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Brief report: KB-24-002-039. Do sun care products increase the vulnerability of coral reefs to global warming by lowering thermal bleaching threshold levels?

Authors: Dr. Diana Slijkerman, Dr. Tim Wijgerde

Introduction and aim: Coral bleaching due to global warming is currently the largest threat to tropical coral reefs (Hughes et al., 2017¹). Mass bleaching has devastating effects on coral reefs and their ecosystem services, which include coastal protection, fisheries and tourism. Recent studies show a specific sensitivity of corals for compounds present in sun care products such as UV filters. Pollution with sun care products might act synergistically with global warming, affecting coral bleaching threshold levels. The aim of this study was to explore potential synergistic interactions between climate change and water pollution by the UV filter Oxybenzone.

Data will be presented in a peer reviewed article, and are, therefore, not published in a report. In summary, the **following work** plan was executed:

- The experimental work was performed twice in climate controlled facilities of Carus, the facility for experimental animal research in Wageningen. Marine Animal Ecology (ASG) coordinated the experimental work, supervising in total 4 students.
- Main activities included experimental exposure studies, following a factorial design to study the effects of temperature, water quality (UV filter oxybenzone at a field relevant level of 1 µg L⁻¹) and their interaction. In total 3 coral species were used and species dependent sensitivity could thus also be explored
- Endpoints reported:
 - o To monitor induced stress: PSII quantum yield by Pulse Amplitude Modulation (PAM) fluorometry; Mortality rate, Growth rate, Zooxanthella density

- DNA profile of the bacterial genome (possibly responsible for playing a key role in the observed alterations)
- Time lapse video of polyp health illustrating induced bleaching was not possible, photo recording on a weekly basis was done instead.

Results

The experiments were successfully concluded. Results on the actual responses within the experiment are not shared yet. When reported and published, results can be used in the debate on whether or not to continue a ban on specific compounds and products. Furthermore, the experimental set up was optimised, and as such provides a blueprint for testing effects of various stressors on coral reefs. The collaboration between MAE and WMR was strengthened. WMR chemical lab successfully attributed with the recently developed protocol to analyse oxybenzone levels.

Involvement other stakeholders

WWF: Preliminary results were shared with WWF in order to promote ongoing work on Bonaire, and to discuss follow up studies. WWF is very interested in discussing upcoming work and to disseminate the results to the larger public.

EU-COST Scientific collaboration is strengthened via a COST Action Proposal: OC-2018-2-23267 "Environmental implications of sunscreens on the Mediterranean Sea" submitted to the COST Open Call OC-2018-2. Tovar Sanchez is coordinator, and the team attributed to the text.

The NCV (Nederlandse Cosmetica Vereniging) is the association of manufacturers and importers of cosmetics (products for personal care). WMR and MAE met with the director and science coordinator of NCV, discussing the topic in the coral lab in Wageningen, exploring mutual questions. For 2019, Diana Slijkerman is invited to give a keynote on the yearly meeting of NCV.

Dissemination

- Letter report to EZ (this report)
- Peer reviewed article. Data analysis is due in January 2019. Publication strategy is to be discussed accordingly.
- Demonstration of lab work via blog/vlog (student project), is presented on <https://www.youtube.com/watch?v=mQ9xgng5f1Y>
- Contribution to Sunscreen seminar on Bonaire (coupled with other assignments, see <http://edepot.wur.nl/446117>)

To conclude: Experiments were successfully executed, strengthened collaboration and increased communication with stakeholders. Results will be presented after acceptance of the peer reviewed manuscript.

Project details

Project number: 4318300060

Project leader: Diana Slijkerman

Team members: Tim Wijgerde, Ronald Osinga, Christiaan Kwadijk, Jochem van Herwaarden, Mike van Ballegooijen, Sam Plaatsman, Anna Haider Rubio.

This letter report is reviewed by a colleague, and a member of the management team of Wageningen Marine Research.

Verantwoording

Projectnummer: 4318300060

Dit rapport is met grote zorgvuldigheid tot stand gekomen. De wetenschappelijke kwaliteit is intern getoetst door een collega-onderzoeker en het betreffende, verantwoordelijk MT-lid/director van Wageningen Marine Research.

Akkoord: Dr. Klaas Kaag
Sr. researcher

Handtekening:



Datum: 8 januari 2019

Akkoord: Drs. Jakob Asjes
Manager Integratie

Handtekening:



Datum: 8 januari 2019