Berichte aus der Biologie

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Benthic-Pelagic Coupling in Coral Reefs: Interaction between Framework Cavities and Reef Water

Shaker Verlag
Aachen 2005

Bibliographic information published by Die Deutsche Bibliothek
Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the internet at http://dnb.ddb.de.

Zugl.: Universiteit van Amsterdam, Diss., 2005

Printed in Germany.

ISBN 3-8322-4325-9
ISSN 0945-0688

Shaker Verlag GmbH • P.O. BOX 101818 • D-52018 Aachen
Phone: 0049/2407/9596-0 • Telefax: 0049/2407/9596-9
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Summary

In this thesis, I took a closer look to the trophodynamics and habitat of a major and understudied component of the sessile benthic suspension feeders: the cryptofauna.

Benthic suspension feeders in cavities do not directly compete with corals for space, but supply the reef with extra inorganic nutrients after consuming primarily ocean-derived pico-and nanoplankton. The overall pattern appears to be that the strongest removal of bacteria on coral reefs takes place in cavities.

I studied the diversity, cover and composition of cryptofaunal communities in relation to the physical characteristics of cavities along the coast of Curaçao (Netherlands Antilles) and assessed the role of cavity biota in the benthic-pelagic coupling. I found that cavities, the virtually inaccessible undersides of overhanging corals and passages within the recent and sub-recent reef framework, form the largest habitat on coral reefs in terms of hard substratum per projected reef area. This hard substratum surface area is for more than 95% covered with sessile cryptic organisms. The cryptic reef fauna is highly diverse and includes suspension feeders such as polychaetes, bryozoans, tunicates, bivalves and sponges. I assessed the role of these cryptic communities as consumers of the abundant bacterioplankton, flowing over the reef, and their role as mineralizing agents of organic matter. My hypothesis is that suspension feeding by cryptic communities accounts for the widespread, but unexplained, observations of strong gradients in concentrations of pico- and nanoplankton over reefs. The cryptic suspension- feeding fauna potentially forms a quantitatively important sink of microorganisms and an important link in reef trophodynamics. The influx of ocean-derived nutrition to be used by coral reef biota may contribute to explaining Darwin's paradox: a biologically diverse and extremely productive ecosystem surrounded by oligotrophic waters.