

February 2022 | Number 8

## UPDATE ON COVID-19 PANDEMIC NOISE OBSERVATIONS AND PUBLICATIONS



Observations of the changes in ocean sound that resulted from the COVID-19 pandemic will help managers understand the extent to which different changes in human activities will impact ocean sound, such as decreased shipping and slowing of ships. The journal *Frontiers in Marine Science* published a [Research Topic](#) on Before-After Control-Impact (BACI) Studies in

the Ocean, which included six papers related to the COVID quieting, as well as 6 additional ocean acoustics papers. IQOE has established a page on its Website to compile a list of COVID quieting papers when they appear (see <https://iqoe.org/covid-pause-papers>). Please contact [Ed Urban](#) if you know of research papers that should be added to the list.

## UN DECADE ON OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT

Ocean acoustics has received increased attention in the UN Decade on Ocean Science for Sustainable Development. For example, the *Ocean Decade Laboratory on a Clean Ocean: The Ocean Decade* sponsored an open meeting for its Clean Ocean theme on 17–19 November 2021. The following videos from the event are available:

- [Entire Session](#)
- [Introduction to Ocean Sound](#) (Christine Erbe)
- [Breakout Session #4: Toward Quieter Ocean](#) (starts at 1:54 in the recording) moderated by Christine Erbe and Colin Devey

## OCEAN SOUND ESSENTIAL OCEAN VARIABLE (EOV)

An IQOE panel supported by Partnership for Observation of the Global Ocean (POGO) proposed that the Global Ocean Observing System (GOOS) adopt Ocean Sound as an Essential Ocean Variable. GOOS agreed and assigned IQOE the responsibility to work on implementation of this EOv. IQOE formed a committee in 2020 to write an implementation plan for the Ocean Sound EOv and the committee's work is ongoing at this time. The plan is expected to be released for community comment soon. The Plan will make it possible to implement the measurement of ocean sound as a variable that can be observed worldwide as part of GOOS as a measure of ocean processes and of the health of the ocean.

## GLOBAL HYDROPHONE NETWORK

At the first IQOE open science meeting, a list of ocean sound observing assets was compiled; the list was published in the *IQOE Science Plan* in 2015. This list was made available on the IQOE Website at <https://www.iqoe.org/systems>. In 2020, the IQOE Project Manager began collecting metadata on non-military hydrophones deployed in different parts of the world, to enlist the help of hydrophone operators to determine whether COVID-19 caused an observable decrease in ocean sound. The inventory on the IQOE Website was updated in early 2021. Hydrophone operators also began providing metadata about deployments before and after the pandemic, so that the current number and positions of hydrophones and the course of deployments over time can be determined. The

potential of this network was described in an article in [Eos](#) in March 2021. Work has begun to create a database integrated with the IQOE Website that will include the hydrophone metadata that is the basis for the map of the hydrophones and the trend in hydrophone numbers that are shown in the *Eos* article. The global hydrophone network could become the central element to measure the Ocean Sound EOY. It represents the first attempt to coordinate global ocean sound observations worldwide. IQOE is in the process of updating its global hydrophone map.

## LOW-COST HYDROPHONES

POGO has led IQOE discussions of low-cost hydrophone systems. An [IQOE Workshop on Low-Cost, Self-contained Underwater Acoustic Recording Systems](#) (in three two-hour sessions to make global participation possible) was held on 13–14 December in virtual mode to bring together ocean acousticians and bioacousticians, engineers, and some NGO representatives to discuss how to develop and deploy lower cost hydrophone systems worldwide. Sixty-five individuals participated in the sessions and several interesting ideas were put forward, related both to hydrophones for citizen science/education (not necessarily calibratable) and hydrophones that could be calibrated and deployed by countries seeking to contribute data related to the Ocean Sound EOY. IQOE will establish several working groups to follow-up on recommendations from the workshop, possibly including a hardware “hack-a-thon” to stimulate community development of low-cost hydrophone systems.

## MANTA SOFTWARE

A new version of MANTA has been released (see <https://bitbucket.org/CLO-BRP/manta-wiki/wiki/Home>), for processing ocean acoustic data according to ISO standards and making it possible to compare observations made by different equipment at different locations.



## OPEN PORTAL TO UNDERWATER SOUND (OPUS)

OPUS has recently been opened to a limited number of individuals outside of the Alfred Wegener Institute for

testing, with data from many recorders loaded already. It is hoped to invite international testing of the site in the next month or so.

## SPECIAL JOURNAL ISSUES

Several special issues of journals of potential interest to the IQOE community are now open or have been recently completed:

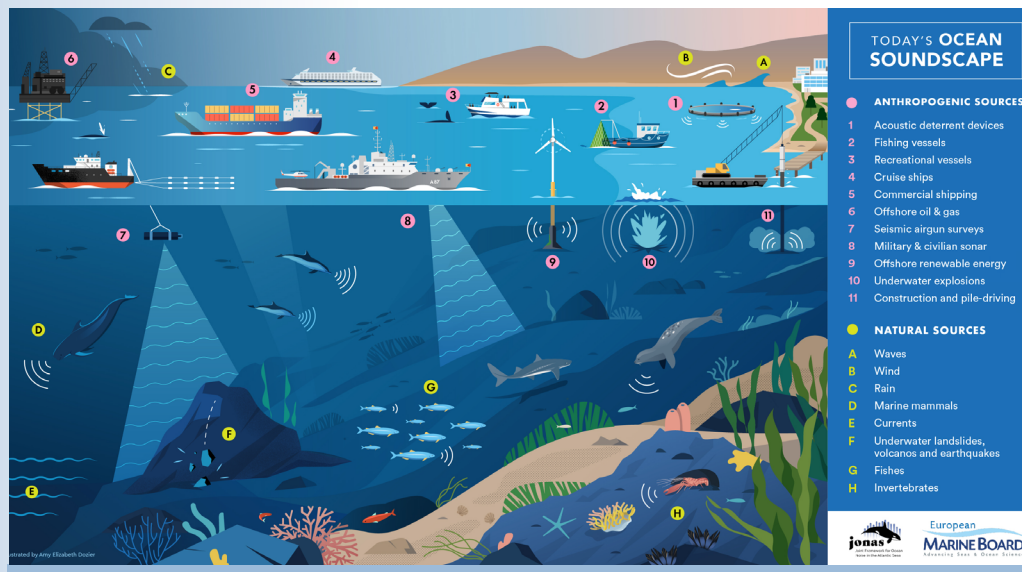
- Special issue of the *Journal of the Acoustical Society of America* (JASA) on [Ocean Acoustics in the Changing Arctic](#). Individual papers have been published in regular issues of JASA.
- Special issue of the JASA on [COVID-19 Pandemic Acoustic Effects](#). The submission deadline is currently open-ended. Individual papers have been published in regular issues of JASA.
- Research Topic on [Acoustic Remote Sensing of Cetacean and Pinniped Populations](#) in *Frontiers in Remote Sensing*. The abstract deadline was 10 December 2021 and the manuscript deadline is 1 April 2022. It is not necessary to submit an abstract in order to submit a manuscript.
- Research Topic on [Advances in Ecoacoustics](#) in *Frontiers in Ecology and Evolution*. The research topic is closed.

## NEWS FROM ENDORSED PROJECTS

**ADEON** (<https://adeon.unh.edu/>)—ADEON data collection has ended, but there are still two ADEON landers in the water off North Carolina because the weather was too rough to recover them in November 2021. It is planned to recover these landers in March 2022.

**JOMOPANS** (<https://northsearegion.eu/jomopans/about/>)—The latest JOMOPANS newsletter is available at [https://northsearegion.eu/media/18736/newsletter\\_no1\\_jomopans\\_2021.pdf](https://northsearegion.eu/media/18736/newsletter_no1_jomopans_2021.pdf). JOMOPANS was scheduled to be completed at the end of June 2021 and held a final event on 10 June 2021 (for presentations, search YouTube for “JOMOPANS End Event”). Shortly after, Interreg North Sea Region decided to grant the project an extension year to follow up on some of the project’s results, including in relation to use of JOMOPANS results for policy. The extension year provides a special opportunity to examine the impacts of the COVID-19 pandemic on sound in the North Sea. JOMOPANS will be able to compare noise data from 2019 and 2020. Another goal for the extension year is to make JOMOPANS observations more available to the public.

**Joint Framework for Ocean Noise in the Atlantic Seas (JONAS)** (<https://www.jonasproject.eu/>)—JONAS recently published its [2021 Newsletter](#). 2022 will be the final year of the project. JONAS is networking with other European projects related to ocean acoustics, for example, in terms of data sharing and governance, including participation in a Transnational Advisory Committee. JONAS supported the development of an “an open-source and open-code tool that encourages and facilitates the exchange of acoustic data between institutions and consequently promotes collaborative ocean sound monitoring, called PAM2PY. This tool makes it possible for users to process underwater observations using PamGuide in Python. The JONAS communications officer (Amy Dozier) helped design [an infographic](#) for the EU Marine Board’s report ‘Addressing Underwater Noise in Europe: Current State of Knowledge and Future Priorities.’ (see below) —From JONAS Website



### NOAA/NPS Ocean Noise Reference Station Network (NRS) (from Leila Hatch) (<https://www.pmel.noaa.gov/acoustics/noaanps-ocean-noise-reference-station-network>)—

All data from the Noise Reference Station network continue to be made available through NOAA's National Centers for Environmental Information Passive Acoustic Archive (see [https://www.ncei.noaa.gov/maps/passive\\_acoustic\\_data/](https://www.ncei.noaa.gov/maps/passive_acoustic_data/)). Two recent publications utilizing network data focused on (1) assessing shipping-influenced ambient levels in U.S. waters ranging from Arctic (less impacted) to the Gulf of Mexico (more impacted) and (2) highlighting the role of centralized data management to support sound level attribute comparison across wide-ranging longer term monitoring assets.

- 1 [Haver, SM, Adams JD, Hatch LT, Van Parijs SM, Dziak RP, Haxel J, Heppell SA, McKenna ME, Mellinger DK and Gedamke J \(2021\) Large Vessel Activity and Low-Frequency Underwater Sound Benchmarks in United States Waters. \*Front. Mar. Sci.\* 8:669528. doi: 10.3389/fmars.2021.669528](#)

- 2 [Wall CC, Haver SM, Hatch LT, Miksis-Olds J, Bochenek R, Dziak RP and Gedamke J \(2021\) The Next Wave of Passive Acoustic Data Management: How Centralized Access Can Enhance Science. \*Front. Mar. Sci.\* 8:703682. doi: 10.3389/fmars.2021.703682](#)

### Ports, Humpbacks, Y Soundscapes In Colombia (PHySIC)—

The PHySIC project continued despite the inability for international scientists to enter Colombia for the second field season in a row. Students and collaborators in Colombia made the season successful. The project switched its hydrophones from Ecological Acoustic Recorders (EARs) to Loggerhead SNAPS this year and was able to place two at Morro Mico (the location that has been monitored since 2018) and two at a new location at the southern edge of the Gulf of Tribugá, Piedra Bonita. Piedra Bonita is expected to have even

less boat traffic than Morro Mico since there is no national park in the area for tourism/transit traffic. The currents are known to be faster in this area, though, so natural levels of background noise may be higher than in the more protected waters of the Gulf. Recorders were oriented 180 degrees from each other this year: one towards the open ocean (as in previous years) and one towards the coast. Students with the project have been learning about directionality, so this configuration will provide actual data to explore whether a difference in the orientation of a hydrophone affects the sound pressure level and noise budget.

The PHySIC project has been instrumental in the education and training of several students:

- Valentina Huertas Amaya continues her undergraduate thesis calculating impact volumes of predicted shipping lane configurations if a port was built on the Pacific coast of Colombia, using the techniques presented in the recent [MacGillivray & De Jong paper](#) to calculate the source levels for the ships.
- Valentina Ramirez Caycedo defended her undergraduate thesis on a BACI experiment to understand whether differences exist in three fish sound types at Morro Mico before versus during and after a boat pass.
- Astarte Brown used data from Morro Mico for her internship. comparing bandwidths of humpback whale song units (within the same phrase) before and after a boat pass. Brown presented a poster at the Acoustical Society of America's fall 2021 meeting and has been invited to present her project at the Effects of Noise on



Aquatic Life meeting in Berlin in July 2022.

- Maria Paula Rey Baquero began her master's degree program with the PHYsIC project at the University of Javeriana. She is proposing to (1) calculate acoustic indices at the three sites in the Gulf of Tribugá, and (2) use output from the parabolic equation acoustic propagation model as a layer in ArcGIS to create acoustic connectivity maps within the Gulf. Rey Baquero recently co-authored [an article in \*Oceanography\*](#) with Clea Parcerisas, comparing sound pressure density levels from different components of the soundscape in the Gulf of Tribugá with those in the Belgian part of the North Sea.
- Natalia Botero Acosta collected biopsies for two months to measure cortisol and other stress hormone levels from humpback whales in her continued collaboration with Ari Friedlaender's lab. This is the third year of collecting biopsy data for a long-term study intending to replicate the [Rolland et al. \(2012\) paper](#) comparing stress levels and noise levels. Natalia is currently on a cruise to Antarctica collecting biopsies of the same humpback population as they migrate to their feeding grounds.

**SanctSound** (<https://sanctuaries.noaa.gov/science/monitoring/sound/>)—A recent publication based on SanctSound data highlighted [national scale comparison of sound level results as well as interpretation complexities](#) for shallow water natural resource managers.

SanctSound recordings are available for download through NOAA's National Centers for Environmental Information [Passive Acoustic Archive](#). The project will culminate in spring 2022 with public release of a data portal through NOAA's [Integrated Ocean Observing System](#), providing explanation, exploration and download capability for all data products, ranging from sound levels to detections to sound clips. Additional contextual data assets will also be explorable through the portal, including vessel tracking summaries and sound propagation modelling results.

The project continues in its presentation of a [web-based series of new stories](#) showcasing the application of its results to questions of importance to natural resource managers at individual sanctuaries and for the sanctuary system as a whole. In addition, a StoryMap is available to provide a visual overview of the project. More details are available online.

— From Leila Hatch

## Get Your Project Endorsed

IQOE would like to endorse any research project or observation activities that are relevant to IQOE. Information about the endorsement process and endorsed projects can be found at <http://www.iqoe.org/projects>. The benefits of endorsement include increased international visibility of endorsed projects, which are usually national or regional,

and the potential for joint activities with other endorsed projects and with other IQOE-involved scientists.

## WG PROGRESS

**Acoustic Measurement of Ocean Biodiversity Hotspots—**This WG is helping bring international focus on the use of biological sounds to augment other measures of biodiversity. Sound has the advantage that it can remotely sense biological activity continuously. The WG recently published [a paper](#) in *Frontiers in Ecology and Evolution* for a Research Topic on Advances in Ecoacoustics. The title of the article is “Sounding the call for a global library of biological underwater sounds” and the paper was accepted for publication. The article makes the case for the cooperation of institutional and national databases of underwater biological sounds. The library would also be used to provide training sounds for artificial intelligence-enabled sound identifications. The group is working to developing funding for a coordination workshop. It will meet in hybrid (in-person and virtual) format on 16 July in Berlin, Germany (and virtually) in conjunction with the Effects of Noise on Aquatic Life meeting.

**Arctic Acoustic Environment—**The work of this WG is bringing attention to the Arctic policy and science community that sound is an important parameter to include in Arctic Ocean observing systems. The group has been engaging with the Arctic observing community to promote the collection of sound as a key parameter in the Arctic Ocean. A poster was presented by the WG at OceanObs'19 and the WG held a virtual conference on Sound in the Arctic Ocean on 11–12 November 2020. Conference participants asked that the event take place again in about two years. WG members are working on a response to a recent request for proposals from JPI Oceans. The group is planning a one-day hybrid meeting on 19 June 2022 to advance its work.

**Marine Bioacoustical Standardization and Standardization—**From Michael Ainslie and Michelle Halvorsen: “The Marine Bioacoustical Working Group (WG) prepared an [inventory of standards and procedures](#) in June 2021. This inventory lists no international standard procedures in marine bioacoustics. That's precisely none, zero, ninguno, nul, zilch, nessuno. Regardless of the language it is written in, the result is equally discouraging. However, the outlook is not all bleak. There is one national standard procedure for measuring audiograms ([ANSI/ASA S3/SC1.6-2018 Procedure for Determining Audiograms in Toothed Whales through Evoked Potential Methods](#)) and there is an international terminology standard defining appropriate bioacoustical terminology ([ISO 18495](#)). There is consensus that further standardization is not just desirable, but essential to secure further advances in quantitative understanding of (for example) fish hearing acuity (each lab uses a completely different methodology, making results incomparable). Without standards we are throwing good

money after bad. What to do about it? The WG's short-term goal is to identify a path towards international standards that are desirable and achievable. Having established the inventory in 2021 (our first step), the second step towards this goal will be to prepare a list of recommended procedures by identifying those most suitable for development into international standards."

## NATIONAL/REGIONAL ACTIVITIES

Several national efforts beyond endorsed activities are directly relevant to IQOE. If you have news of national scientific projects or meetings related to IQOE, please email them to [Ed Urban](#).

### Africa

The African Bioacoustics Community (ABC) is an organization designed to disseminate information about bioacoustics research in Africa (terrestrial and marine) and to help network scientists working on bioacoustics. The ABC publishes *African Bioacoustics Communique* to highlight recent research results. To subscribe to the ABC email news please send an email to [africanbioacoustics@gmail.com](mailto:africanbioacoustics@gmail.com) with the subject line "Mailing List - Subscribe". The ABC also maintains a Facebook page (<https://business.facebook.com/africanbioacousticscommunity/>) that includes many interesting posts.

### Canada

*Ambient Noise Monitoring in British Columbia, Canada:* Launched in 2014, the Enhancing Cetacean Habitat and Observation (ECHO) Program, led by the Vancouver Fraser Port Authority, is a regional, collaborative program designed to better understand and reduce the cumulative effects from commercial shipping activities on at-risk whales throughout the southern coast of British Columbia, Canada. The ECHO Program includes a diverse range of partners and advisors, including government agencies, the marine transportation industry, Indigenous communities, environmental groups, scientists, and naval architects and engineers.

The program includes several research projects and operational initiatives to meet its objectives, with a key focus on underwater noise research to support and inform the recovery of endangered Southern Resident Killer Whale populations. While focused on this local whale species, the research advanced by the ECHO Program can be applied to other whale species in Canada and across the globe.

Of particular relevance to the International Quiet Ocean Experiment is the ongoing monitoring of ambient noise in our region and the work undertaken to better understand the contributions of various factors to the underwater soundscape. To this end, the ECHO Program acoustic technical committee formulated a set of metrics for data collection and analysis, and supported scoping of a study of ambient noise at three locations in the Salish Sea, over a two-year period (2016–

2018). The study evaluated key factors for consideration in the measurement and analysis of ambient noise, including recording systems, vessel traffic, and environmental features. This detailed technical report was followed up by publication of a Best Practices document that provides a high-level overview of the project results, discusses contemporary studies, identifies lessons learned through the work conducted, and provides recommendations for future monitoring.

The ECHO Program and our project partners\* continue to monitor underwater noise at key locations in the Salish Sea on the approach to the Port of Vancouver; and are pleased to be a part of the International Quiet Ocean Experiment. We are building a longer-term data set to help monitor underwater sound trends over time and evaluate the efficacy of operational initiatives for underwater noise reduction, such as the seasonal voluntary vessel slowdowns."

— From Krista Trounce, Port of Vancouver

\*Project partners on ambient noise monitoring include Transport Canada, JASCO Applied Sciences Ltd., SMRU Consulting, Tsleil-Waututh Nation, the Whale Museum and Ocean Networks Canada.

*MERIDIAN:* The Meridian project is developing a tool—called MarNoise—complementary to MANTA software, to calculate some underwater acoustic metrics according to ISO 18405:2017. MarNoise uses the open-source Python programming language, whereas MANTA uses MatLab, so each will have different users and each will produce somewhat different metrics, although both are compliant with ISO 18405:2017. Meridian has also launched FishSounds, a library of fish sounds that is relevant to the work of the IQOE WG on Acoustic Measurement of Ocean Biodiversity Hotspots, and the WG's activity to develop an international library of marine organism sounds.

### Europe

The European Marine Board recently issued a report entitled "Addressing underwater noise in Europe: Current state of knowledge and future priorities (see <https://www.marineboard.eu/publications/addressing-underwater-noise-europe-current-state-knowledge-and-future-priorities>).

The European Maritime Safety Agency recently issued its [European Maritime Transport Environmental Report](#), which includes a section on understanding noise emitted by commercial ships.

### USA

*Consortium for Ocean Leadership (COL):* COL was awarded a grant from the Lounsbery Foundation to "conduct engagement and convening activities to coordinate the international ocean acoustics community in the development of an ocean sound effort under the UN Decade of Ocean Science for Sustainable Development."

*National Oceanic and Atmospheric Administration:* “The NOAA National Centers for Environmental Information (NCEI) recently established a [passive acoustic data archive](#) in partnership with the NOAA National Marine Fisheries Service and Office of National Marine Sanctuaries, U.S. Navy, Bureau of Ocean Energy Management, and academia. This fast-growing archive currently contains over 120 TB of passive acoustic audio files. These datasets are documented with standards-based metadata and are freely available to the public. The archive enables discovery, query, and accessibility of those data through an [ESRI web-based map service](#). Since 2018, NCEI has partnered with Google through the NOAA Big Data Program to also provide free and immediate access to archived datasets using [Google Cloud Platform](#). The archive supports numerous passive acoustic monitoring projects including IQOE-endorsed projects NOAA-National Park Service Ocean Noise Reference Station Network (NRS), NOAA-Navy Sanctuary Soundscape Monitoring Project (SanctSound), and Atlantic Deepwater Ecosystem Observatory Network (ADEON). The archive is in a position to grow exponentially in the coming years as staff address petabyte-sized data management needs from federal partners as well as expand to better steward-derived data products. The archive’s priorities and direction are established during an annual stakeholder workshop that brings together partners from across federal agencies, academic institutions, and industry. The latest workshop was held in September 2021.”

— From Carrie Wall Bell

- **Gizmodo**, United States International Project Will See How Quiet of Covid-19 Affected Oceans <https://earther.gizmodo.com/international-project-will-see-how-the-quiet-of-covid-1-1846630821>
- **IndoAsian News Service**, India Amid slowdown, scientists assess changes in marine life behaviour <https://www.prokerala.com/news/articles/a1148781.html>
- **Baidu**, People’s Republic of China, [The “Year of Quiet Sea” created by COVID-19: How does the sound of the ocean environment change under the epidemic?](#)

## IQOE EMAIL LIST

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## 2020: YEAR OF THE QUIET OCEAN

[IQOE Newsletter #7](#), chronicling IQOE’s progress, helped spur this [Press Release](#) reporting advances, including the MANTA software and the data archive. Some press coverage included the following:

- **The Guardian**, United Kingdom: [Pandemic made 2020 ‘the year of the quiet ocean’, say scientists](#) especially good article!
- **Agence France Presse**: Lull in shipping activity gives scientists chance to listen to sounds of the ocean <https://ca.news.yahoo.com/lull-shipping-activity-gives-scientists-042755282.html>
- **German**: Internationales Forscherteam untersucht Tierlaute im Ozean während Corona-Krise <https://de.nachrichten.yahoo.com/internationales-forscherteam-untersucht-tierlaute-ozean-214115152.html>
- **BBC News Online**, Ocean noise: Study to measure the oceans’ ‘year of quiet’ <https://www.bbc.com/news/science-environment-56676820>
- **BBC World Service Radio**, 1st story (here)
- **Agencia Efe**, [Científicos aprovechan la pandemia para hacer un mapa del sonido de los mares](#)

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**Endorsed projects (8):** JOMOPANS, JONAS, NRS, PHYSIC, QUIETSEAS, SanctSound, SATURN, TANGO

**Publications in Aquatic Acoustic Archive:** 6,831

**IQOE Email List:** 377

**Twitter Followers:** 116