UNITED STATES OF AMERICA
Department of Commerce
National Oceanic and Atmospheric Administration

In re: Proposed Waiver and Regulations Governing the Taking of Eastern North Pacific Gray Whales by the Makah Indian Tribe	Administrative Law Judge Hon. George J. Jordan Hearing Docket No. 19-NMFS-0001

DECLARATION OF STELLA VILLEGAS-AMTMANN, PHD

I, Stella Villegas-Amtmann, hereby declare as follows:

PROFESSIONAL BACKGROUND

1. I have a PhD in Ecology and Evolutionary Biology from the University of California Santa Cruz and a B.S. in Biology from the Universidad Nacional Autónoma de México (UNAM), México D.F, México. A copy of my Curriculum Vitae is attached hereto as Exhibit SVA 1.

2. I am currently a Research Associate in Ecology and Evolutionary Biology and a Lecturer in Molecular, Cell, and Developmental Biology at the University of California Santa Cruz. Additionally, I am employed as an Adjunct faculty member in the Biology Department, Natural and Applied Sciences Division, at Cabrillo College.

3. My research focuses on the ecological physiology of marine mammals, including work to develop bioenergetic models of baleen whales, specifically gray, humpback, and blue whales, to predict population consequences of disturbance in order to be implemented in management plans.

SEA SHEPHERD LEGAL
2226 Eastlake Ave. East, # 108
Seattle, Washington 98102
(206) 504-1600

4. I have been involved in numerous marine mammal research projects, including a 2013-15 study that relied upon gray whale bioenergetics modelling to assess the population consequences of disturbance. I conducted this project with Dr. Costa and Dr. Schwarz at the University of California Santa Cruz.

5. I am the lead author of two published, peer-reviewed studies focusing on the energetic consequences of disturbance on gray whales and am currently finishing up a third manuscript for publication focused on energetic consequences of disturbance on humpback whales.

DISTRIBUTION AND MIGRATORY MOVEMENTS

6. Gray whales that are subject to disturbance from anthropogenic activities could experience energy loss as a consequence of avoiding that disturbance or in reacting to it. This energy loss could influence the whales' survival. Additional factors, acting in conjunction with energy loss, that could influence their survival are poor body condition, compromised immune response, and an increased risk of predation. I provide a more detailed discussion of these issues below.

7. In his declaration in support of NMFS's proposed waiver, an expert witness for the Makah Tribe, Jonathan Scordino, states that *"I agree with the conclusions of Blokhin and Litovka (2011) (Ex. M-0023) and Blohkin et al. (2017) (Ex. M-0021) that there is no evidence that Chukotkan hunts cause shifts in gray whale distributions or abundance."* Dkt No. 31 (Initial Direct Testimony of Jonathan Scordino) ("Scordino Direct"), at 26. I disagree with Scordino's statement on several grounds. First, the cited papers, which were submitted to the Scientific Committee of the International Whaling Commission (IWC), do not reach the "conclusions" referenced by Mr. Scordino. In fact, the goal of these limited studies was not to specifically determine whether the hunting caused shifts in gray whale distributions or abundance in the hunt area but rather to generally assess whether the hunts *e.g.* "negatively affect the modern state of the Eastern gray whale stock in Russian waters" for purposes of assessing the consistency of the hunts with the IWC's

criteria for aboriginal subsistence whaling (ASW). *See, e.g., id.*, Ex. M-0023, at 4. Second, these short papers do not contain an analysis of whale behavior in response to hunting activities. Similarly, they do not make any attempt to even ascertain if the same whales return to the limited study area each year – thus, rendering it impossible to know whether whales that survived previous hunting seasons in the subject small observation area actually return the following year. Third, if anything, these studies support the conclusion that whale numbers in the observation area are highly variable – both by year and by month within each season. Accordingly, in light of the fact that, for at least the time period between 2007 and 2011, the studies describe "stable feeding conditions for gray whales along the Chukotka Peninsula," it cannot be ruled out that the extreme fluctuations in reported numbers are due to disturbance related to the hunts. *Id.*, Ex. M-0023, at 1; Ex. M-0024, at 1.

8. With respect to the Chukotkan hunts, Mr. Scordino further asserts: "*Hunting occurred throughout periods of high and low abundance near Lorino (Blokhin et al. 2012) (Ex. M-0024), suggesting that the observed changes in abundance were more likely driven by factors such as availability of prey than by the response of whales to hunting pressure."* Scordino Direct, at 26. Again, the cited paper (submitted to the IWC to demonstrate compliance with the ASW criteria) does not address the "response of whales to hunting pressure." Moreover, there is no scientific basis for the suggested inference. The cited paper by Blokhin *et al.* (2012) (like the two other referenced IWC submissions), was intended for a limited purpose and based upon very limited data. *See, e.g.*, *Id.*, Ex. M-0023, at 2 ("[O]nly small part of Mechigmensky Bay coastal waters within a radius about 10 km (5.4 miles) was observed."); *Id.*, Ex. M-0024, at 2 (same). Additionally, the description by Blokhin *et al.* (2011) and Blokhin *et al.* (2012) of "stable" foraging conditions further undermines any suggestion that prey availability is driving the observed large fluctuations in whale abundance in the small study area. Thus, Blokhin *et al.* (2012) does not support the inferential leap suggested by Mr. Scordino.

SEA SHEPHERD LEGAL
2226 Eastlake Ave. East, # 108
Seattle, Washington 98102
(206) 504-1600

9. Assuming, *arguendo*, that there is a lack of shifts in gray whale distribution in the area of the Chukotkan hunts, this phenomenon may be due to the fact that the whales are not able to energetically afford such shifts while migrating. It might be a question of whether the whales are physiologically capable of affording the extra energy required to change their migration route and distribution. Studies have shown that extending migratory routes or altering migration speed is energetically costly for the whales. SVA-2 (Braithwaite, *et al.* 2015). Thus, in order to conserve the energy reserves that they possess to accomplish migration and survive and reproduce, the whales may face the risk of being hunted rather than expending the energy required to change their distribution to avoid the hunting area.

10. Villegas-Amtmann *et al.* 2015 demonstrated how a small proportion of the energy lost, such as 4% in migrating gray whales, could cause gray whales to not reproduce that year. SVA-3 (Villegas-Amtmann *et al.* 2015). Furthermore, if the hunting area represents a foraging stop over for migrating whales, it might be of crucial importance for the whales' survival to travel through that area to replenish their energy stores – again providing another reason why the whales might not change their distribution despite the hunting disturbance. Whales follow a fairly constant migratory route over the years and coastal migration provides them and their calves with protection. Blokhin *et al.* (2011) actually supports my opinion regarding foraging in observing that "[t]o all appearances, this water area is an important foraging ground for Gray whales." Scordino Direct, Ex. M-0023, at 3.

11. Consideration should also be given to the temporal aspect of whale distribution. Disturbance at the end of their northward migration will likely have a greater impact on the whales because they will be in an emaciated condition and eager to feed. Upon arrival at the foraging grounds, whales would prioritize foraging to replenish their body stores. Furthermore, pregnant females have the greatest energy requirements, are the most vulnerable to energy losses, and are

under a greater time constraint to return to the breeding grounds. SVA-4 (Villegas-Amtmann *et al.* 2017).

12. Any behavioral change obviously has associated costs to the individuals since the energy invested to avoid the disturbance could have been invested toward other needs, such as acquiring more food. In addition, repetitive exposure to a stimulus that elicits a behavioral response has the potential of causing cumulative stress or could have the reverse effect of habituation. Even short-term responses that have the potential to separate mom-calf pairs could become biologically significant. SVA-5 (NRC 2003). However, it is extremely difficult to attribute the immediate response of an individual to biologically significant parameters such as decreased foraging efficiency, growth, survivability, reproductive successes, etc., since the result occurs on a much larger temporal and spatial scale than the immediate response alone. SVA-6 (NRC 2005). In addition, unknown physiological factors, such as stress and cumulative exposure, may lead to biologically significant effects. An observed increase in breathing rate could be associated with stress and prolonged exposure and could have biologically significant consequences. For individuals that are already stressed, such as skinny whales, the contributed external stress could ultimately be detrimental in the long-term survivability or reproductive success of such whales. SVA-7 (Gailey *et al.* 2011).

13. In my opinion, Mr. Scordino also inappropriately discounts the effects of the hunt and training approaches on gray whales in the hunt area. *See* Scordino Direct, at 27-29. Numerous studies show that noise and vessel activity disturb and have an effect on a whale's behavior. For example, it has been shown that western gray whales were distributed farther from shore when exposed to high levels of sound from seismic surveys. SVA-8 (Gailey *et al.* 2007a). Similarly, during the installation of a Concrete Gravity Based Structure, western gray whales moved farther from shore as sound levels increased. SVA-9 (Gailey *et al.* 2007b). Additionally, Tyack and Clark (1998) found that migrating eastern gray whales avoided a low frequency acoustic sound source

when it was located directly in their migratory path. Malme *et al.* (1986) found that ~10% of eastern gray whales stopped feeding and moved away from transient (seismic) sounds when received sound levels exceeded 163 dB re μPa (rms).[1] SVA-10 (Malme *et al.* 1986). Williams *et al.* (2009) found that the number of killer whales in the area decreased as the number of vessels increased and distance from shore was significantly associated with research vessels. SVA-11 (Williams *et al.* 2009).

14. It is known from other studies that both marine and land mammals can feel "hemmed in" by a perceived danger and will often edge away by moving into more open, unfettered space where, presumably, they can run, or swim, in any direction. SVA-12 (Würsig and Evans 2001). Notably, any behavioral change obviously has associated costs to the individuals since the energy invested to avoid the disturbance could have been invested toward other needs, such as acquiring more food. Again, short-term responses that have the potential to separate mom-calf pairs could become biologically significant. SVA-5 (NRC 2003).

15. These studies support my opinion that vessel activity and other noise produced during the Makah hunt and associated training exercises would disturb the gray whales in the area, altering their behavior and, consequently, imposing negative energetic costs.

16. Further with respect to approaches and unsuccessful harpoon strikes, Mr. Scordino testifies:

> *In almost all cases I have observed, only the whale that was shot with the biopsy bolt reacted; even when other whales were in close proximity to the darted whale they did*

[1] This relationship was based on small sample sizes but was later supported by a larger dataset obtained from migrating eastern gray whales. *See* Malme, C.I., Würsig, B., Bird, J.E. and Tyack, P. (1988). Observations of feeding gray whale responses to controlled industrial noise exposure. pp. 55-73. *In:* W.M. Sackinger, M.O. Jefferies, J.L. Imm and S.D. Treacy (eds.) Vol. 2. *Port and Ocean Engineering under Arctic Conditions*. University of Alaska, Fairbanks, AK. 111pp.

> *not react with the exception of mother-calf pairs. My observation of gray whale response is consistent with observations of other researchers.*

Scordino Direct, at 28-29.

Mother-calf pairs are indeed the most vulnerable individuals in the population. Females that are nursing calves are operating with a limited amount of energy. A proportion of this energy is allocated to the nursing calf before they are able to reach the foraging grounds and replenish their energy reserves. At this point, females have been fasting for over 4 months and need to utilize their energy reserves toward migrating north and nursing a growing calf. A female's energy stores are at the lowest point during their north migration and any disturbance that may alter the allocation of these resources could have important consequences. Any disturbance that a female may experience when migrating with a calf has the potential risk of the female weaning the calf at an earlier age, given that the female will prioritize her survival before that of the calf. A calf that is weaned at an earlier age has a lower probability of survival. SVA-4 (Villegas-Amtmann *et al.* 2017).

17. While recognizing the reaction of mother-calf pairs to research activities, Scordino states that *"Makah whalers can use the different migratory behavior of cow-calf pairs to reduce the probability of striking either a cow or calf during hunts that occur during the northbound migration, even for hunts in late May."* Scordino Direct, at 50. He further claims that *"[a]s part of their training, Makah hunters will learn how to identify and avoid cow-calf pairs." Id.* Nevertheless, how will the hunters determine if a single whale is a male or a female or, more importantly, if the female is a pregnant female? Females with calves are sensitive to disturbance, but so are pregnant females. A disturbance that causes a pregnant whale to lose ~4% of the overall energy needed has the potential to affect its reproduction. That is, the whale may abort the fetus and forego producing a calf that year. Furthermore, stress can also cause an animal to miscarry. These effects can have population consequences, as fewer calves will be recruited into the population in a given year, thus affecting population growth.

18. In discounting the effects of climate change on gray whales, Mr. Scordino fails to account for the energetic costs associated with a greater foraging range. *See* Scordino Direct, at 89-90. Gray whales that feed in and around the Bering Strait and Chukchi Sea are regularly seen migrating farther north, and there is some indication that prey resources, particularly in the traditional foraging grounds, are no longer as abundant as they once were. SVA-13 (Moore *et al.* 2003). If this trend continues, and the majority of eastern north pacific gray whales migrate farther or have larger foraging ranges, the energetic costs will be greater, and this population will likely become more sensitive to disturbance.

19. Villegas-Amtmann *et al.* (2017) found that total energy requirements (for a 2 year breeding cycle) were on average 11% greater for the western gray whale population breeding in Baja California than the eastern one, due to the 25% increase in their migration length and their higher metabolic rate when they are pregnant (single females) at the foraging grounds. If gray whales need to travel farther to reach their foraging grounds, their total energy requirements could potentially increase. SVA-4 (Villegas-Amtmann *et al.* 2017).

20. In addition, Villegas-Amtmann *et al.* (2017) pointed out that if a substantial number of the female western gray whales that forage off Sakhalin do indeed migrate to Baja California to breed, these western gray whales may be more sensitive to disturbance as compared with eastern gray whales if the western whales cannot compensate for the additional energy needed for a longer migration. *Id*.

21. Other critical factors related to climate change concern prey resource change over the foraging season and environmental changes that may alter the temporal and spatial distribution of prey. It is also important to determine whether these changes are due to gray whale foraging or the preys' own phenology. In particular, the patch quality (and depth) likely effects the cost of foraging in that patch. Prey shifts due to environmental changes may alter the whale's foraging behavior,

requiring more energetically costly feeding behavior (*e.g.* deeper dives to access higher quality prey patches).

22. I have also reviewed the initial direct testimony of NMFS's expert David Weller offered in support of the MMPA waiver for the Makah Tribe's proposed hunt. In particular, I have reviewed his statements concerning the effect of the hunt on the behavior of gray whales in the hunt area, including the following:

a. *"[A]ccording to Calambokidis et al. (2017), between 1996 and 2015, researchers photographed 21,235 gray whales representing 1,638 unique individuals between southern California and Kodiak Island, an area that overlaps the PCFG range. NMFS Ex. 3-33. Obtaining a photograph of sufficient quality to make an identification requires a close approach. Notwithstanding these close approaches, ENP gray whales, including PCFG whales, continue to use these areas."* Dkt No. 5 (Direct Testimony of David Weller) ("Weller Direct"), ¶ 47.

b. *"Similarly, despite over a hundred gray whales being pursued and killed in native hunts off Chukotka each year (many of which are killed during the summer feeding months), there has not been a discernible change in the availability and location of hunted whales in that region." Id.*

c. *"Based on the foregoing information and my firsthand observations, in my professional judgement 353 approaches of ENP gray whales per year, including up to 142 approaches per year of PCFG gray whales, would not have a lasting effect on the health or behavior of the affected whales." Id.*

d. *"Based on the best available scientific information, it is my professional opinion that any changes in gray whale behavior due to an unsuccessful strike attempt or training harpoon throw would likely be short-term and not have more than temporary effect on the affected whale's health or behavior. Given these considerations, and the relatively* *small number of training harpoon throws and unsuccessful strike attempts allowed under the proposed regulations, it is reasonable to expect that whales exposed to these hunt-related activities would experience them as temporary and localized events." Id., ¶ 50.*

e. *"Even-year hunts and training exercises conducted from December through May would encounter mostly migrating whales that pass through the ocean portion of the Makah U&A. Migrating whales would be able to transit the widest portion of the Makah U&A (approximately 32 miles or 51 km north-south) in several hours . . . [A]dverse weather conditions in the Makah U&A in winter and early spring coupled with shorter periods of daylight would keep most hunts and training exercises close to shore and of shorter duration than during the summer. It is reasonable to expect that the relatively small number of migrating whales subjected to non-lethal hunt encounters, including hunting or training approaches, unsuccessful strike attempts, or training harpoon throws, during the migration season would experience the encounter as temporary and localized near-shore events that would otherwise not affect their migration." Id., ¶ 51.*

23. With respect to points 11.a – 11.d, I reiterate my statements above concerning the Chukotkan hunts as well as those regarding the effect of disturbance on gray whales and, particularly, on mother-calf pairs and pregnant females.

24. With regard to point 11.e, it is relevant to consider the temporal aspect of the disturbance. The proposed even year hunt (December-May), and a portion of the training exercises, would occur during the northward migration toward the foraging grounds for the ENP whales and upon arrival at foraging grounds for the PCFG whales. These grounds include the area of the Makah Tribe's hunt. SVA-14 (Calambokidis *et al.* 2015). As mentioned previously, whales migrating north are likely in an emaciated condition and eager to reach the foraging grounds to replenish their

energy reserves – and, therefore, are the most vulnerable to energy losses due to disturbance. Consequently, it is likely that, upon arrival at the foraging grounds, the migrating gray whales would prioritize foraging. In addition, gray whales spend a greater percentage of their time foraging at the beginning than later in the feeding season when they are observed to be engaged in different behaviors, such as traveling and socializing. SVA-15 (Zimushko and Ivashin 1980), SVA-16 (Gailey *et al.* 2008).

25. An additional point to consider is that, early in the season, the hunt and training exercises would likely encounter pregnant females, which are the first to arrive at the foraging grounds (SVA-17 (Rice and Wolman 1971), SVA-18 (Sumich 1986)) and have the greatest energy requirements. Accordingly, disturbance at the beginning of the feeding season may place them at greater risk. As previously mentioned, a loss of ~4% of their energy budget could cause a pregnant female to abort the fetus or not produce a calf that year. On the other hand, later in the season (during an odd year hunting season), the hunt is likely to encounter females with calves, as they are the ones who depart the breeding grounds last. As mentioned above, such female whales are vulnerable to disturbance given the energetic constraints of supporting themselves and a calf through lactation.

26. Irrespective of the timing of the hunt – and the associated disturbance – there is evidence that anthropogenic disturbance may affect gray whale foraging behavior. Such behavioral responses include changes in gray whale distribution because whales exposed to the disturbance may avoid the area in which the disturbance occurs. If the area of the disturbance is spatially limited compared to the entire foraging area, gray whales may alleviate some of the energy lost by moving to other regions within the foraging area, or to a secondary feeding ground. *Id.*

I declare under penalty of perjury under the laws of California and the United States that the foregoing is true and correct.

DATED this 6th day of August 2019

[signature]

Stella Villegas-Amtmann

Dr. Stella Villegas-Amtmann

Exhibit List

Exhibit No.	Short Form Reference	Full Citation
SVA-1		Curriculum vitae for Dr. Stella Villegas-Amtmann
SVA-2	Braithwaite *et al.* 2015	Braithwaite, J.E., Meeuwig, J.J. and Hipsey, M.R. (2015). Optimal migration energetics of humpback whales and the implications of disturbance. Conservation Physiology 3(1)
SVA-3	Villegas-Amtmann *et al.* 2015	Villegas-Amtmann, S., Schwarz L.K., Sumich, J.L., Costa, D.P. (2015). A bioenergetics model to evaluate demographic consequences of disturbance in marine mammals applied to gray whales. Ecosphere 6(10): 183
SVA-4	Villegas-Amtmann *et al.* 2017	Villegas-Amtmann, S., Schwarz, L.K. and Costa, D.P. (2017). East or West: The energetic cost of being a gray whale and the consequence of losing energy to disturbance. Endangered Species Research 34:167-183.
SVA-5	NRC 2003	NRC. (2003). Ocean noise and marine mammals. The National Academic Press. Washington, D.C. 192 pp.
SVA-6	NRC 2005	NRC. (2005). Marine mammal populations and ocean noise: Determining when noise causes biologically significant effects. The National Academic Press. Washington, D.C. 126 pp.
SVA-7	Gailey *et al.* 2011	Gailey, G., McDonald, T., Racca, R., Sychenko, O., Hornsby, F., Rutenko A, . . . Würsig, B. (2011). Western Gray Whale Movement, Respiration, and Abundance during Pipeline Construction off Sakhalin Island, Summer 2006. 2006MVAREPORT.
SVA-8	Gailey *et al.* 2007a	Gailey, G., Würsig, B. and McDonald, T. (2007a). Abundance, behavior, and movement patterns of western gray whales in relation to a 3-D seismic survey, Northeast Sakhalin Island, Russia. Environmental Monitoring and Assessment.
SVA-9	Gailey *et al.* 2007b	Gailey, G., McDonald T., Racca, R., Sychenko, O., Rutenko, A. and Würsig, B. (2007b). Influences of Underwater Sound and Nearshore Vessel Activity on Western Gray Whale Behavior

		during the Installation of a Concrete Gravity Based Structure off Sakhalin Island, Summer 2005. Prepared for LGL ecological research associates Ltd, for Exxon-Neftegas Ltd. and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russian Federation. 150 pp.
SVA-10	Malme *et al.* 1986	Malme, C.I., Würsig, B., Bird, J.E. and Tyack, P. (1986). Behavioral responses of gray whales to industrial noise: feeding observations and predictive modeling. Outer Continental Shelf Environmental Assessment Program, Final report of Principal Investigators, NOAA.
SVA-11	Williams *et al.* 2009	Williams, R., Bain, D.E., Smith, J.C. and Lusseau, D. (2009). Effects of vessels on behaviour patterns of individual southern resident killer whales *Orcinus orca*. Endangered Species Research 6: 199-209.
SVA-12	Würsig and Evans 2001	Würsig, B. and Evans, P.G.H. (2001). Cetaceans and humans: Influence of noise. Pp. 565-587 in Marine Mammals: Biology and Conservation, ed. By. P.G.H. Evans and J.A. Raga. Plenum Press, New York, NY.
SVA-13	Moore *et al.* 2003	Moore, S.E., Grebmeier, J.M., Davies, J.R. (2003). Gray whale distribution relative to forage habitat in the northern Bering Sea: current conditions and retrospective summary. Can. J. Zool. 81: 734–742.
SVA-14	Calambokidis *et al.*, 2015	Calambokidis, J., Steiger, G. H., Curtice, C., Harrison, J., Ferguson, M. C., Becker, E., . . . Parijs, S. M. (2015). 4. Biologically Important Areas for Selected Cetaceans Within U.S. Waters – West Coast Region. *Aquatic Mammals,* 41(1), 39-53.
SVA-15	Zimushko and Ivashin 1980	Zimushko, V.V, Ivashin, M.V. (1980). Some results of Soviet investigations and whaling of gray whales. Report of International Whaling Commission 30: 237–246.
SVA-16	Gailey *et al.* 2008	Gailey, G.O., Sychenko, O., Würsig, B. (2008). Patterns of western gray whale behavior, movement and occurrence off Sakhalin Island, 2007. Prepared for LGL Ecological Research Associates Ltd. for Exxon-Neftegas Ltd. and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk.

SEA SHEPHERD LEGAL
2226 Eastlake Ave. East, # 108
Seattle, Washington 98102
(206) 504-1600

		www.sakhalinenergy.com/media/2a760f68-ea52-4d66-a1cd-5951c7c4f88f.pdf.
SVA-17	Rice and Wolman 1971	Rice, D.W., Wolman, A.A. (1971). The life history and ecology of the gray whale (Eschrichtius robustus). Spec Publ 3. American Society of Mammalogists, Washington, D.C.
SVA-18	Sumich 1986	Sumich, J.L. (1986). Latitudinal distribution, calf growth and metabolism, and reproductive energetics of gray whales, Eschrichtius robustus. PhD dissertation, Oregon State University, Corvallis, OR.

SEA SHEPHERD LEGAL
2226 Eastlake Ave. East, # 108
Seattle, Washington 98102
(206) 504-1600