Public report

Monitoring the well-being of arctic marine animals throughout the year is challenging due to the harsh environmental conditions scientist must face especially during the winter at such remote locations. Traditional monitoring systems requires human involvement in sampling and performing expensive chemical analysis regularly, gaining only partial understanding of the processes. Our approach however, consist in attaching micro-sensors (electrodes) on live bivalves and deploying them in the field. By gluing electrodes on each of the species' valves, the distance between valves is measured continuously in real-time, remotely and online. The species' gaping behavior (closing and opening of the valves) is thus characterized, providing information about the species health and growth.

By recording the daily growth and gapping behavior of the Icelandic scallop *Chlamys islandica* and blue mussel *Mytilus edulis*, (Figure 1) in Svalbard, we are studying the effects of climate and environment upon the growth and behavior of the species. While Icelandic scallops are commonly found in Svalbard waters, the blue mussel is a species that it is re-colonizing the archipelago. The gaping behavior can be consulted online (http://molluscan-eye.epoc.u-bordeaux1.fr/index.php?rubrique=enregistrement&lang=en&site=NYALESUND)

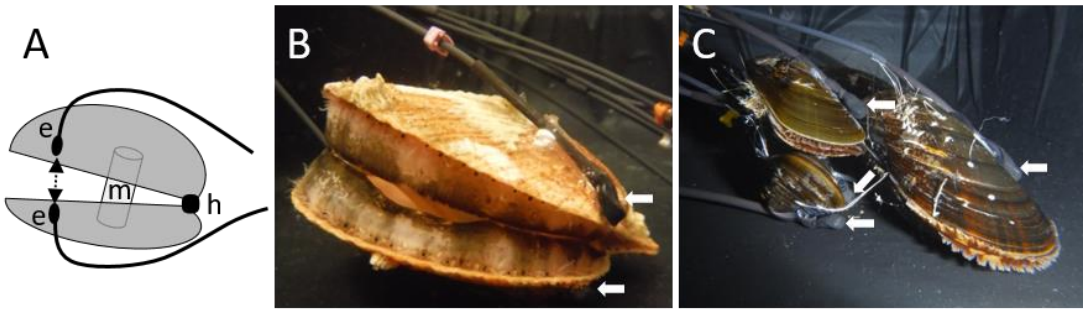

Figure 1. Schematic representation of the High frequency non-invasive electrodes glued to a bivalve (A) showing the position of the electrodes (e), the muscle (m) and the hinge (h). The Icelandic scallop *Chlamys islandica* (B) and blue mussels *Mytilus edulis* (C) are the species for which the biosensor has been employed in Svalbard. Figure taken from Andrade et al. 2016.

Our project has generated some very interesting outcomes. It has challenged the prevailing paradigm that the polar night is a period of little biological activity. Results have shown that scallops in Ny-Ålesund are active during the polar night, and that they continue to grow despite the relative lack of light. The daily growth and gaping behavior data obtained since the first deployment (2012) is still been expanded until today (January 2018). Our findings have been published in renowned scientific

journals as seen in the reference list. The results achieved until now allowed us to understand how gaping behavior of the species changes due to the prevailing environmental conditions in the Arctic, especially with regards to the light cycles (polar day/polar night). Future plans involve using this system to detect the presence of toxic algae in the water which are becoming more prominent in Arctic waters as a direct consequence of climate change.

Reference list

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