for a 45-minute viewing window limit for SRKW. The committee also questions the justification of the 45-minute time limit in Proposal L for vessels to wait until Soundwatch/WDFW arrives.

The WSAS committee also notes that neither Proposal provides a break during daytime hours in which whales would have no interactions with CWW vessels. Both proposals provide 45-minute limits on interactions per vessel or group of vessels, but both (and in particular Proposal J) leave the potential for SRKW to be interacting with boats all day. Current research is being conducted on diurnal patterns, particularly for foraging behavior. Other management schemes have time closures – for example, New Zealand’s voluntary code of conduct expects vessels to refrain from approaching dolphins from 11:30am-1:30pm.

### **No-go zone**

The area denoted as a no-go zone in both Proposals is a known corridor for SRKW. If the no-go zone were expanded (from the proposed ¼ mile to ½ mile, for example), other issues could arise. For example, large male SRKW often use areas farther offshore to forage, and an expansion of the no-go zone could cause a larger burden of vessels on a smaller number of whales foraging at the farther distance.

Similar to the maximum number of boats around whales, a no-go zone would be best applied as a rule for recreational vessels, as well. Exclusion zones are useful, but also need to be reviewed regularly as part of adaptive management, as SRKW behavior and spatial patterns change, as they have in recent years.

### **Kayaks**

While the WSAS committee notes limited evidence (due to low sample sizes in studies) that kayak presence can cause disturbance, mitigating potential disturbance may be in conflict with the access and safety of kayakers. Expanding on Proposal L, another mechanism to decrease interaction would be requiring that kayaks cannot launch into an oncoming group of SRKW.

### **Automatic Identification System (AIS) requirements**

AIS is an automated data source that would inform many scientific questions about spatial patterns in vessel locations and densities. AIS would also likely increase data quality and reduce the burden of reporting sightings by allowing automation of SRKW location reporting. These characteristics could enhance conservation efforts by shedding light on vessel density around whales, whale movement patterns, and so on.

The WSAS committee stresses that AIS is not an enforcement mechanism and does not imply lack of responsibility of commercial operators as Proposal J suggests. Its use as an enforcement mechanism would be reliant on knowing the precise location of the whales relative to vessels in the vicinity.

### **Reporting**

While Proposal J suggests that CWW license holders will establish a reporting protocol, the WSAS committee notes the potential for bottlenecks in creating this protocol and suggests instead an automated hotline such as that managed by NOAA for North Atlantic Right Whales.

### **Adaptive management**

#### ***Fish hatchery data***

Although higher prey availability in key areas makes it easier for SRKW to handle stressors, these data should not be used as a justification to increase the number of vessels in the vicinity of SRKW. The science shows that SRKW reduce foraging behavior in the presence of vessels, regardless of prey

availability. That is, SRKW need not only a sufficient fish population to forage but also opportunities to forage undisturbed.

Effective adaptive management defines a unit of acceptable change and sets targets for management. Given the above limitations, fish hatchery numbers are inappropriate for use as a management trigger though they may inform the environment that SRKW are in. Fish hatchery data is not an indicator of SRKW recovery, which is the intended management target.

Additional concerns about the use of fish hatchery data as a management trigger include:

- The data from a fishery would not likely be interpretable early enough in the season to be used as a management trigger. One year of fish escapement data is also not predictive of the next year – the measure of escapement does not indicate the survivability of smolts or the prior year currently at sea. In order to be usable, one might consider tracking sustained high Albion numbers across multiple years.
- Data from Albion as a terminal test fishery cannot parse out what fraction of fish travel south through the Strait of Juan de Fuca (more likely available to SRKW) as opposed to those which travel north through Johnstone Strait.
- Fraser River salmon indicators are an incomplete measure of the full scale of fish abundance for the west coast; the full scale is important to SRKW reproductive success.
- The literature shows a time lag between salmon numbers and SRKW population effects – that is, real-time Albion data only affects future reproductive success (not that of the current year).
- SRKW may need to have higher rates of (undisturbed) foraging during periods of high prey availability to compensate for low-prey periods. During low-fish years, less disturbance is imperative, but this need for low disturbance persists in years with higher fish counts.
- Though both SRKW and Northern Resident Killer Whale (NRKW) population dynamics are related to salmon abundance, even in good fish years, SRKW have lower reproductive success compared to NRKW. This could indicate that the energetic needs of SRKW are not being met to achieve population recovery.

### ***Population target***

While population number is a clear and easy measurement, the target number may not be appropriate. It is not clear what the current ecosystem's carrying capacity for SRKW is, including changes such as climate change impacts. This uncertainty coupled with population declines over the past decades would point to 84 as too low a population number to indicate recovery. The carrying capacity and the minimum viable population number should both be part of the target setting process in the adaptive management plan.

Demographic issues with a small population also make it continually more challenging to recover. Even if vessel interactions are at a tolerable level, the population may not be able to produce a calf for a variety of other reasons.

Population count is an integrated target that relies on many other factors – that is, while management of vessel interactions may be successful, the SRKW population may take a very long time to reach, or fail to reach, 84 or more adult whales.

### ***Additional comments regarding adaptive management***

At this point, there exist several uncertainties that are critical to address prior to developing long-term management of whale watching. In general, the adaptive management plan needs to include all relevant factors that could change and/or be manipulated based on a set of testable hypotheses. Adaptive

management requires monitoring what is being managed (vessel interactions), the response (such as population), and other interacting, and cumulative, factors (such as prey availability). Other possible adaptive management measures could include body condition (with the caveat that other factors impact body condition), bioenergetic studies, and tracking of successful foraging.

### Specific Questions

**1. Is the impact of recreational boats significant enough to merit consideration of commercial whale watching as a mechanism to regulate recreational boaters' behavior?**

The total volume of traffic (recreational and commercial) is the critical measure in this rule-making. The sentinel role is not supported by scientific evidence. Neither is there sufficient scientific evidence to state whether CWW vessels have a magnet effect that draws in recreational boats. However, the impact of recreational boats, which Soundwatch data indicates is the largest fraction of infractions, is significant enough to merit consideration of more restrictive regulations for recreational vessels for the purpose of decreasing interactions of vessels with SRKW.

Proposal J's assumption that CWW provide a sentinel role has limited empirical data. Though Proposal L is more restrictive, it leaves the possibility that private boaters will continue to view SRKW at numbers that create disturbance. If Proposal J mandates requirements that CWW operators serve as sentinels and educate other boats about appropriate behavior, this would increase the likelihood of a sentinel effect.

**a. If Yes; How/should the precautionary principle be applied to the "sentinel role"? If there is some limited science, and some observational/anecdotal evidence, on the influence of CWW vessels in lessening the number/frequency of recreational impacts on SRKW, but the science is inconclusive, should we apply a precautionary approach in assuming there is a potential (causal relationship and therefore) benefit we should preserve?**

As it is known that vessel presence has behavioral and physiological effects on whales, and it is not known that there is a sentinel effect on recreational boater behavior, the precautionary principle would lead us to assume that the sentinel effect is not present until otherwise demonstrated.

**2. Relative to the past impacts of commercial whale watching, the broader vessel disturbance/noise issue, and the broader threats facing SRKW (e.g. prey availability), is there a marginal or significant expected benefit of choosing proposal L (the more restrictive proposal) over proposal J? (a) Were certain contrasts between the proposals more/less important to this determination? (b) Putting both proposals at the ends of a spectrum, is there an inflection point at which the cumulative impacts start increasing/decreasing sharply?**

Both proposals will limit the number of CWW vessels near SRKW. The research suggests that a lower number of vessels would lead to lower levels of disturbance. However, there are limitations in that the literature has not measured differential impacts in fewer than 3 vessels, thus the scientific evidence does not indicate a differential impact to SRKW between 1 (as in Proposal L) and 3 (as in proposal J) vessels. The current scientific evidence also does not make it possible to identify an inflection point of impacts. A marginal benefit would be highly challenging to quantify, and would require actual experiments to determine.

Proposal L is more in line with other approaches used to manage marine mammal populations globally, is more precautionary, and has greater beneficial effects compared to Proposal J, especially when recreational vessel numbers are low. In contrast, Proposal J makes assumptions such as the sentinel role that are not supported by the evidence, and the ability to approach multiple sub-groups of

the same pod if they are separated by ½ nautical mile may lead to a large number of CWW vessels around a single pod.

However, neither Proposal addresses the full range of vessel disturbance. Restricting CWW without restricting all boats may lead to situations where the number of CWW may be negligible compared to other boats, leaving recreational vessels as the primary interactions and therefore driving source of disturbance for SRKW. As SRKW responses to vessels are only reduced when the number of boats is very low (fewer than 3), removing more CWW boats may not provide the intended benefit. In that way, rules focusing only on commercial operators are likely to fall short of the core objective of reducing vessel disturbance to SRKW.

**3. What is the mitigation benefit of 3 – 5 vessels at a distance of 300-yard approach distance and slow speed limits versus historical vessel numbers at 200-yard approach distance with no legal slow speed zone?**

The most effective immediate noise-reduction strategy is reducing the number of vessels. An increase from 200 yards to 300 yards would also decrease noise to a lesser extent. Vessel speed also impacts noise levels. Reducing all (number, distance, speed) components would reduce disturbance to SRKW. Given that even a low number of vessels can cause behavioral responses, 3-5 vessels will still potentially disturb SRKW.

**4. What are the expected benefits of 3 - 5 slow commercial whale watching vessels at 300 yards working to slow high speed transiting vessels?**

The impacts of this action will depend on the whale distribution and behavior as well as the efficacy of the vessel operators' ability to make contact with and slow other vessels. Depending on these variables, it could instead increase overall vessel exposure by increasing the amount of time SRKW spend with vessels.

**5. Could the Albion Test Fishery be used as an adaptive management trigger and/or trigger for variable rules (e.g. X boats in high Albion Test Fishery months; Y boats in lower Albion Test Fishery months)?**

The Albion Test Fishery hatchery numbers would be inappropriate for use as a management trigger. There is uncertainty in fish survival and travel and time lag in effects on SRKW reproductive success. Also, SRKW may need to have higher rates of (undisturbed) foraging during periods of high prey availability to compensate for low-prey periods.

Although higher prey availability in key areas makes it easier for SRKW to handle stressors, these data should not be used as a justification to increase the number of vessels in the vicinity of SRKW. The science shows that SRKW reduce foraging behavior in the presence of vessels, regardless of prey availability. That is, SRKW need not only a fish population to forage but also opportunities to forage undisturbed.

Additional detail is provided in “Adaptive management” above.

**6. Could seasonality of higher recreational boating traffic act as an adaptive management trigger and/or trigger for variable rules (e.g. X boats in high recreational boating seasons; Y boats in lower recreational traffic seasons)?**

Given the uncertainty of the sentinel effect, and the difficulty in implementing/managing a variable rule, it is advisable to have one set number of vessels in the licensing rules for the first year. Rigorous studies by impartial scientists conducted to evaluate the sentinel effect would inform revisiting this component.

7. **What is the WSAS panel’s interpretation of Todd Hass’s analysis of the purported “sentinel effect” for CWW? Does the analysis indicate the potential for a “magnet” effect, where the presence of a CWW or flag vessel attracted recreational boaters? Does the analysis provide any justification for allowing CWW on southern residents, in order to fulfill a “sentinel role,” when WDFW enforcement or Soundwatch vessels are present? Does the statistical analysis appropriately take into account all the variables, including variability of CWW vessels, recreational vessels, enforcement vessels, and infractions?**

The WSAS committee did not interpret the findings of Dr. Hass’s analysis of existing Soundwatch data to be consistent with a sentinel effect, due to limitations in data collection and sample size. These analyses do not indicate sufficient evidence to support either sentinel or magnet effects from CWW vessels.

Additional detail is provided in “Sentinel effect of CWW” above.

8. **What triggers for relaxing or tightening limits on commercial viewing of southern residents are most appropriate to a precautionary approach to management?**

The triggers depend on the evidence available. Other industries have defined rules that define a population as depleted, recovering, or recovered, and a change in status triggers changes in viewing limits and other regulations.

Additional detail is provided in “Adaptive management” above.

9. **Is the ¼ mile no-go zone distance off the west side of San Juan Island scientifically beneficial to the SRKW, or does it need to be expanded (e.g., to ½ mile)?**

The area denoted as a no-go zone in the Proposals is a known corridor for SRKW. Exclusion zones are useful, but also need to be reviewed regularly as part of adaptive management, as SRKW behavior and spatial patterns change.

If the no-go zone were expanded (to ½ mile, for example), other issues could arise. For example, large male SRKW often use areas farther offshore to forage, and an expansion of the no-go zone could cause a larger burden of vessels on a smaller number of whales foraging at the farther distance.

10. **What is the spread of southern resident matriline or pods when they come into the inland waters of Washington to forage, and what are the cumulative impacts of having as many as 3 CWW vessels intercepting them concurrently at ½ nautical mile intervals during daylight hours?**

As noted in the Proposals, SRKW pods can change behavior quickly, fusing groups in certain geographic areas and splitting in others. The patterns of fusion/fission are observed by experienced vessel operators, but this behavior has also changed in recent years and is likely to continue to change over time.

Increasing the number of vessels near whales increases the disruption of whales’ activities. If whales are attempting to communicate while spread out, they will need a quieter environment – more vessels in that environment will increase the noise level.

11. **Please provide guidance on the use of anecdotal information such as that of instances of disturbance, harassment, and near misses by recreational boats or kayaks when no monitors (PWWA, Soundwatch, WDFW) are present, in developing this rule and its adaptive management.**

These types of anecdotal observations can be useful to understand the dimensions of the problem and clearly describe aspects that may be useful for analysis and interpretation later. This information can



inform a robust study design to collect quantitative, semi-quantitative, or qualitative data and conduct analyses to make inferences about associative and causal relationships.

*Note: Research citations will be included in the forthcoming full summary of science.*