Data and Services Discovery projects - Transformative Data Collections

Title

Macroalgal Essential Ocean Variable (EOV) data processing and workflow.

Approach

Following recommendations from a Global Observing of Macroalgal Communities workshop held in September 2018, we ran a workshop in Hobart focusing specifically on the technical and data management requirements to fully specify how the process of data collection, QA, publishing and aggregation will be managed to meet the requirements for EOVs and the research community addressing the following questions:

- What software architecture will support aggregation of relevant and disparate data sources to support community needs and the macroalgal EOV specification?
- What governance structure (in alignment with GOOS principles and terms of reference) will support future sustainability of policies, platforms, standards and procedures?
- What data sharing agreement(s) and licensing need to be agreed and in place to enable the goals of the community?
- What are the data formats (variables, units, vocabularies etc) required for the various data that will be aggregated?
- What is the data format for output to a global EOV aggregation portal?
- What are the minimum metadata requirements for publishing the data and how will it be made discoverable?

Workshop participants with international representation and relevant technical expertise were selected and attended the workshop run from 1st-4th October 2019. Attendee countries included Australia, Belgium, Italy, Mexico, New Zealand, Portugal, United Kingdom and USA. A much broader community of practice will be engaged post workshop.

Draft Standard Operating Procedures (SOPs, including information on data formats and proposed vocabularies) were prepared leading up to and during the workshop.

Information gathering activities during the workshop provided all of the material required to produce a governance model (including committee terms of reference, data management policy and data sharing agreement) and a detailed plan of hardware and software infrastructure that will be used to collect, perform quality assurance, publish and aggregate the data to the Ocean Biogeographical Information System (OBIS, governed by the Intergovernmental Oceanographic Commission of UNESCO and based in Oostende, Belgium).

FAIR

While the workshop hasn't immediately resulted in making data more in line with FAIR data principles, initiatives leading from this workshop will have a significant impact.

- Development of the Standard Operating Procedures (SOPs) will result in uniform data collection methods, data files formats and vocabularies globally significantly increasing interoperability and reusability (the work to produce and review these SOPs in the broader community of practice will continue post workshop).
- The proposed workflow and architecture, if implemented, will provide a location for aggregating and publishing uploaded macroalgal data globally. Data will be translated to agreed values for the macroalgal EOV and transformed to Darwin Core format to be harvested by OBIS International to provide EOV data in an agreed format (translation and Darwin Core schema provided in the SOPs). ISO19115 compliant metadata will be available from an OAI-PMH interface allowing harvesting by national and global metadata repositories. All of these features will make the data Findable and Reusable.
- Uploaded data will be made available on an OGC compliant Web Feature Service and Web Mapping Service for access by third parties. EOV data will be made available through OBIS APIs and associated tools. These features will make the data Interoperable and Accessible.

SOPs will be published on Ocean Best Practices.

Collaboration and coverage

The workshop brought together people collecting data that can be contributed to a global macroalgal EOV. Specific methods and associated derived data products addressed included visual surveys, remote sensing (satellites, LIDAR, drones), AUV-derived and other kinds of marine imagery, genetics, and acoustics.

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Including data from drones and acoustic surveys was ultimately premature in terms of delivering mature SOPs. We had envisaged data from acoustic surveys intended to be run this year would result in developing a methodology for determining components of the macroalgal EOV. However, the voyage planned to collect the data was postponed until early 2020. While drones have been successful in terrestrial research, adaption to marine research is complex and finalising a SOP premature in the context of this workshop. However, we have engaged with both communities and will continue to develop these areas of data collection with the intention of completing the SOPs for both during 2020.

For the development of SOPs for techniques other than drones and acoustics, we invited 2-3 people from each area of expertise who were very visible within the broader networks of their

respective communities. The draft SOPs developed as part of this workshop will be shared for input with a much larger representative group from each research community of practice. Finalised SOPs will be published on Ocean Best Practices.

As part of the workshop, we established governance to ensure progress on establishing infrastructure and broadening the community of practice continues.

- Established a global steering committee and draft terms of reference. The group will be called the “Global Ocean Macroalgal Observing Network” (GOMON).
- Assigned foundation co-chairs (Lisandro Benedetti-Cecchi – GOOS Panel member representing the macroalgal EOV and Jarrett Byrnes, The Byrnes Lab, University of Massachusetts Boston, and founder of the KEEN (Kelp Ecosystem Ecology Network) initiative).
- Assigned/Proposed foundation members representing communities of practice (Craig Johnson, Neville Barrett and Vanessa Lucieer* – University of Tasmania, Ester Serrao* – University of Algarve, Tom Bell* – University of California
- Assigned/Proposed foundation members representing major observing networks (Nova Mieszkowska – MarClim, Jen Caselle* – PISCO, César Cordeiro* – MBON, Trina Bekkby* – NIVA, Mary O’Connor* – British Columbia).
- Assigned/Proposed foundation members for data management and development (Pieter Provost – OBIS, Peter Walsh – IMAS)
- Collected information and prepared a Data Management Policy and Data Sharing Agreement.

* To be confirmed.

Sustainability

A number of new and pre-existing mechanisms are in place to ensure future sustainability of systems developed:

- Established governance with remit to establish a global monitoring network, broadening to include a large community of practice (see Terms of Reference). Governance will have broad community of practice representation and commitment from members.
- An agreement between major global observing networks for the establishment a sustained, coordinated global ocean system of marine biological and ecosystem observations.
- An infrastructure plan that leverages off the considerable investment in the Australian Ocean Data Network (AODN) providing core software infrastructure and its ongoing maintenance.
- A commitment from IMAS to support the new platform and maintenance tasks not provided by the AODN (specifically, this includes “keep the lights on” maintenance of the software and hardware architecture and curation of data. Providing resources for data curation may include an element of risk for IMAS and could require negotiation in the

future with the community, through established governance, to ensure ongoing availability).

Learnings

Workshop participants agreed that:

- Sustainability relies on ongoing governance and commitments from established organisations to underwrite the ongoing provision and maintenance of infrastructure and maintenance of data management and curation mechanisms.
- Broad community of practice representation and agreement is critical to long term success.
- The success of workshops with a global scope and participants is greatly enhanced by assigning ‘homework’ and holding video conference sessions before the face-to-face meeting. Providing ‘hands-on’ time during the workshop greatly enhanced outputs.
- The stages of a data workflow for a global observation platform were identified: collection, metadata/upload, quality assurance, translation/transformation, ingestion/aggregation, curation, products (visualisations, reports etc).

In assigning funding for projects, we recommend that the ARDC should include consultation with national peak organisations to consider national priorities within specific research domains (e.g. the National Marine Science Committee and Plan).

Impact

The workshop:

- Determined the basis for costing and applying for funding to build the platform required for a transformative data collection to deliver the global macroalgal EOV.
- Established a Global Ocean Macroalgal Observing Network (GOMON) and associated steering committee to continue work and establish a broad, global community of practice.
- Instigated a workflow and system of infrastructure that will significantly contribute to monitoring and evaluating coastal ecosystem health at a global scale and impacts of pressures including ocean warming, acidification, pollution, invasive species, and overfishing among other stressors.
- Agreed to develop a research paper on the subject of global observing of macroalgal canopy cover and composition as an EOV and associated data systems, and to introduce GOMON and the data system to the broader community through a presentation at the next International Temperate Reefs Symposium (January 2021).
- Determined that broader aggregation of this and other EOVs will provide information and data enabling world Governments to make evidence-based decisions on environmental and resource management and sustainability with global considerations.

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