IQOE
International Quiet Ocean Experiment
NEWSLETTER

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The International Quiet Ocean Experiment (IQOE) is currently scheduled to sunset at the end of 2025. The IQOE Science Committee and others are discussing how to continue IQOE work beyond 2025, as a separate project or by incorporating some IQOE activities in the UN Ocean Decade or other project or organization.

Science and environment reporter Alice Hutton recently wrote a lively and informative article for the UK *Guardian* newspaper about IQOE: Listen to a toadfish's grunt! AI helps decode a 'symphony' of ocean sounds.

WOPAM DAY

To celebrate World Ocean Day and the increasing awareness and use of aquatic passive acoustic monitoring, the first annual World Ocean Passive Acoustic Monitoring (WOPAM) Day was launched on 8 June 2023 as a product of IQOE and its Global Library of Underwater Biological Sounds (GLUBS) project. (The initiative embraces all aquatic PAM, whether in fresh, marine or brackish waters.) As the first effort to produce a globally synchronized aquatic PAM study, more than 150 researchers from approximately 100 institutes across 34 countries expressed interest in sharing data from recordings taken between 7 and 9 June of this year. The anticipated dataset has 320 sites, though this number may change as participants confirm whether their planned deployments took place. With many datasets due to be collected late in 2023, and even into next year, the overall collection will be complete sometime in 2024. From the ice-covered waters of the Arctic, to the balmy mesophotic reefs around Curaçao, we can't wait to hear what the hydrophones picked up!

Miles Parsons (m.parsons@aims.gov.au) and Steve Simpson (s.simpson@bristol.ac.uk) are leading the effort.

GLUBS WORKSHOP

On 28–29 April 2023, the Woods Hole Oceanographic Institution hosted a two-day workshop for the expanded working group of GLUBS. A total of 32 in-person and 12 online participants from research institutes, management agencies, consultancies and international advisory committees discussed plans to develop an integrated

GLUBS Workshop participants

platform to facilitate building reference dictionaries and machine learning training databases for as many identified and unidentified underwater sounds as possible. The GLUBS mission is to develop and merge novel technologies with existing bioacoustics resources to make the exploration of biological sounds more accessible to researchers, managers, educators, and enthusiasts. By fostering a deeper appreciation of underwater soundscapes, GLUBS will promote greater stewardship of aquatic ecosystems. Energized by the collective vision to produce an inventory of the world's aquatic sounds to understand and protect biodiversity, the team developed several medium-term goals to help standardize the categorization of biological sounds, develop libraries of unknown sounds, and develop artificial intelligence algorithms to detect, characterize, and count organisms. An important achievement of the workshop was better definition of GLUBS components and work flows, and development of GLUBS working groups to carry on development work.

A news release about GLUBS was issued in April 2023; the news was reported by publications worldwide.

A GLUBS-inspired Research Focus has been opened in *Frontiers in Remote Sensing*, with a manuscript submission deadline of 24 November 2023.

MEETING OF THE IQOE SCIENCE COMMITTEE (SC)

The IQOE Science Committee (SC) met on 26–27 April 2023, in Woods Hole, Massachusetts, USA, chaired by Peter Tyack. All 10 SC members participated either in person or remotely. Meeting participants reviewed ongoing IQOE activities, evaluated the progress of IQOE after 8 years, and planned for the coming year. The Ocean Sound EOV Implementation Plan has passed external review and the SC agreed to complete its approval in a few weeks after the SC meeting and to determine how IQOE can help implement recommended actions from the plan. The SC requested that pages be added to the IQOE Website for training opportunities and a portal for outreach materials (e.g., links to DOSITS, videos, and other resources). The SC discussed an IQOE activity to evaluate the effects of the COVID-19 pandemic on ocean sound levels, potentially through hiring a post-doctoral fellow to work on this activity. IQOE is forming a task team to accelerate the deployment of low-cost hydrophones for certain research applications (not requiring calibrated equipment), education, and citizen science. Ed Urban updated the SC on the development of the IQOE Hydrophone Metadatabase. The meeting concluded with a discussion of future activities of IQOE and final impressions from meeting participants. Participants agreed that IQOE has provided a unique framework for developing international cooperation on ocean acoustics and bioacoustics, and has built a foundation that will be important for the next several years of IQOE implementation (see IQOE self-appraisal). These topics will be discussed in more detail below.

Please contact Ed Urban if you know of ocean acoustic or bioacoustics training opportunities.

IMPLEMENTATION PLAN FOR OCEAN SOUND ESSENTIAL OCEAN VARIABLE (EOV)

The Implementation Plan for the Ocean Sound EOV completed external review and was approved by the IQOE Science Committee for release, after formatting. The formatted plan will be announced through the IQOE email and Twitter accounts and will be presented to the relevant panels of the Global Ocean Observing System. Several of the recommendations of the implementation plan are already being undertaken by IQOE and the IQOE SC will discuss mechanisms that might be used to implement the others.

UPDATE ON COVID-19 PANDEMIC NOISE OBSERVATIONS AND PUBLICATIONS

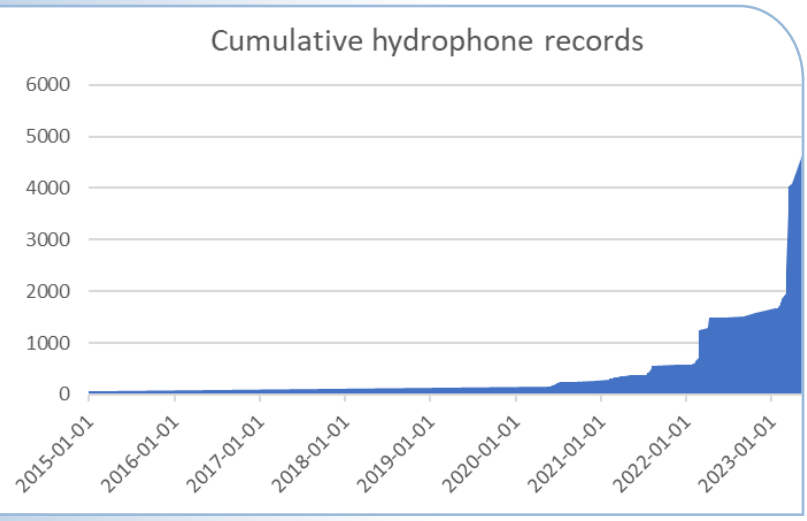
Since the previous *IQOE Newsletter,* three papers have been added this year to the list of papers on the effects of the COVID-19 pandemic on ocean sound at https://iqoe.org/covid-pause-papers. The IQOE SC is seeking funding to hire a post-doctoral fellow to analyze ocean sound observations to determine if, when, and where the pandemic affected ocean sound. Approximately 150 records in the IQOE Hydrophone Metadatabase span an appropriate time period to conduct such an analysis. The metadata providers and authors of papers related to COVID effects on ocean sound will be involved in this activity. An IQOE working group may be set up to work with the post-doc.

GLOBAL HYDROPHONE NETWORK

The number of records in the IQOE Hydrophone Metadatabase continues to grow, now surpassing 5,000 unique recordings (see chart on next page). The number of observing days has reached around 300,000. The metadatabase has been used to (1) identify for the Worldwide Soundscape project cabled networks that provided public metadata and (2) connected a Ph.D. student with data sources for a specific area and a specific day, to study acoustic propagation modeling and seismic event detection related to his dissertation research.

It is expected that several thousand more records could be added in the next year, primarily from past recordings not yet in the metadatabase. This resource will make possible new cooperation among hydrophone operators, acousticians, and modelers seeking to identify observations within specific areas. The IQOE SC is in the process of forming a IQOE working group to carry on the work of identifying new records and preparing the metadatabase for public access.

See also map of hydrophone distributions at the end of newsletter.



LOW-COST HYDROPHONES

The IQOE Task team on Low-cost Hydrophones for Research, Education, and Citizen Science will convene online and/or at ASA or other meetings to focus on specifications for low-cost hydrophones—not needing to be calibrated—that could be deployed for a variety of uses, including research, education, and citizen science. The team will also suggest components of do-it-yourself hydrophone kits that would be globally available and identify what would need to be included in an online tool or online forum/YouTube channel to help individuals build and deploy their own hydrophone systems. IQOE is in the process of forming this task team, which is chaired by Lucille Chapuis (University of Bristol, UK).

OPEN PORTAL TO UNDERWATER SOUND (OPUS)

OPUS is designed as a tool to discover archived, quality-controlled passive acoustic monitoring data to promote public recognition of underwater sound. It is relevant to IQOE goals of estimating the current levels and distribution of sound in the ocean, and assessing trends in this sound. Motivation for OPUS is to (1) provide easy access to global passive acoustic records to anybody, (2) promote understanding of underwater soundscapes, and (3) address open questions about whether there are trends in anthropogenic sound levels. There are currently six observation sites available through OPUS (87 data sets), from Alfred Wegener Institute (AWI) PAM observations, and OPUS is already adding recordings from sources beyond AWI, including a North Sea dataset provided by the Flanders Marine Institute, observations from Mosman Bay (Australia), and data from two IQOE-endorsed projects, SanctSound and possibly JOMOPANS. OPUS will be launched for public use in the coming year (without log-in requirements) and additional products will be developed, such as 2-min spectrograms and power spectrum plots. OPUS will explore cloud-based data storage options that will make expansion possible by different funding models. OPUS will encourage external data providers to submit their raw audio data to a recognized repository and provide a digital object identifier (DOI). OPUS is planning to create a video tutorial showing how to use the system.

NEWS FROM ENDORSED PROJECTS

QUIETSEAS—The QUIETSEAS project has reached the end of its planned life of 28 months. During this time, the project assisted governments and other stakeholders in the Mediterranean and the Black Sea regions with the practical development of the European Marine Strategy Framework Directive (MSFD) by providing tools and methods to facilitate underwater noise assessment and management. Outputs from the project include "a review of risk-based approaches and frameworks for criterion D11C2 of MSFD (anthropogenic continuous low-frequency sound in water), definition of regional specificities of a risk-based approach for continuous sound assessment in the Mediterranean Sea and Black Sea regions, recommendations on the applicability of acoustic propagation modelling approaches for continuous sound assessment in the Mediterranean Sea and Black Sea regions, identification of national barriers for the implementation of the Task Group on Noise methodological framework for D11C2, proposal of a methodology to establish threshold values for D11C2 in the Mediterranean and Black Sea regions, a preliminary Good Environmental Status (GES) assessment of D11 underwater noise in the Mediterranean Sea and Black Sea regions, data management tools for harmonization and noise data sharing, identification of best practices of subregional cooperation to set mitigation measures to address underwater continuous noise pollution, and guidelines for Competent Authorities on a reporting method for continuous noise appropriate for the GES assessment and the establishment of thresholds."

Solutions At Underwater Radiated Noise (SATURN)—Amy Dozier reported the following highlights:

- "Our research was featured on the Euronews docuseries "Ocean" episode about ocean sound. The SATURN segment starts at 5:39 and focuses on our efforts to track seal response to shipping noise in the busy Port of Hamburg. https://www.euronews.com/green/2023/06/27/sounding-the-alarm-scientists-say-noise-pollution-is-affecting-ocean-health

- In May, we contributed to the WWF Arctic Magazine 'The Circle" an article on technologies to reduce shipping noise: https://www.saturnh2020.eu/post/article-in-wwf-arctic-magazine-on-designs-for-reducing-underwater-noise-from-ships

- We released the third version of the DEPONS software for simulating the population effects of noise on harbour porpoises from shipping noise: https://www.saturnh2020.eu/post/depons-model-3-0-release

- We issued an urgent call for the reduction of underwater noise together with other attendees of OCEANOISE2023: https://www.saturnh2020.eu/post/urgent-international-call-for-action-to-reduce-human-noise-in-the-ocean

- We joined a global effort to record underwater sounds for WOPAM Day: https://www.saturnh2020.eu/post/world-oceans-passive-acoustic-monitoring-day

- We published a new paper on assessing the usefulness of MSP for reducing underwater noise: https://www.saturnh2020.eu/post/can-marine-spatial-planning-effectively-mitigate-the-impacts-of-underwater-noise

- We made a video explaining our research on pilot whales in Tenerife: https://www.saturnh2020.eu/post/listening-to-pilot-whales-shipping-noise

- We had our first meeting regarding the Adriatic Sea case study we will be undertaking regarding marine spatial planning for reducing underwater noise: https://www.saturnh2020.eu/post/creating-a-decision-support-tool-to-reduce-underwater-noise"

Project scientists recently published an article based on SATURN work:

Findlay, C.R., L. Rojano-Doñate, J. Tougaard, M.P. Johnson, and P.T. Madsen. 2023. Small reductions in cargo vessel speed substantially reduce noise impacts to marine mammals. Science Advances 9, eadf2987.

Ports, Humpbacks, Y Soundscapes In Colombia (PHySIC)—Maria Paula Rey Baquero recently defended her master's thesis and she was awarded honors status for it. Astarte Brown and Laura Valentina Huertas Amaya both have had their chapters for the 2022 Aquatic Noise meeting publication approved. PHySIC received a research grant from the New England Aquarium to continue hydrophone deployments and to work on the correlation of stress hormones with noise levels; four biopsies have already been collected during this field season. Work has commenced again at the field site, including deployment of SNAP underwater acoustic detectors. Project scientists will attempt two back-to-back recording sessions in this field season to extend temporal coverage. Two documentary groups will film project activities this year.

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.

NATIONAL/REGIONAL ACTIVITIES

Several national and regional 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 latest African Bioacoustics Community newsletter has just been issued. It highlights bioacoustics research on the continent, publications from this research, and information about events and opportunities in the region.

Canada

The latest newsletter (May 2023) from the MERIDIAN project can be accessed here. MERIDIAN recently received funding from the Canadian Department of Fisheries and Oceans for the AISviz (Making vessel tracking data and maps available to everyone) project. AISviz "aims to build National capacity for marine conservation to access, process, and visualize historical and real-time vessel traffic data to monitor and predict the effect of commercial and leisure vessels in current and future Marine Protected Areas / Other Effective Area-Based Conservation Measures." MERIDIAN held a workshop on 4 May 2023 at Dalhousie University to identify user requirements, challenges, and barriers related to Automatic Identification System (AIS) data and explore solutions to address them, to support their new project.

MERIDIAN has developed and is testing a bearded seal detector, based on a deep neural network, using the ketos package. This detector will be the first of a series of Arctic marine mammal detectors envisioned by MERIDIAN. The MERIDIAN Marine Artificial Intelligence Platform (MAIPL), an open-source Web platform that will make AI techniques accessible to ocean researchers, will be released in January 2024 as a multifaceted toolbox to apply AI on underwater acoustic data including graphical user interfaces to annotate acoustic data, and create databases. MAIPL will support the development of deep learning-based acoustic detectors and classifiers without needing to code. MERIDIAN's goal is to make AI techniques available to a large spectrum of ocean and environmental scientists.

The MERIDIAN team is excited to announce Specviz-React, a powerful tool for annotating audio files, designed to make tasks such as acoustic research and recognition training more efficient and accurate. With its built-in browser graphics, real-time frequency filtering, and customizable visual styles, users can easily inspect and annotate audio files with precision

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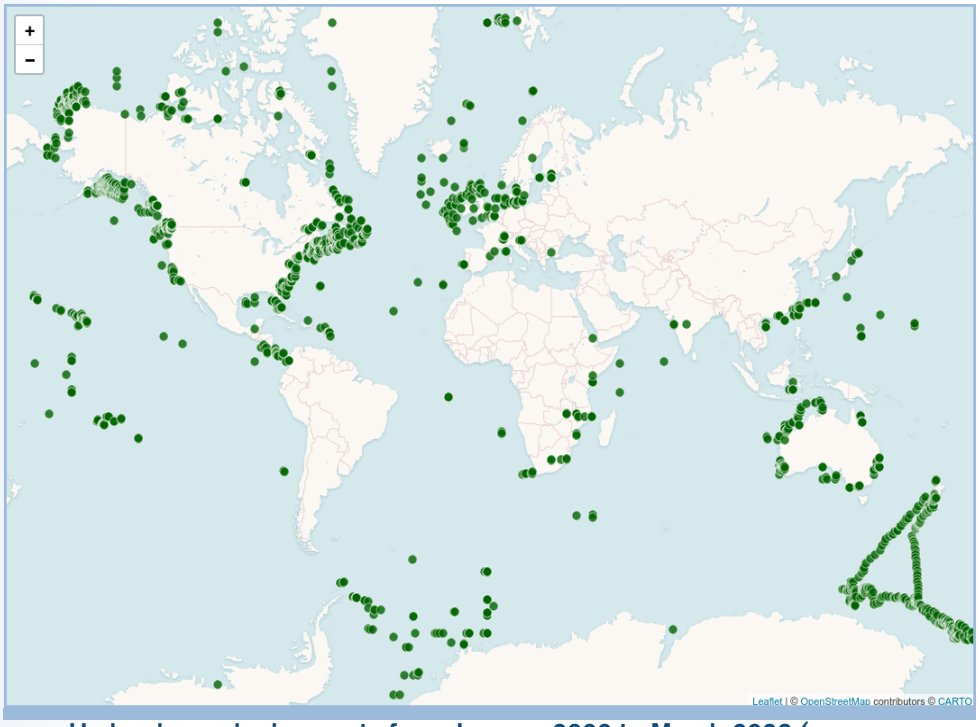
Endorsed projects (4): NRS, PHYSIC, SATURN, TANGO

Publications in Aquatic Acoustic Archive: 7,115

IQOE Email List: 411

X Followers: 175



Hydrophone deployments from January 2000 to March 2023 (map courtesy of Eduardo Klein)