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Input on “Noise Pollution – The soundscape of the Anthropocene ocean”

Dear Prof Carlos Duarte and Colleagues,

On behalf of OceanCare, an international marine conservation organisation which holds Special Consultative Status with the Economic and Social Council of the United Nations (ECOSOC), we would like to congratulate you and your colleagues on the publication of “The soundscape of the Anthropocene ocean” in *SCIENCE* Vol. 371, Issue 6529. The article provides important information and results in support of strengthening conservation mechanisms for protecting marine wildlife and habitats from ocean noise.

OceanCare has been addressing the ocean noise issue at the United Nations, the UN Convention on Biodiversity (UNCBD), the Convention on Migratory Species (CMS), the International Maritime Organization (IMO), the Food and Agriculture Organization (FAO), among others, since the early 2000s and we welcome that the issue is gaining further momentum and public attention through your in-depth paper. To complement the article’s findings and conclusions, we kindly ask you to consider the following aspects which we believe are not accurately reflected within your important publication as well as to respond to some arising questions:

- 1) We disagree with the general statement that “*effects of [noise] decline swiftly once sources are removed*” as some effects persist for months or a year after the noise source is gone (e.g. Fitzgibbon et al. 2017; Day et al. 2017; Day et al. 2019).
- 2) Why does Fig. 2 claim shipping has a longer range effect than seismic surveys? Fig. 2 shows seismic surveys to have a spatial scale of hundreds of kilometers, yet shipping’s spatial scale to extend to 10,000 km. Nieu Kirk et al. (2012) showed seismic airgun noise to not only be heard over 4,000 km but to form the predominant part of the background noise.
- 3) Regarding Fig. 2, what evidence do you have that cetaceans produce higher frequency sounds than they can hear?
- 4) Also, regarding Fig. 2, Goold & Coates (2006) show airgun energy to extend to 100 kHz at spectral levels (120 dB re 1 μ Pa²/Hz) still audible to *Tursiops*, according to their audiogram. This is not reflected in your article.

- 5) In our opinion, the claim that *"evidence for impacts of anthropogenic noise on mortality and fitness of marine animals is weaker, with 35.2 and 50% of studies reporting significant impacts, respectively"* is highly misleading and not put into proper context. Most of these studies are on cetaceans where mortality and fitness impacts cannot be determined with any precision for most species. If increased mortality or decreased fitness can be documented (above natural variation), it is very rare for these to be able to be linked with anthropogenic noise and noise alone vs. other stressors in the environment, both natural and anthropogenic.
- 6) We do not agree that the *"likely reason for the noncommittal nature of international agreements that address marine noise is the absence of a compelling assessment of the evidence of impacts"*. Numerous international agreements have adopted decisions and resolutions which clearly conclude the necessity to prevent, mitigate and reduce negative impacts of anthropogenic noise on marine species. In our opinion the *"noncommittal nature"* to effectively reduce ocean noise relates to the poor or partly non-existing compliance and enforcement regimes within such international agreements. Even binding provisions, such as the MSFD (Marine Strategy Framework Directive) and the Species and Habitats Directive of the European Union, are poorly implemented, which should result in legal action towards Member States. Regarding the poor implementation of proper action reducing underwater noise within the waters of European Union Member States, please see ["Risch, D., Belin, A., Entrup, N., Leaper, R., Panella, E., Taylor, B., Weilgart, L., Werner, S., Ziebarth, N., 2020. Underwater Noise – The neglected threat to marine life. 14 pp."](#)
- 7) *"the growing use of advanced materials, such as fiber-reinforced polymer composites, which have good dampening properties and are also lighter—thereby requiring less energy for propulsion—can also help to reduce ship noise."* Weight would seem to be irrelevant given the ships are carrying cargo and the noise is generated in the water. Where is the evidence for this?
- 8) We do not share your conclusion that a *"seafloor-based seismic survey"* would be part of a *"well-managed future"* [ref. to illustration on p. 583]. Regarding *"seismic surveys"* for hydrocarbon resources, a well-managed future should entail a ban of such activities in support of meeting the objectives of the Paris Agreement as well as preventing negative impacts to marine animals.
- 9) *"Several companies are developing prototype vibroseis technology to be mounted on submarine vehicles that would roam the seafloor. These vehicles will use hydraulic systems to generate force waves that penetrate the sediments and deliver the required data while avoiding impacts on animals in the water column."* Firstly, we doubt they would avoid impacts on animals in the water column, though the impacts should be substantially less. Secondly, scouring the seafloor is not recommended and would introduce considerable physical damage to the benthic environment. While we find vibroseis technology promising as a quieter alternative to seismic airguns, a better solution would be to have this or similar technology hover just above the seafloor without actually touching it. Where is the reference and citation to *"vibroseis technology to be mounted on submarine vehicles"*?

10) *"Although our assessment shows that anthropogenic noise detrimentally affects marine animals, a lack of global syntheses of data has resulted in it being typically ignored in reviews of cumulative and/or global impacts of anthropogenic stressors on marine life and consequently by the high-level policy initiatives (e.g., UNCBD, UNCLOS, UN SDGs) that these analyses inform. For instance, the draft of the UN Law of the Sea "BBNJ" Agreement on Biodiversity in Areas Beyond National Jurisdiction does not mention noise among cumulative impacts, despite mandating an environmental impact assessment of activities in the high seas and the fact that anthropogenic noise was discussed at its 19th session of the process in June 2018."*

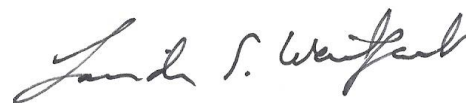
Finally, since anthropogenic ocean noise is one of our core issues, OceanCare has devoted a great deal of resources over the past nearly 20 years to ensuring that the issue of anthropogenic noise be addressed in high-level policy initiatives such as UNCLOS and UNCBD. We have helped write or edit several reviews on the impacts of anthropogenic noise on marine life for the UNCBD. Our work resulted in important language on anthropogenic noise impacts on marine life within UNCLOS decisions and UNGA Oceans Resolutions, as well as UNGA Sustainable Fisheries Resolutions. The 19th session of UNICPOLOS (United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea), in June 2018, was devoted to anthropogenic underwater noise. We would also like to point out that the ["Third draft of the second world ocean assessment"](#) - a product of the UN Regular Process of the Whole - devotes an entire chapter on the ocean noise issue. We feel that the article would gain considerably if the international decisions on noise would be reflected.

Again, applauding you and colleagues for this publication, we look forward to your response on the points mentioned.

Your sincerely,



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About OceanCare

OceanCare is a Swiss non-profit organisation. It was founded in 1989 and has a strong commitment to realistic and cooperative initiatives. The organisation works at national and international level in the areas of marine pollution, environmental changes, fisheries, whaling, sealing, captivity of marine mammals and public education.

OceanCare holds Special Consultative Status with the Economic and Social Council of the United Nations (ECOSOC) and is a partner of the General Fisheries Commission for the Mediterranean (GFCM), the Convention on Migratory Species (CMS), and the UNEP/CMS Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), as well as UNEP/MAP. OceanCare has also been accredited to the United Nations Environment Assembly (UNEA), which is the governing body of UNEP as part of the Major Group 'Science and Technology' and is a part of the UNEP Global Partnership on Marine Litter.