



Project Title: AQUACOSM: Network of Leading European
AQUatic MesoCOSM Facilities
Connecting Mountains to Oceans from the Arctic
to the Mediterranean

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Abstract	<p>The second and final AQUACOM Best Practices Workshop “Optimizing mesocosm design and operational procedures” was hosted by GEOMAR Helmholtz Centre for Ocean Research in Kiel, 18-20 SEP 2018.</p> <p>The workshop focused on how to broaden the research scope and disciplinary spectrum of mesocosm experimentation in general, and how to further support a development of a European network of leading RI’s, and specifically to increase competence, develop guidelines on best practices for experimentation and prepare a roadmap towards future mesocosm technologies.</p> <p>To maximize the use of time and efforts the best practices workshop was organised in collaboration with the first AQUACOSM Science Strategy Workshop.</p>
Keywords	Mesocosm design, operation, competence, RI-roadmap, science strategy, Mile Stone 21 & 25, Wp2, 3 & 4.



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1. Executive summary

The second and final Best Practices Workshop of WP3 “Optimizing mesocosm design and operational procedures” was hosted by GEOMAR Helmholtz Centre for Ocean Research Kiel and took place in Kiel between the 18th and 20th of September 2018.

The overall aim of the workshop was to discuss broadening the research scope and disciplinary spectrum of mesocosm experimentation. The ambition of the workshop was to reinforce a network of leading experts, produce recommendations and checklists for existing mesocosm approaches and infrastructures, develop guidelines on best practices for experimentation and prepare a roadmap towards future mesocosm technologies.

During discussions in various fora (AQUACOSM workshops, GA meetings and others) it emerged that in order to put the research scope into context a set of documents connected to best practices are necessary. The set of documents that the consortium has found most necessary to focus on are the recommendations manual, whose current working title is “The use of mesocosms in aquatic research”, and the Standard Operation Protocols (which are part of WP4). The consortium has also recognised that in order to ensure the continuation of the project goals beyond the end of the project, the science strategy is a vital component.

For these reasons the second workshop on best practices (Milestone 25) was organised in collaboration with the Science Strategy Workshop 1, which is part of task 2.2. (WP2, Milestone 21), and the topics covered were connected to the above-mentioned components.



Figure 1. Meeting participants in front of GEOMAR, Kiel, Germany.



2. Workshop details

2.1 Workshop organisation.

This workshop was organised by partner 9 (GEOMAR) between the 18th and 20th of September 2018, at the facilities of this partner in Kiel, Germany. Partners 1 (FVB-IGB), 2 (UNI), 3 (UiB) and 16 (SYKE) were major contributors to the organisation. Representatives from most partner institutions were present and contributed as needed to the workshop with presentations and input.

Initially, the workshop was planned to take place in M18. However, as it became clear that the 2018 TA-activities would clash with this month for most partner institutions as well as with the month-18 reporting, it was requested to move the WS to M21, and the associated deliverable and milestone to M22. The request was proposed to the PO in a timely manner and was approved.

The workshop programme was as follows:

AQUACOSM WP2 & WP3 Joint workshop on Science strategy and Best practices

Agenda 18-20 Sep 2018, Workshop in Kiel, Germany

Tue 18 Sep AQUACOSM Science Strategy (Task 2.2).

10:30 – 12:00 Opening session: AQUACOSM niche in the European future RI landscape, alliances with key environmental RI's.

1. Summary of Task 2.2, responsibilities and expected outcomes (Timo Tamminen, Dominique Durand)
2. Orientation of recent science political developments (Jens Nejstgaard, Dominique Durand, Timo Tamminen)
3. Initial discussion of the possible actions/proposal writing by the AQUACOSM consortium (All, moderation Timo Tamminen)

12:00 - 13:00 Lunch

13:00 – 15:00 Optimising interactions with other AQUACOSM components: state-of-the-art and discussion

4. Plans and aims of WP9 (JOMEX, Herwig Stibor)
5. Possibilities for collaborations including WP6 (TA, Stella Berger, Tatiana Tsagaraki, Herwig Stibor)
6. Interactions between WP2 (Dominique Durand, Jens Nejstgaard for D2.1) and WP3 (Tatiana Tsagaraki) to achieve Task 2.2

15:00 - 15:20 coffee break

15:20 – 18:00 WP interactions (cont'd), and steps towards deliverables (Months 24 & 44)

7. Potential interactions between Task 2.2. and WP7 (Johan Wikner, Henrik Larsson, Jens Nejstgaard)
8. Potential interactions between Task 2.2. and WP8 (Robert Ptacnik, Timo Tamminen, Behzad Mostajir): achievements so far and goals: implications for Science Strategy.



9. Draft structure of the Science Strategy report: what is needed for Month 24 (December 2018), what will be developed during the second half of the project? (Timo Tamminen, Dominique Durand)
10. Summary discussion of possible development of AQUACOSM+ proposal –potential collaboration with (e)ILTER+ JERICO++ (Jens Nejstgaard, Timo Tamminen, Dominique Durand, and all)

19:00 Joint dinner at restaurant Louff

Wed 19 Sep AQUACOSM WP3- Task 1 + 4 book writing

Suggestions for what presentations should include (but not be limited to) e.g. timeline, contributors and what is needed from them, draft

09:00 – 12:00 Presentations plans for separate sections, focusing on present contributors, structure, suggestions for additional points, contributions required and or suggestions of sections that could be taken out or written in addition, as stand-alone sections/info-boxes/and or in SOPs, to specifically support the planned section.

Also mention whether/which SOPs may be referred to and suggest a time plan (Responsible presenter in parenthesis, but others can also be assigned by the responsible, according to planned writing duties).

1. Sections 1-3 Preface, Acknowledgements & Introduction (Jens Nejstgaard and co-editors, 10 min presentation + evtl. questions).
2. Section 4 Modeling considerations (Selina Våge, Aud Larsen and the Bergen Group and associates, 15 min presentation + 10 min discussion).
3. Section 5 Statistical design, replication, randomization. Lead remains to be finalised, as former suggested leads Tony Underwood and Pedro Peres-Neto did not contribute to the section. It was therefore instead presented by Lisette de Senerpont Domis and Robert Ptacnik, 10 min presentation + 15 min discussion)
4. Section 6 Data handling, including Data legacy (Lisette de Senerpont Domis, 15 min presentation+ 10 min discussion)

ca 10:30-10:50 Coffee break

5. Section 7 Rivers/running water mesocosms (Jay, 15 min + 10 min discussion)
6. Section 8 Benthic/Benthic-pelagic estuaries tidal (Hartvig Christie and Martin Wahl, 15 min + 10 min discussion)
7. Section 9 Land based (ex-situ) Pelagic and pelagic/benthic mesocosms (Johan Wikner, 15 min + 10 min discussion)
8. Section 10 Pelagic in situ mesocosms (Ulf Riebesell, 15 min + 10 min discussion)

12:20 - 13:20 Lunch

- 9 Section 11 Sampling and measurements (including close refs to SOPs, Robert Ptacnik, Behzad Mostajir, Lisette de Senerpont Domis, Meryem Beklioğlu, Christian Preiler (15mins + 10 discussion)
- 10 Section 12 Challenges, opportunities, and lessons learned (Jens Nejstgaard, 10 min+ discussion)



11. Section 13 Future perspectives, Conclusions and Recommendations (Jens Nejstgaard, 10 min + discussion)

15:20 - 15:40 coffee break

12. Overall discussion of missing themes, themes that can be changed. Info-Boxes (like springer-infographics) general harmonisation between sections, new suggestions, co-authorship suggestions, etc., 2 h)
13. Presentation, Discussion and Selection of publication form, publicer and collaborative funding (Jens, 30 min)

19:00 Joint dinner at restaurant Längengrad

Thu 20 Sep AQUACOSM SOP's (Task 2.2).

09:00 – 12:00 Present status and work needed to finalize the AQUACOSM SOPs (session led by Meryem Beklioğlu and Lisette de Senerpont Domis).

1. Present status of the AQUACOSM SOPs
2. Quick overview of need and expertise in the group for specific SOPs, followed by Division into SOP temporary working groups-
3. SOP temporary working groups- discuss and determine further specific tasks (authoring), including (reviewing and?) harmonisation with existing non-AQUACOSM SOP-initiatives.

12:00 - 13:00 Lunch

4. SOPs continued - Time for continued /or new Work groups-as needed
5. Wrap up SOP and Bookwriting, summary and task list/deadlines

15:30 - 16:00 coffee break –Possible to leave for persons not in the editorial group

16:00-17:00 Editorial Group meeting: Summary and discussions of the next activities, meeting schedule and responsibilities

Dinner

Fri 21 Sep.

Departures



The attendance list is attached to this deliverable as appendix 1.

2.2 Summary report

2.2.1 Day 1- Science Strategy

The science strategy is connected to Task 2.2, which addresses the need to **harmonise and integrate** the mesocosms in order to address key scientific questions or specific societal needs related to climate change, contaminants and ecosystem disturbances in Europe.

The Science Strategy meeting started with a short presentation of the ESFRI roadmap published recently. We decided to focus on the landscape analysis aspect of the roadmap. Specifically, where does **AQUACOSM** fit in the “connected RI ecosystem”, what are the connections, and next steps?

The role of the AQUACOSM RI in the European RI-landscape was defined to be the specific and unique focus on ecosystem-scale experimental studies spanning all types of aquatic systems as the core activity, as opposed to e.g., the collection and curation of time series and big data, which is a prominent feature in other environmental infrastructures.

Currently there is a recognised need for long-term observations. The role of mesocosm experimentation is less recognised, even though with mesocosm experiments we are able to address a wide range of essential research objectives outlined by the EU and other funding bodies (e.g. acidification, warming, multiple stressors, ecotoxicology etc.). More specifically, the experimental approach allows us to test scenarios of future environmental change in aquatic systems before they are manifested, whereas time series data can only look back in time. Mesocosms are a technology-driven infrastructure, and it was pointed out that we should highlight the capacity of mesocosm experimentation to unveil processes and ecosystem properties that cannot be discovered by direct observations. Food web interactions are a good example of this, as most observational data depends on snapshots, and the presence of many confounding factors, affect the interactions observed.

It was also concluded that the AQUACOSM community should enhance its interactions with other European environmental RI networks. We agreed that it would be very constructive to invest in knowledge building and collaboration between infrastructures, and RI projects like LTER, JERICO and ICOS were mentioned as infrastructures AQUACOSM should collaborate with. The specific advantage of this is to create domain-specific alliances leading to larger collaborations and the transition from aquatic research to an alignment with observational RIs. The concept of joint-supersites was also discussed in this context. Timo Tamminen (SYKE) and Dominique Durand (UNI) agreed to facilitate the communication between the neighbouring RI consortia.

Through WP2 and WP3, AQUACOSM can develop mechanisms of how to proceed in science strategy and what dimensions we need to be focusing on.

As part of optimising interactions with AQUACOSM components, there were also presentations on the Joint Research Activities of the project (WPs 7 8 and 9). This consisted of updates on the JRAs as these activities are important for science strategy, since they represent very good case studies of how large coordinated joint efforts function.

In a similar fashion the TA component for the project is an important component for science strategy since the experiments proposed by users give a feeling for what kind of research the community is interested in doing outside the AQUACOSM consortium. It was suggested to do a more detailed analysis of the recurring research themes that come up in applications in this and the coming years.



2.2.2 Days 2 & 3 Best practices

During the Best practices workshop we had agreed to set aside some time to discuss the consortium best practices advice for AQUATIC research. This is part of task 3.4 but it transpired during the first workshop that one of the optimal ways to address best practices and optimisation of mesocosm approaches is to actually start compiling the best practices or recommendations for those wishing to embark on, or already engaging in mesocosm experimentation. Although the consortium gathers a large range of expertise on mesocosm experimentation in aquatic systems in different longitudes and latitudes it is a challenge to overcome the idiosyncratic nature of each facility.

Creating common guidelines and recommendations is an integral part of overcoming the aforementioned issues. In the description of work, workshop 2 was meant to address goal 3 of task 1, namely broadening the research scope and disciplinary spectrum of mesocosm experimentation. As mentioned during the first workshop it became apparent that the research scope and disciplinary spectrum is not well enough defined but fortunately there is a number of tasks in WP2, 3 and 4 addressing this. The workshop was supposed to comprise a broad spectrum of expertise, which is now being incorporated in the best practices advice, as experts on the respective topics are being recruited to contribute. In this workshop, again, experts and users outside the consortium were present to give their opinion and advice about the planned work. In this workshop Jeremy Piggott (Trinity college Dublin and Jose Gonzalez from the university of Vigo had that role.

During the course of the workshop each section leader presented their plans for their respective sections, listing contributors, both confirmed and unconfirmed and committed to a time plan for completing the next steps.

Those presenting were as follows:

Section 4 Modelling considerations- S. Våge (UiB)

Section 5 Statistical design, replication and randomization- L. de Senerport Domis (NIOO/KNAW) & R. Ptacnic (WCL)

Section 6 Data handling L. de Senerport Domis (NIOO/KNAW)

Section 7 Rivers- J. Piggott (Trinity College, Dublin)

Section 8- Benthic/ Benthopelagic estuaries H. Cristie (NIVA), M Wahl (GEOMAR)

Section 9. Land based systems J. Wikner (UMU)

Section 10 Pelagic in situ mesocosm U. Riebesell (GEOMAR)

Section 11 Sampling and measurements M. Beklioglu (METU)

Section 5 was not presented per se since those who had initially taken the lead for this (A. Underwood and P. Peres-Neto) were not present at the workshop neither sent their contributions. Since their contribution remained unconfirmed for a long time they were replaced by L. de Senerpont Domis (NIOO/KNAW) and R. Ptacnic (WCL) who volunteered to take charge of this. T. Davidson (AU) and M. Araujo (UE) also volunteered to help.

During the presentations the structure was discussed. Whether the conceptual and experimental design should precede all other chapters, whether there should be extra purely technical sections, and how scaling issues should be addressed, were all aspects brought up.

The suggestion was to have the definition and scaling issues as separate sections and that some sections such as the technical info should be focused on online versions since they will likely need to be updated often.

It also became apparent from the presentations that some aspects probably can/should be combined. In order for the work to progress, the participants agreed to keep the structure as is for now and let the editorial board decide at a later stage about moving sections. A recurring topic was to also include the concept of “success through failure”, where contributors are encouraged to share incidents where experimentation did not go as planned.

The SOPs were also discussed in the context of best practices, as they will be a component of the advice produced. This WP4 activity is developing in collaboration with WP3, the SOPs have been a component of the WP3 workshops, and the relevance to task 3.4 is high. After an update of the status of SOPs the meeting participants gathered in small groups to discuss how to further develop the proposed SOPs. While the breakout groups were discussing the Editorial group also had a meeting.

2.2.3 Conclusions

Eventually the ambition of the two workshops of WP3 was to reinforce a network of leading experts, produce recommendations and checklists for existing approaches and infrastructures, develop guidelines on best practices and contribute to the roadmap towards future mesocosm technologies.

Through the workshops, there was continuous close collaboration between WPs 2, 3 and 4. Both workshops advanced joint work of WP2 and 3 (they were joint), as well as important aspects of sharing and standardization (WP4).

The workshop fostered the collaboration between partners and WPs towards creating recommendations for best practices in mesocosm experimentation. We made progress and were updated on a number of tasks and WPs in the project, ensuring our continuing communication and streamlining in reinforcing our network of leading experts.

Thus, the development of guidelines for best practices is progressing as planned, with set deadlines and next steps. The discussions of the workshop will be used towards preparing the roadmap on future mesocosm technologies (2.5), as planned. Through the meeting our common goals were reiterated and better defined. In order to obtain more input on this from each partner a questionnaire is scheduled to be distributed by WP2. Each partner is encouraged to consider how their activities feed into the science strategy of the project.

As imminent next steps we discussed that all lead authors shall continue the communication with potential contributors and continue the writing process. This topic will be discussed again at the next AQUACOSM general assembly on Evora, Portugal in spring 2019. A first draft of the manual should be ready in late spring 2019.





Figure 2. Meeting participants in Kiel Harbour.



3. Dissemination activities related with the Deliverable

The event was tweeted and a facebook post was written during the event. Both included pictures of the proceedings and were retweeted and shared by users of both platforms.



4. Appendix

Appendix 1: Attendance list

Miguel Araujo	mba@uevora.pt
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