2024 Annual SCOR Working Group Report

1. Name of group

SCOR WG157 MetaZooGene: Toward a new global view of marine zooplankton biodiversity based on DNA metabarcoding and reference DNA sequence databases

2. Activities since previous report to SCOR (e.g., virtual or in-person meetings, email discussions, special sessions). Limit 1000 words

ICES-PICES 7th International Zooplankton Production Symposium (17-21 March 2024; Hobart, AUS)

ZPS7 Theme Session #4 "Shedding new light on zooplankton: Unveiling communities, ecology, and evolution through integrated approaches" was organized and chaired by WG157 members, Astrid Cornils and Silke Laakmann. There were 16 contributions (13 oral presentations and 3 posters) authored by 14 MetaZooGene members. The invited talk on convergent evolution in pelagic pteropods was presented by WG-157 Vice-Chair, Katja Peijnenburg. Presentations supported MetaZooGene goals, noting knowledge gaps in zooplankton species diversity and calling for continued effort toward taxonomically and geographically complete reference sequence databases. The session reviewed technological approaches and recommended integrative approaches (including molecular, morphological, imaging, and acoustics) for better understanding of zooplankton communities.

ZPS7 Workshop #1 "Reference sequence databases for global zooplankton biodiversity: Optimization, applications and user guidelines" was organized and chaired by SCOR WG157 members Silke Laakman, Todd O'Brien, Jenny Huggett, and Leonie Suter. Invited speakers Iole Di Capua and Junya Hirai are also MetaZooGene members.

ZPS7 Early Career Scientists (ECS): MetaZooGene provided travel support for ECS presenters at ZPS7 who are named as colleagues and collaborators with WG157.

MetaZooGene WG157 Annual 2024 Meeting @ ZPS7

The WG157 annual meeting was held during the Zooplankton Production Symposium (ZPS7) at the Institute for Marine Antarctic Science (IMAS) of the University of Tasmania. A total of 40 people attended the meeting, including 14 members, 10 Early Career Scientists, and 16 guests from IMAS and other partner institutions. The meeting featured presentation updates from 13 WG157 members, with open discussion and deliberations on future goals, activities, and plans for WG157 members.

UN Ocean Decade Action Collaborative Meetings

SCOR WG157 members and colleagues serve as representatives for the MetaZooGene UNOD Action (No. 102.2) and have attended numerous meetings with UNOD partner programs and projects, including regularly-scheduled, special-topic, and strategic meetings. WG157 representatives are: Ann Bucklin, Leocadio Blanco-Bercial, Pennie Lindeque, Jennifer Questel, Todd O'Brien.

3. Documents published since previous report to SCOR (e.g., peer-reviewed journal articles, reports, Web pages) and should be limited to publications that resulted directly from WG activities and which acknowledge SCOR support

O'Brien, T.D., Blanco-Bercial, L., Questel, J.M., Batta-Lona, P.G., and Bucklin, A. (2024) MetaZooGene Atlas and Database: Reference Sequences for Marine Ecosystems. In: DeSalle, R. (eds) DNA Barcoding. Methods in Molecular Biology, vol 2744. Humana, New York, NY. https://doi.org/10.1007/978-1-0716-3581-0_28

Gonzalez C.E., Blanco-Bercial, L., Escribano, R., Fernandez-Urruzola, I., Rivera, R. and Ulloa, O. (2023) Revealing zooplankton diversity in the midnight zone. Front. Mar. Sci. 10:1252535. https://doi.org/10.3389/fmars.2023.1252535

MetaZooGene Atlas and Database Web page: https://metazoogene.org/mzgdb/. The MZGdb web portal provides access to both a reference database and a barcode atlas, and now includes zooplankton, benthic invertebrates, fish, marine mammals, and phytoplankton (aka microbes and protists). The molecular content now includes mitochondrial COI, 12S, 16S; and nuclear 18S and 28S. The web portal is designed to fulfill deliverables WG157 ToR 1 (see below).

4. Progress toward achieving group's terms of reference. List each term of reference separately and describe progress on each one. Limit 1000 words

ToR 1) Create an open-access web portal for DNA barcodes for marine zooplankton

The MetaZooGene Atlas and Database (MZGdb; https://metazoogene.org/mzgdb/) includes DNA sequences for cytochrome oxidase I (COI) for 20,415 (30%) of the total 66,809 recognized marine invertebrate species. The MZGdb creator, WG157 member Todd O'Brien (NOAA Fisheries) designed the database, which also includes multiple gene regions used as barcodes for marine organisms across the Tree of Life from microbes to mammals, as well as birds and reptiles. Observation records from the OBIS and COPEPOD databases, barcoding coverage, and summary statistics are generated for taxonomic groups and ocean regions. The MZGdb is a unique and valuable resource for biodiversity researchers and fisheries managers, allowing targeted searches and providing coverage statistics that guide priorities for efforts toward a complete reference database for marine organisms.

ToR 2) Design an optimal DNA barcoding pipeline for marine zooplankton

Deliverables for this ToR (2) have focused on a key aspect of the DNA barcoding pipeline: improving reliability and accuracy of taxonomic classification and species identification, with the specific goal of encouraging use of the MetaZooGene Atlas and Database (MZGdb). A primary deliverable was publication of an invited chapter in *Protocols for DNA Barcoding*, in the series, *Methods in Molecular Biology* (Springer Nature) authored by WG157 members, Todd O'Brien, Leocadio Blanco Bercial and Ann Bucklin. The target audience for the book chapter includes researchers, managers, museum curators, and students focused on diverse topics requiring accurate identification of marine species based on DNA barcodes.

ToR 3) Develop best practices for DNA metabarcoding of marine zooplankton biodiversity

WG157 members are carrying out a global-scale inter-calibration experiment for testing impacts of using different molecular and analytical protocols for DNA metabarcoding of zooplankton diversity. A set of reference samples was generated by and distributed among 10 research groups led by

participating WG157 members. Statistical analysis and bioinformatics of the resulting DNA sequence data are underway. The study is designed to evaluate the of consequences of using different molecular, bioinformatics, and statistics protocols and parameters for metabarcoding analysis and evaluate the impacts and significance for the results and conclusions about the biodiversity of marine zooplankton.

5. WG activities planned for the coming year. Limit 500 words

Inter-calibration Experiment for Metabarcoding Zooplankton Diversity
This effort will fulfill goals and deliverables associated with ToR 3 (see above). Centralized bioinformatics and statistical analysis are in progress for DNA sequence data for 4 gene regions for samples from 10 participating WG157 research groups. Preparation of a manuscript for publication in the scientific peer-reviewed literature is planned for Fall 2024, with submission for publication by early 2025.

Support for Early Career Scientists
Early Career participants will continue to be invited and actively encouraged to participate in all WG157 activities, including meetings, special sessions at conferences, and publications. These efforts have been very successful in ensuring significant numbers of ECS colleagues at conferences, special sessions, and symposia. Special attention to active participation of ECS will be expanded whenever and however possible.

Continued Progress on Deliverables
Progress on Terms of Reference and Deliverables will continue online and via web resources, including project-specific virtual "Work-Areas" for WG157 members.

6. Is the group having difficulties expected in achieving terms of reference or meeting original time schedule? If so, why, and what is being done to address the difficulties Limit 200 words

Work toward SCOR WG157 goals, as defined by terms of reference and deliverables, is continuing successfully as WG157 begins a fifth year. Beginning in Spring 2020, activities requiring international travel and in-person collaboration were cancelled and shifted to online and virtual activities. In-person gatherings resumed in 2022, with an international MetaZooGene Symposium (Dublin, Ireland) focused on Early Career Scientists. WG157 activities will continue to be carried out virtually using an online Work-Area, with project-specific folders for documents and data accessible to WG157. SCOR WG157 MetaZooGene members and colleagues have every expectation of completion of all deliverables during the coming year.

7. Any special comments or requests to SCOR. Limit 100 words.

N/A

Additional information can be submitted and will be included in the background book for the SCOR meeting at the discretion of the SCOR Executive Committee Reporter for the WG and the SCOR Secretariat.