Further to the Letter from the Under-Secretary-General for Legal Affairs and UN Legal Counsel, calling for contributions to the theme "New Marine Technologies: challenges and opportunities", we wish to submit the following input.

Scientific Contributions and Proposed Panellists:

1. **Weilgart, L. (2019) «Best Available Technology (BAT) and Best Environmental Practice (BEP) for three noise sources: Shipping, Seismic Airgun Surveys, and Pile Driving», in *Journal of Ocean Technology* 14 (3), 2019: pp. 1 – 9. (attached)**

Abstract: *The application of Best Available Techniques/Technology (BAT) and Best Environmental Practice (BEP) is required under several international agreements and conventions. For shipping noise, this generally includes minimizing cavitation by various techniques such as better maintenance and optimizing the propeller design to the hull and to usual operating conditions, which often improves efficiency as well. Focusing quieting on the 10-15% of the noisiest container and cargo ships will go furthest in reducing overall shipping noise. Slow steaming, or reducing ship speed mainly to save fuel, from an average of 16 kts to 14 kts (12% speed reduction) as was done in the Mediterranean, probably reduced the overall broadband acoustic footprint by over 50%. Slow steaming has the advantage that no retrofitting is required, and greenhouse gas emissions are reduced. For seismic airgun surveys, quieting technologies, such as Marine Vibroseis, that could replace airguns show the most promise, as much of the energy (the mid- or high-frequencies) emitted by airguns is wasted and unused. A controlled sound source, like Marine Vibroseis, tailor-made to the specific environmental conditions and without the damaging sharp rise time of airguns would also likely be more environmentally friendly towards marine life. Mitigation measures for airgun surveys should show proof of their efficacy and should include: avoiding sensitive areas and times, not proceeding in conditions of poor visibility such as at night (unless technologies and techniques that are as effective as mitigation in good visibility are developed), establishing statistically meaningful baseline studies of biological abundance and distribution, and provide a thorough quantitative analysis of synergistic and cumulative impacts from other noise and non-noise stressors. If the latter cannot be achieved, adequate precaution must be built into the decision-making, and these gaps in analysis must be made explicit. Quieting technologies would almost certainly require much fewer additional mitigation measures. Many new quieting technologies and alternative low-noise foundation concepts have been developed for pile driving, mainly due to the German government setting an action-forcing standard and noise limit. The great variety of quieting technologies and noise abatement systems for pile driving is in stark contrast to the lack of innovation that is occurring for quieter alternatives to the seismic airgun, where, for instance, MV has been in development since 2008 and yet little progress is evident. For both seismic airgun surveys and pile driving, Best Available Technologies will likely be more effective than Best Environmental Practice, unless it is siting them away from sensitive marine life. At least 150 marine species have shown impacts from ocean noise pollution, but it has been difficult to*

specify the exact scenarios where ecosystem and population consequences from underwater noise will occur. Therefore, managing this threat requires a precautionary approach. Application of quieting technologies that reduce sound at source will likely be the most effective way to reduce the environmental impacts of underwater noise, and quieting methods that also reduce greenhouse gas emissions or encourage technological innovation should be especially encouraged.

2. **Skarsoulis EK, Piperakis GS, et al. (2022) A Real-Time Acoustic Observatory for Sperm-Whale Localization in the Eastern Mediterranean Sea. Frontiers in Marine Science (2022). 9:873888. doi: 10.3389/fmars.2022.873888 (attached)**

Abstract: A deep-water acoustic observatory for real-time detection and localization of vocalizing sperm whales was developed, deployed and operated for two 3-month periods in summer 2020 and 2021, off south-west Crete in the Eastern Mediterranean Sea, in the framework of the SAvEWhales project. Regular clicks, pulsed sound produced by the diving animals, were detected and localized using a large-aperture array of three hydrophones suspended from surface buoys at depths of about 100 m and 1-2 km apart. Travel times of significant arrivals, arrivals with magnitude above a certain threshold, were extracted in situ and transmitted, together with other supporting data, via mobile broadband to a land-based analysis center. Upon reception, the data from all buoys were combined to enable detection and 3D localization of vocalizing animals exploiting direct and surface-reflected arrivals and using a Bayesian approach. The large separations between hydrophones resulted in small localization uncertainties f ranges up to 7 km; on the other hand, they posed significant challenges related to synchronization and peak association between the buoys, as well as because of the directionality of sperm whale clicks. The integrated observing system which has been successfully tested in detecting and localizing sperm whales can have a significant effect mitigating ship strikes on whales, the prominent threat for sperm whales in the Eastern Mediterranean Sea, by providing information about the presence and location of the animals in real time. The design and implementation, as well as results from the operation and validation of the acoustic observatory are presented.

Further information and suggestion on a potential panel presentation & discussion on this topic:

A ship strike is a collision between any type of boat and large marine animal, such as whales, dolphins, marine turtles, sea lions, seals, sharks etc. Regardless of their type and size, all vessels have the potential to collide with marine species. Animals struck by boats – hit by the hull or by the propeller - , when they are not killed immediately, often experience serious injuries and a slow and painful death. Ship strikes represent a serious conservation and welfare problem for marine wildlife in many regions around the globe, in particular large whales.

To avoid and prevent ship strikes, different measures exist:

1. Re-Routing: Separating shipping lanes from habitats of large whales is the best way of preventing collisions between vessels and whales. To identify potential re-routing options, it is important to know where whales live and how they use their habitat.
2. When Re-Routing is not an option, then vessel speed reduction is the most effective measure. Indeed, speed is the most significant factor in ship strikes. Not only is the impact of the collision less harmful with reduced speed, but both parties have more time to avoid each other and prevent a collision in the first place. In fact, it is the same as with road traffic with respect to people, which is why speed limits are set.

A 10% reduction in speed across the global fleet would reduce the risk of ship strikes by 50 % and would also result in very positive environmental effects reducing the ecological and climate footprint of shipping:

↘ Noise emissions by 40%

↘ CO2 emissions by 13-19%

3. Technical solutions can be and are complementary measures: In some regions where threatened and endangered species and populations occur and crossing their homes can't be avoided, speed reduction measures need to be accompanied by technical solutions to improve the detection and localisation of marine wildlife and communication their presence to mariners. Some existing tools are being further developed, and some new ones are being elaborated. OceanCare funded the development and testing of SAVeWhale, the first ever integrated real-time localization system of sperm whales.