LifeWatch-WoRMS Cnidaria Editor Workshop Report

Date: 27-29 February

Venue: VLIZ, Ostend

Attendees:

Scientific Team:

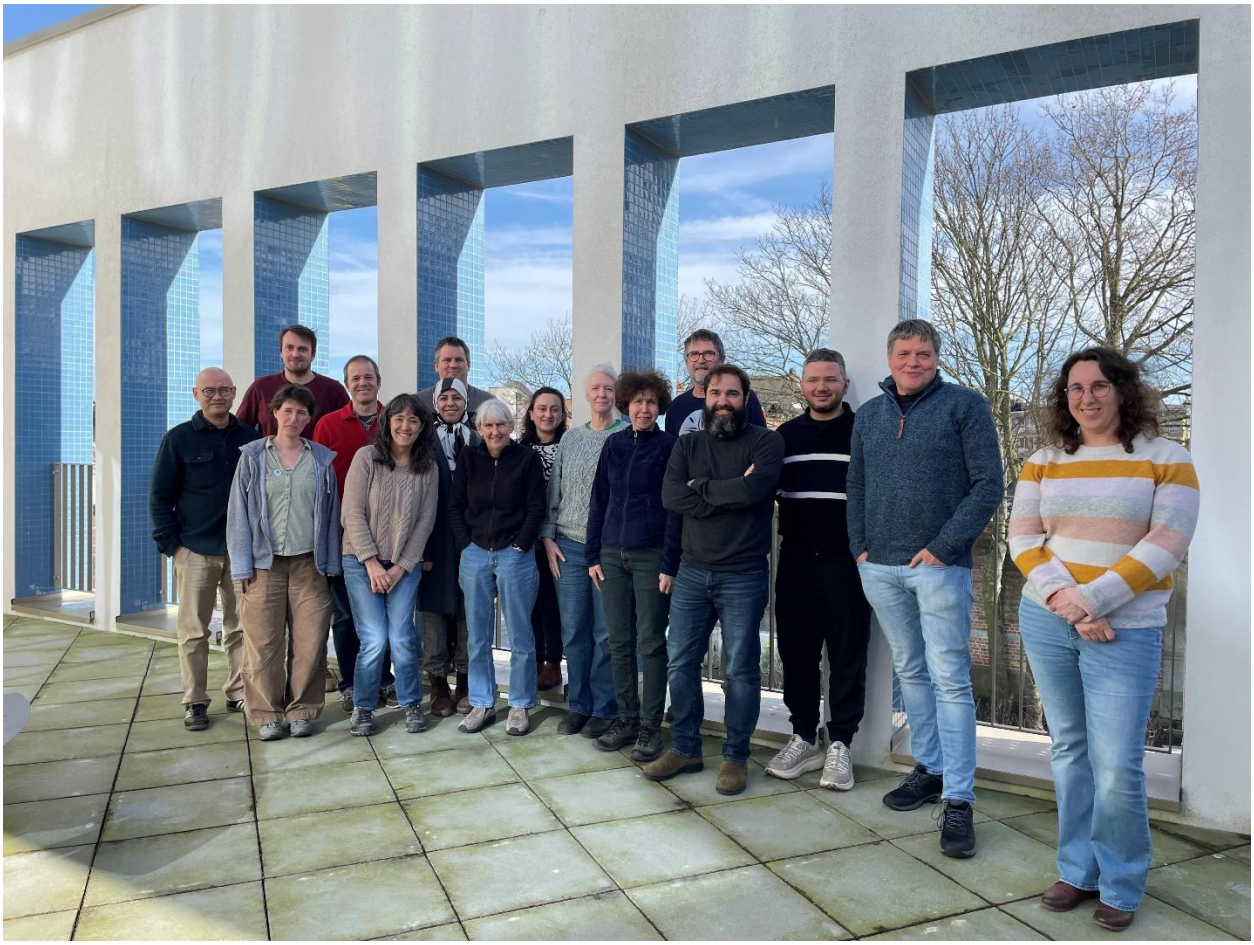
Paulyn Carwright, University of Kansas (USA), Hydrozoa
Henry Choong, Royal British Columbia Museum (Canada), Hydrozoa
Meg Daly, Ohio State University (USA), Actiniaria, Corallimorpharia [reporter]
Bert Hoeksema, Naturalis (Netherlands), Anthozoa, Myxozoa
Catherine Mc Fadden, Harvey Mudd College (USA), Octocorallia
Tina Molodtsova, Shirshov Institute (Russia), Antipatharia, Ceriantharia
Kaveh Samimi-Namin, Naturalis (Netherlands), Octocorallia
Frederic Sinniger, University of the Ryukyus (Japan), Zoantharia
Paris Stefanoudis, Oxford (UK), corals

DMT:

Ben Boydens
Wim Decock
Lynn Delgat
Stefanie Dekeyzer
Mona Goharimanesh
Leen Vandepitte
Bart Vanhoorne

Apologies:

Allen Collins, Smithsonian Institution (USA), Cubozoa, Hydrozoa, Scyphozoa, Staurozoa
Ralf Cordeiro, Universidade Federal de Pernambuco (Brazil), Octocorallia
Andre Morandini, University of São Paulo (Brazil), Medusae
James Reimer, University of the Ryukyus (Japan), Zoantharia
Estefania Rodriguez, American Museum of Natural History (USA), Actiniaria
Peter Schuchert, Natural History Museum Geneva (Switzerland), Cubozoa, Hydrozoa, Scyphozoa, Staurozoa



Introduction

Comprising approximately 12,000 known, valid species, Cnidaria is among the oldest lineages of animals, diverging from other metazoans before the Cambrian. The majority of cnidarians are marine, including familiar animals like jellyfish, corals, sea fans and sea anemones. Species like the hydrozoan *Hydra* and the sea anemone *Nematostella* are long-standing and important model systems for cellular and developmental biology. Corals, a common name that is used for members of diverse lineages within Cnidaria, are ecologically critical as habitat anchors in reef ecosystems and of conservation concern in light of anthropogenic threats. Canonically considered to represent two major lineages—the exclusively polypoid Anthozoa and the biphasic Medusozoa—Cnidaria is now recognized to also include Myxozoa, microscopic endoparasites previously classified among unicellular eukaryotes.

Objectives

This workshop serves as an opportunity to connect across the editor and expert community for Cnidaria to make WoRMS a more useful and coherent resource for the research community. We aim to update the higher-level taxonomy of Cnidaria within WoRMS, add locality (geographic and bathymetric) data as both point data and zonation attributes, and identify priority trait data to be implemented for Cnidaria. Planned near-term outcomes are a "status report" type of publication that highlights diversity and taxonomy of Cnidaria and a nascent trait database for species-level attributes of broad interest and ecological relevance.

Activities

Day 1: Tuesday 27 February

Goal: Orient participants to the state of Cnidarian data in WoRMS. Identify opportunities for synthesis or broad-scale framework paper based on data in WoRMS. Identify major gaps in terms of data evenness for existing data fields and strategize about ways to improve evenness, depth of data.

Consensus among members is that goal is to have all basionyms and combinations, locality data for type specimens (minimally), with specimen data connected to record of a name.

Data quality for linked data sources is spotty. Most notable for images and geographic points through OBIS. Taxa that span recent and fossil need coordination to resolve inconsistencies. Qualitative depth data needs to be added for most taxa.

Growing library of images for type specimens through DigIn, IDigBio. VLIZ adding links and resources through BHL and other sources for original descriptions.

Taxonomic structure needs to be updated. The phylum should be split into Endocnidozoa (Myxozoa and Polypodium), Medusozoa, and Anthozoa. The sublineages in Anthozoa, Octocorallia and Hexacorallia, need to be elevated to class, following McFadden et a. 2022 (https://doi.org/10.18061/bssb.v1i3.8735). Upcoming paper by DeBiasse et al (published March 2024: https://doi.org/10.1101/2022.10.03.510641)

provides synthesis phylogenetic framework and some clade names that will need to be included. Large-scale phylogeny of the group is well resolved. Ordinal membership is stable. Relationships among and within orders remain dynamic.

The group engaged in discussion about lineage-specific portals, either as a Cnidaria portal with subregisters or a merger/fusion of existing portals. Consensus favored status quo of lineage-specific portals at subclass or ordinal level, with superstructure at superordinal level through standard WoRMS pages. Taxon editors responsible for lineages where portal is not yet populated should reach out to DMT about development.

<u>Existing lineage portals</u>
World List of Actiniaria (exists already)
World List of Scleractinia (exists already)
World Hydrozoa database (exists already)

<u>Not yet extant but listed in WoRMS GSD superstructure</u>
World List of Antipatharia
World List of Ceriantharia
World List of Corallimorpharia
World List of Cubozoa
World List of Scyphozoa
World List of Staurozoa
World List of Myxozoa
World List of Octocorallia

Cnidaria: Needs revision to structure to reflect contemporary taxonomy.
Anthozoa

- **Actiniaria**: Basionyms and combinations >95% complete. Specimen documentation is good for most names older than 2010; more recently described species and more recent records less complete. World Actiniaria portal.
- **Antipatharia**: Basionyms and combinations >95% complete; some homonyms not fully resolved. Old species not as well documented as more recent species.
- **Ceriantharia**: Basionyms and combinations >95% complete. Documentation of type species is spotty.
- **Corallimorpharia:** Basionyms and combinations >95% complete. Could use an expert editor.
- **Octocorallia**: Basionyms and combinations > 95% complete. Database contains most original descriptions, photos of most type specimens, and locality data for type specimens.
- Recent **Scleractinia**: Basionyms and combinations >95% complete. Some old synonyms remain, and there are grey areas for taxa that include recent and fossil members. Documentation of specimen info (images of types, localities) lags behind names.
- Fossil **Scleractinia**: Basionyms and combinations >75% complete, but inconsistencies and ambiguities not well resolved or addressed.
- Fossil corals (non-Scleractinia): **Tabulata** and **Rugosa** are not as complete as Scleractinia.
- **Zoantharia**: Basionyms and combinations >95% complete. Some older species are not checked or identified as accepted/not. Documentation of distribution and images developing, not yet complete.

Myxozoa: Database lags behind compared to other lineages, but there is substantial demand for these records from users. Some structural issues in adding these because freshwater distributions not

included. Should probably be documenting hosts as part of data entry. Need ways to engage use community.

Medusozoa

Cubozoa: Basionyms and combinations >95% complete.

Hydrozoa: Basionyms and combinations >95% complete. Documentation of specimen info (images of types, localities) lags behind names.

Scyphozoa: Basionyms and combinations >95% complete.

Staurozoa: Basionyms and combinations >95% complete.

Day 2: Wednesday 28 February

Goal: Hands-on training in WoRMS data entry and use, focusing on geographic/zonation data and image data. Conversation with WoRMS leadership about obstacles and opportunities for this group. Conversation about new functions and training on how to view and add trait data to records.

The appropriateness, feasibility, and practicality of various traits, and the best way to formalize/conceptualize the traits to facilitate coding and comparison. Traits discussed included photosymbiotic state, trophic group, coloniality, biofouling, colonization of man-made structures, mobility, habitat forming (garden vs reef), lifespan, feeding type, polyp size, and invasibility.

Day 3: Thursday 29 February

Goal: Sketch out trait database for Cnidaria within WoRMS. Develop plan for populating and using this database.

Discussion that balanced the scientific need and value of various traits with the feasibility of coding them led to the identification of the following as traits to code (exist in trait database) and new traits to add. For new traits or new states (in bold), the trait and states are defined below, with a key citation.

Zonation
Body size
Functional group
Supporting structure
Feeding type
Photosymbiosis
Habitat forming
Lifespan

The traits to be added require vetting by the Steering Committee because they are likely to apply to multiple lineages. The trait name is in bold and state names are in italics.

Photosymbiosis: An extra or intracellular symbiotic relationship in which the host harbors photosynthetic microorganisms.
Yes (Symbiotic: Organism hosts phototropic partner)

Substates when answer is “yes” refer to identity of the photosynthetic partner

Dinoflagellate (zooxanthellae)
Green Alga (zoochlorellae) (note from Meg: because “alga’ is a very broad term, might want to clarify that Chlorophyta is the intention)
Cyanobacteria
Unknown

Facultative (Aposymbiotic: Organism hosts phototropic partner under some circumstances, but not obligately)

Substates when answer is “yes” refer to identity of the photosynthetic partner

Dinoflagellate (zooxanthellae)
Green Alga (zoochlorellae) (note from Meg: because “alga’ is a very broad term, might want to clarify that Chlorophyta is the intention)
Cyanobacteria
Unknown

No (Organism does not host phototropic partner)

Unknown

Key Citation **https://doi.org/10.1111/brv.12430**

Habitat Forming: Species create structures that modify the environmental parameters, habitat complexity, and number of available ecological niches.

No (Organisms do not create structure that modify their habitat)
Yes (Organisms do create structures that modify their habitat)

Reef forming (Organism creates structure and complexity through biogenic accretion)

Non-reef forming (Organism creates structures through means other than biogenic accretion)

Mat forming (< 10 cm)
Bed forming (> 10 cm)
Dense bush forming
Open bush forming
Burrow forming

Key Citations: Trait definition from **https://doi.org/10.1016/j.ecolind.2020.106747**
Trait data for non-reef forming are adapted from Hydrothermal Vent Trait Database **https://doi.org/10.1111/geb.12975**

Lifespan This trait exists; desire is to add more states to add precision and granularity within the “perennial” categories. Recommendation is to substitute existing “long and “short” perennial categories into: *Years; Decades; Centuries.*

Body Size This trait exists. It is somewhat imprecise as applied to cnidarians because it does not capture ecologically critical aspects of colony size. The Cnidarian editor group requests that the Steering Committee add *Colony Diameter* and *Colony Height.*

The Cnidaria group requested that the Steering Committee consider adding a trait around **Human Health Impact** (with venomous, toxic, unknown, and none as the states). This was not a priority trait for the Editor group but is one we think would have value to the larger community (and is easy for Cnidaria!)

Outcome

All editors have action points for the coming year around data entry. A plan was developed for two follow up manuscripts: one addressing taxonomy and state of knowledge about diversity (follow up/update of Daly et al. 2007, using WoRMS data and new phylogenies) and one using trait data.

Action points

- Discussion of Health Impact trait (**Steering Committee**: April 2024)
- Discussion of Photosymbiosis and Habitat Formation traits (**Steering Committee**: April 2024)
- Discussion of new states for Body Size, Lifespan traits (**Steering Committee**: April 2024)
- Add traits to trait database options (**DMT**: June 2024)
- Update of classification at subphylum level. Done at meeting; will need revision again after publication of DiBiasse et al. 2024. (**MD and BH**: June 2024)
- Entry of trait data for key features (**ALL**: August 2024)
- Development of synthesis of current state of knowledge for PLoS (Draft from **MD** to rest of group Aug 2024, **ALL** review, **MD** submission Oct 2024)
- Analysis of trait data for key features (Preliminary analyses Nov 2024 by **TM** & **PS**; feedback from **ALL** by Jan 2025; ms submission March 2025)
- Engage possible editors for Corallimorpharia (**MD** and **BH**, June 2024)
- Engage possible editors for Myxozoa (**DMT, BH, PC,** and **AC,** Summer 2024)
- Entry of locality data for type specimens (**ALL:** Ongoing/continuous)
- Stand up lineage-specific portals **(DMT and editor** communities for Antipatharia, Ceriantharia, Corallimorpharia, Cubozoa, Myxozoa, Scyphozoa, Staurozoa: ongoing. **MD** will send emails to relevant editors in May to get this on their radars)

Acknowledgments

The organization of this workshop and the support of the WoRMS Data Management Team (DMT) are supported by LifeWatch Belgium, part of the E-Science European LifeWatch Infrastructure for Biodiversity and Ecosystem Research. LifeWatch is a distributed virtual laboratory, which is used for different aspects of biodiversity research. The Species Information Backbone of LifeWatch aims at bringing together taxonomic and species-related data and at filling the gaps in our knowledge. In addition, it gives support to taxonomic experts by providing them logistic and financial support for meetings and workshops related to expanding the content and enhancing the quality of taxonomic databases.

We are grateful to the LifeWatch program for providing (financial) support and also to the WoRMS Data Management Team at Flanders Marine Institute (VLIZ) for making the arrangements which allowed the workshop to happen. The valuable contribution by participants is also very much appreciated.