Effects of nutrient enrichment and top-predator size structure on energy flux in a marine benthic community

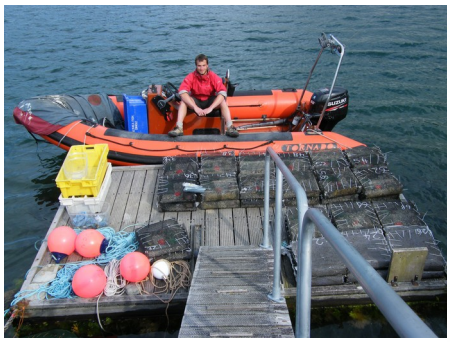
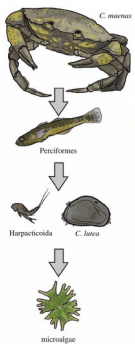
We offer a **Master's project** assessing energy flux through a marine benthic community based on an experiment combining a fertilizer treatment with a top-predator size structure treatment which was done at Lough Hyne marine reserve in 2011 (Jochum et al., 2012).

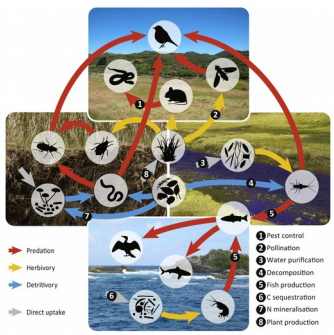
Background:
Climate change impacts ecosystems across the globe (Parmesan & Yohe, 2003) with changes in nutrient availability and animal body-size structure triggering effects in ecological communities. In 2011, we set up an in-situ mesocosm experiment in the shallow subtidal of Lough Hyne marine reserve, Co. Cork, Ireland, a well-studied marine "lake" ecosystem, to investigate the joint impact of these two stressors on the benthic ecosystem (Jochum et al., 2012). We found the treatments to have significant effects on the communities by reducing average body mass (both), increasing species richness and abundance (nutrient treatment) and decreasing community biomass (top predator treatment). Furthermore, altered top-predator body mass structure had cascading effects on the overall community, a phenomenon which we described as an "allometrically-induced trophic cascade" as opposed to the traditional trophic cascade which is usually based on the presence / absence of a species.

Thesis project:
Based on the data from the 2011 experiment, the goal is to a) calculate energy flux through the food web based on an aggregated trophic network and b) use an SEM approach to assess the mechanisms through which the two experimental treatments alter energy flux through the community.
Depending on the abilities and interests of the student, the exact topic can be further discussed.

What we offer and what we expect:
We offer research training and education in a diverse, welcoming and motivated team, supervision by experienced and highly motivated researchers at a unique research centre and the possibility to work on exciting questions with state-of-the art ecological and statistical methods.
We expect students to be interested in climate-change impacts on ecosystems, biodiversity and ecosystem functioning. The ability and willingness to work in a team are absolutely necessary. For this project, skills in the statistical software R as well as an interest in food webs and energy-flux calculation are required.

Contact:
The thesis project will be co-supervised by **Dr. Malte Jochum** (malte.jochum@idiv.de) and **Prof. Dr. Nico Eisenhauer** (nico.eisenhauer@idiv.de). Please get in touch if you are interested to further discuss the options.



References:
Jochum, M., Schneider, F.D., Crowe, T.P., Brose, U. & O'Gorman, E.J. (2012) Climate-induced changes in bottom-up and top-down processes independently alter a marine ecosystem. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 367, 2962–2970.
Parmesan, C. & Yohe, G. (2003) A globally coherent fingerprint of climate change impacts across natural systems. *Nature*, 421, 37–42.
Barnes, A.D., Jochum, M., Lefcheck, J.S., Eisenhauer, N., Scherber, C., O'Connor, M.I., de Ruiter, P. & Brose, U. (2018) Energy Flux: The Link between Multitrophic Biodiversity and Ecosystem Functioning. *Trends in Ecology & Evolution*, 33, 186–197.