Impact of microbe-Jellyfish associations on the Carbon and NItrogen Cycles in coastal marine Ecosystems (JuICE)

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Project Summary

In recent years, populations of jellyfish have increased in number at the expense of their main competitor – fish - in a number of ocean regions. Overfishing and deteriorating coastal water quality are among the main causes for their rise, with a regime shift from a fish to a jellyfish-dominated ocean appearing as a plausible scenario. Jellyfish often display "boom and bust" dynamics, unexpectedly exploding in number to then die *en masse* and sink to the bottom. They are voracious animals, grow fast, have N-rich tissues, and produce large amounts of mucus, which can fuel associated microbial communities. These characteristics suggest that jellyfish may have a relevant impact on the ecosystem biogeochemistry through microbial-driven cycling of carbon (C) and nitrogen (N) in the water column. When they sink en masse or deposit in low O_2 environments, jellyfish carcasses tend to build up at the seafloor, and can rapidly alter benthic biogeochemical cycling.

This project intends to study the impact of jellyfish and their associated microbiome on C and N cycling both in the water column, and upon death after their settlement on the seafloor. Through a combination of field surveys and incubation experiments, using complementary methods such as high-throughput sequencing and stable isotope probing, we will uncover the taxonomic and functional diversity of the microbiome of living and dead jellyfish and the contribution of microbe-jellyfish associations to biogeochemical fluxes of C and N both in the water column and at the benthos. Statistical analyses and budgeting methods will allow quantifying the contribution of jellyfish to biogeochemical cycling during blooms. The proposed research will be facilitated by complementary expertise of participants from the SZN and international collaborators (Heriot-Watt University, UK).

The project is relevant and urgently needed, because: i) it will improve our understanding of the role of microbe-jellyfish associations in biogeochemical cycling and ecosystem functioning, and ii) it will help constraining the fluxes of energy and matter cycling in coastal ecosystems exposed to an ever increasing frequency of jellyfish blooms.