

Annual SCOR Working Group Report to SCOR

Summary:

Traditional and contemporary methods in Biological Oceanography assume a false plant/animal dichotomy for plankton. This dichotomy has been the bedrock of marine science, operationally separating organisms into phototrophic or phagotrophic compartments wherein microbial marine phytoplankton are responsible for about half of Earth's carbon fixation and oxygen production. These phytoplankton are ingested by zooplankton which are then preyed upon by sequentially larger metazoan grazers. However, we now know that most phytoplankton can both photosynthesise and ingest food and that a third of the zooplankton are able to photosynthesize through acquired phototrophy in addition to hunting prey thus synchronically contributing to both primary and secondary production. These previously considered 'eclectic' protist plankton are now recognised as 'mixoplankton' – an important and ubiquitous functional group in global oceans. The overarching aim of MixONET is to update biological oceanography methodologies to quantitatively accommodate the mixoplankton paradigm, and to evaluate emerging methods and technology which will enable accurate assessment of mixoplankton abundance and activities. The official start date of MixONET was January 2022. The MixONET launch WG meeting was held in silico (February 2022); this was the first opportunity for the WG members to e-meet each other. The second hybrid meeting (June 2022) was held in-person in Baiona (Galicia, Spain) and via Zoom. The WG is currently working on establishing a meta-database of databases to aid delivery to ToR1, for ToRs 2 and 3, reviews of extant guides and manuals are ongoing with a view to identify gaps. Since the inception of this WG, we have published an article in the IOC-UNESCO Harmful Algae Newsletter #70; a poster introducing the group has been presented at a conference. Our next meeting is planned in September 2022.

1. Name of group

<i>Mixotrophy in the Oceans – Novel Experimental designs and Tools for a new trophic paradigm</i> (MixONET) – WG 165

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

1	2021 December – introductory start up meeting with SCOR Executive Director and WG liaison officer (Zoom meeting)
2	2021 December – meeting with Claudia Delgado about developing modules for Ocean Teacher Global Academy (OTGA; Zoom meeting)
3	2022 February – launch meeting with all WG members introducing their interests and aligning these to MixONET ToRs & deliverables (Zoom meeting)
4	2022 March/April – resignation of WG associate members Tim Smyth (PML, UK) and Nikola Medic (UCPH, Denmark) due to change in personal circumstances.

5	2022 Jan-May – various meetings with subgroups of WG members to address different terms of references leading to hybrid meeting.
6	2022 May – Luciana Santoferrara (Hofstra, USA) joined group as WG associate member.
7	2022 June – WG meeting to plan deliverables. (hybrid meeting - in person in Baiona, Spain and via Zoom)

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

1	Dedicated webpage established – www.mixotroph.org/mixonet
2	Poster: Mitra A, McManus GB, Gomes HRG, Reguera B (2022) MixONET: SCOR WG 165 Mixotrophy in the Oceans: Novel Experimental Designs And Tools For A New Trophic Paradigm ...introducing SCOR WG 165 MixONET was presented at the XIV meeting of the Iberian Network on Harmful Microalgae and Biotoxins (REDIBAL) (https://redibal.ipma.pt/), Lisboa, 1-3 June 2022
3	Article: Mitra A, McManus GB (2022) MixONET, new SCOR WG #165 on Mixotrophy. In Harmful Algae News. Editors Beatriz Reguera, Eileen Bresnan. 70: 17-18. https://doi.org/10.5281/zenodo.6782899 ...introducing MixONET published in the IOC-UNESCO Harmful Algae Newsletter No. 70. Also, available from https://oceanexpert.org/document/30632
4	Presentation of SCOR WG MixONET ToRs at OCB M&M meeting by George McManus (USA delivered via Webex; 18 th June 2022)
5	SCOR WG MixONET team and ToRs presented as part of invited seminar entitled “ <i>It’s {marine} life Jim but not as we know it</i> (apologies to Mr Spock & Gene Roddenberry)” delivered by Aditee Mitra at the GEOMAR seminar series (Germany; delivered via Zoom, 30 th June 2022)

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#	Descriptor	Progress
ToR1	Biological oceanography databases and the mixoplankton paradigm	Preparation of a meta-database of different plankton sampling and monitoring databases has been started.
ToR2	Repurposing extant methods	Review of the culture and field manuals produced by the EU-H2020-MSCA funded MixITIN project is ongoing to identify gaps in methodologies.
ToR3	Development of New Methods	Dr Sangeeta Naik (Goa University) has been awarded a POGO-SCOR Fellowship on “ <i>Bacterial farming by mixoplankton in the global oceans; an integrated in vivo & in silico training programme</i> ”. Fellowship to be hosted at Cardiff University (UK) working with Aditee Mitra (WG Co-Chair).

		Dr Fernando Unrein (WG full member; Argentina) and Dr Luciana Santofererra (WG associate member; USA) are working on a proposal for the Exceptional SCOR funding call focusing on MixONET ToR 3 {submission deadline 15 th July 2022}
ToR4	Ocean literacy	Module planning for OTGA ongoing. Social media accounts are live: Instagram account (mixotroph.MixoHUB); Twitter account (@mixotrophs) and Facebook page (mixotroph.org).

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

- Plan for a virtual meeting in late summer 2022 and an in-person/hybrid meeting at either the Association for the Sciences of Limnology and Oceanography (ASLO) in Mallorca or International Society Of Protistologists (ISOP) in Vienna in 2023.
- Outline a document on extant and novel methods for quantifying mixoplankton and mixotrophic activity. This could take the form of a review paper or a manual, similar to the *GEOTRACES Cookbook* (<https://www.geotraces.org/methods-cookbook/>) or the *Handbook of Methods in Microbial Ecology*.
- Find a replacement for WG Associate Member Dr. Tim Smyth who resigned from the Working Group due to personal circumstances.
- Identification of 1-2 regional databases that could serve as examples for how estimates of primary production and food-web structure would change if they were realigned with the mixoplankton paradigm.
- Continue strategizing and making connections with OTGA and other groups to create educational materials about the mixoplankton paradigm and to have the paradigm featured more prominently in textbooks.

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

Not applicable

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

None at present

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.