

The overall decline of shallow and deep-sea reefs in response to anthropogenic aspects receives much attention, but the understanding of ecological processes that shaped coral reefs in the first place, and how such processes change with shifting reef stable states have not met similar attention. Consequently, changing patterns in reef community composition have been well described, but processes shaping these patterns, including sponges as (so far largely neglected) key ecosystem engineers remain poorly understood. These processes are at the base of management tools, conservation strategies and sustainable use of reef resources. Therefore we offer: 3 PhD positions in sponge biology / coral reef ecology at the University of Amsterdam – Faculty of Science – Institute for Biodiversity and Ecosystem Dynamics.

Project description

EU ERC Starting Grant: SPONGE ENGINE — Fast and efficient sponge engines drive and modulate the food web of reef ecosystems:

Coral reefs are iconic examples of biological hotspots, highly appreciated because of their ecosystem services. Yet, they are threatened by human impact and climate change, highlighting the need to develop tools and strategies to curtail changes in these ecosystems. Remarkably, ever since Darwin's descriptions of coral reefs, it has been a mystery how one of Earth's most productive and diverse ecosystems thrives in oligotrophic seas, as an oasis in a marine desert. Our team recently discovered the 'sponge loop' pathway (De Goeij et al. Science 2013) that efficiently retains and transfers energy and nutrients on the reef. We recognized sponges as potential (and so far neglected) key ecosystem drivers, and accumulated evidence on sponge loops in other ecosystems, such as deep-sea coral reefs. As a result, current reef food web models, lacking sponge-driven resource cycling, are incomplete and need to be redeveloped. However, mechanisms that determine the capacity of sponge 'engines', how they are fuelled, and drive communities are unknown.

The aim of this ERC project is to systematically establish the novel reef food web framework, integrating sponges as key ecosystem drivers. To this end, sponges will be evaluated on functional traits (morphology, associated microbes, pumping rate) in the processing of dissolved food, the main fuel of the engine. At the community level, we will assess to what extent these different traits are a driving force in structuring reef ecosystems, from fuel input (primary producers) to engine output (driving and modulating the consumer food web). This framework derived from a Caribbean reef ecosystem will then be implemented in a sponge-driven food web model, a much-needed foundation to test and predict future scenarios of changes in reef communities. Ultimately, we will test and generalize the novel food web framework at a tropical Indo-Pacific, a temperate Mediterranean, and a cold-water North-Atlantic reef.

We are looking for 3 excellent PhD-candidates to join our team:

PhD-project 1: Sponge functional traits determining processing of dissolved organic matter (DOM). The candidate will study the physiology and functional traits of different sponge types (high- versus low abundances of associated microbes; massive versus encrusting growth forms; high versus low pumping rate) in the uptake and assimilation of different sources of DOM (coral- versus algal-derived) through the combination of physiological field and laboratory experiments. Additional molecular techniques will be applied to identify the composition of the associated microbial community involved in DOM-processing using next generation high throughput sequencing and stable isotope probing (SIP).

PhD-project 2: Early metazoan eukaryote-prokaryote symbiotic relations: DOM processing by sponge cells and associated microbes. The candidate will study the contribution of associated/symbiotic microbes in the processing of different (coral- and algal-derived) sources of DOM by the sponge holobiont. Moreover, the candidate will identify potential metabolic exchanges between the sponge host and its symbionts. Therefore three different stable isotope tracer approaches will be conducted in both laboratory and field based experiments: sponge/microbial cell separation, compound-specific fatty acid biomarkers and state-of-the-art NanoSIMS technology.

PhD-project 3: Sponge communities drive reef communities from source to sink. The candidate will conduct extensive field surveys and in situ experiments to determine the carbon and nitrogen cycling of different

communities of sponges (massive, encrusting and excavating) and relate these fluxes to algal and coral communities that fuel the different types of sponge engines. The candidate will also determine whether sponge communities increase productivity and diversity of local pelagic and benthic micro-faunal communities.

The successful candidates will be based at IBED in Amsterdam, yet all three PhD-projects include significant periods of field work (at least 3 months yearly) foremost on Curaçao. Moreover, the candidate for PhD-project 1 will further spent up to 9 months at the San Diego State University (in collaboration with Dr. Forest Rohwer and Dr. Linda Wegley-Kelly) for training and analysis. All PhD-candidates will closely work together for the larger part of the project (fieldwork periods will be timed accordingly), but each PhD can and will independently conduct and finalize their own project.

Requirements

The PhD candidate must have:

- MSc in Marine Sciences (all candidates) and sufficient knowledge in molecular biology (PhD-project 1), cell- and microbiology (PhD-projects 1 and 2), or marine ecology (PhD-project 3);
- proven skills in scientific writing (either excellent Master-thesis (in English) or published paper in peer-reviewed scientific journal).
- experience with laboratory and/or field experiments (including data analysis), preferably with sponges, corals, algae or microbes;
- interest to combine theory with laboratory and field studies;
- proven skills in molecular techniques and bioinformatics (high-throughput sequencing) (PhD-project 1 only);
- ability to work on a multidisciplinary topic in a multidisciplinary research team;
- SCUBA diving certification is mandatory for PhD-project 3 and highly recommended for PhD-projects 1/2;
- driving license.

Further information

Dr. ir. Jasper de Goeij (j.m.degoeij@uva.nl). Website:
<http://www.uva.nl/over-de-uva/organisatie/medewerkers/content/g/o/j.m.degoeij/j.m.degoeij.html>

Appointment

The positions will start preferably 1 June 2017. The full-time appointment will be on a temporary basis for a maximum period of 4 years. Initial appointment will be for a period of 18 months and after satisfactory evaluation it will be extended for a total duration of 4 years. The full-time gross monthly salary will range from € 2,191 in the first year to € 2,801 in the final year, according to the Dutch salary scales for PhD candidates. The Collective Labour Agreement for Dutch Universities is applicable. The annual salary will be increased by 8% holiday allowance and 8.3% end-of-year bonus.

Job application

Applications should include a detailed CV, a motivation letter, and two reference letters (including referent contact details from which information about the candidate can be obtained) and should be sent ultimately at 31 March 2017 to:

application-science@uva.nl

Please quote vacancy number 17-076 in the subject field. Interviews are aimed to be held in the 3rd and 4th week of April 2017.

Note: If you apply for more than 1 position, please do not send multiple applications, but clearly explain in your motivation letter which of these positions would fit you best and why.