

Setting the stage for mussel research in the north Atlantic region

Blue mussels are keystone species with a corresponding high value for biodiversity. Mussels also contribute with other valuable ecosystems services, including supportive, provisional, regulatory, and cultural services. Over the past years, blue mussel (*Mytilus edulis*) beds in Europe and North America have been reported to be in regression, yet the causes and consequences of this decline are not fully understood. Further, as the current mussel culture industry is dependent upon collection of wild spat, sustainable management of wild blue mussel beds is essential to sustain the mussel aquaculture industry, yet there is a lack of knowledge related to the dependencies and interactions between wild and farmed mussels.

To address these challenges and the lack of knowledge, the North Atlantic European Mussel Organization (NAEMO) was formed in 2018, and the first NAEMO meeting was held in Corran Halls, Oban, October 30th 2019, as a back-to-back session to the 2019 ASSG conference. The workshop was supported by the ASSG to cover the costs associated to hosting the workshop. The focus of the workshop was “Setting the stage for mussel research in the north Atlantic region”. The workshop was attended by 44 participants from 9 countries. Different aspects of blue mussel research were presented (i.e. mussel population status in different geographical regions, factors affecting population development, recruitment processes, and the value of mussel beds). Later, knowledge gaps related to management of blue mussels were identified by break-out groups with a subsequent plenary discussion to summarize the outcomes, followed by a more formal discussion about the specific objectives for NAEMO and how to proceed with the network.

Some of the practical outcomes from the workshop included recognition of the need for a formal mussel network and to achieve greater momentum by creating a structure for co-ordination and to identify funding options. It was decided that the scope of the network should be broadened to *Mytilus* spp. and that the North Atlantic region will persist as the main geographical focus area. The network should strive to be inclusive – all stakeholders (research, industry, governance, NGO) that see a value with the network activities are welcome. Clustering with other ongoing activities, e.g. workshops, conferences, and projects, was identified as a key component for the success of the network. There was also an expressed ambition to develop NAEMO as a networking and data-sharing platform and to develop a service directory for connecting players within the field. Other specific tasks identified as suitable for the network were to use the network for developing expert consensus opinions, and to use this as a basis for communication to facilitate governance and knowledge transfer to society.

The main knowledge gaps related to management of mussels were identified as population trends and threat analysis (Figure 1). More specifically, it was agreed that the first step towards establishing more efficient management strategies of mussels is to establish evidence of decline. As a first activity, long-term trends based on existing datasets subdivided into different habitats will be compiled and analysed. However, in many areas long-term monitoring programs of both wild and farmed mussel populations is lacking. Standardized monitoring across the north Atlantic region with a management focus was therefore identified as an area in need of development. The second step towards improving management was identified as a lack of knowledge related to causes of decline, including evaluation of recruitment processes (i.e. quantification of larval abundances in different areas and differences in recruitment between habitats), with the objective to connect this to a risk assessment and gap analysis based on a literature review to identify existing threats. It was acknowledged that the effects of abiotic conditions on mussel recruitment is an area

where more research is needed, and that the effects of the most pronounced threats (substrate destruction, commercial exploitation) can easily mask underlying causes of decline. These may potentially be disentangled by comparison of “high pressure areas” with reference areas where the major threats are less pronounced. The third step towards improved management of mussels was identified as a need to improve general knowledge of mussels and their value to society by communicating to user groups the ecosystem services provided by mussels. Special emphasis was put on providing a holistic perspective where services from wild populations to aquaculture, and from aquaculture to wild populations, was highlighted in order to enhance sustainability of all mussel-related activities (Figure 2).

All of these aspects are now being processed further by the steering committee in an effort to initiate some practical activities, starting with 1) Production of a short publication based on the workshop outcomes; 2) Obtaining funding to formalize the network; and 3) Collating time-series data to elucidate evidence of decline.

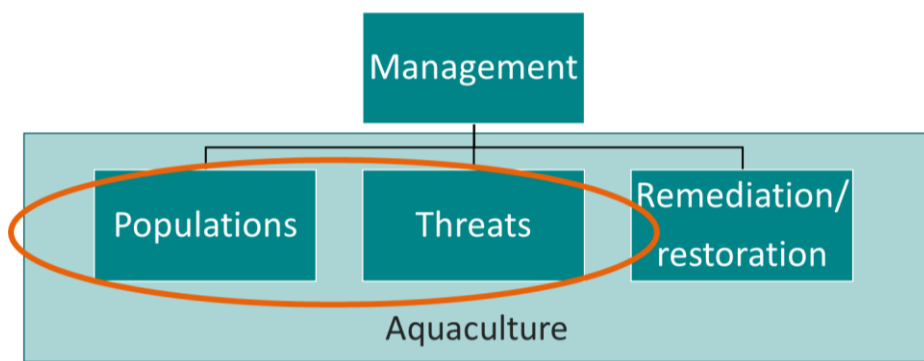


Figure 1. A conceptual model describing the aspects required for successful management of mussel populations. The circle highlights the topics of highest priority based on the workshop discussions.

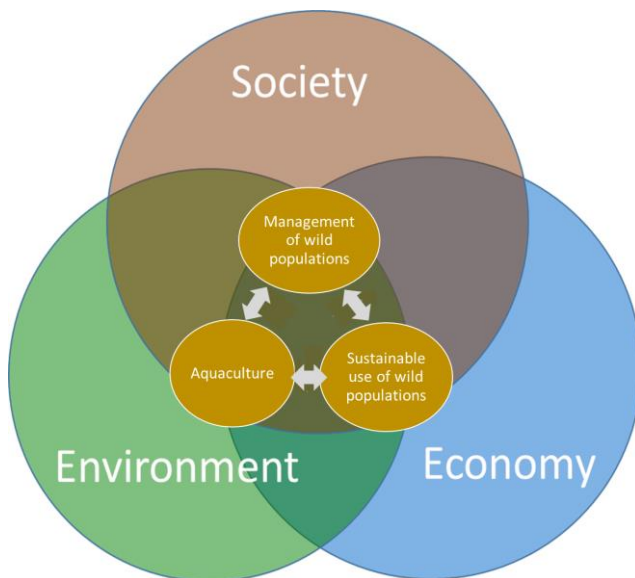


Figure 2. A holistic approach is needed to realize fully the interdependencies between management, sustainable use, and aquaculture of wild mussels within the framework of sustainability.