

WAMSI Top-up Scholarship

PROGRESS REPORT FROM SUPERVISOR

STUDENT:	Janja Ceh	DATE:	NOVEMBER 2009
SUPERVISOR:	Mike van Keulen David Bourne (AIMS)		

PROJECT TITLE:	Microbial communities associated with reef-building corals of Ningaloo Reef in Western Australia
NODE LEADER:	Chris Simpson
PROJECT NUMBER:	Node 3.9

Aims of the Research

This study aims to investigate the composition and structure of coral-microbial associated communities through different coral life stages and through time and space on Ningaloo Reef corals.

Coral microbiology is an emerging field, driven largely by a desire to understand, and ultimately prevent, the worldwide destruction of coral reefs. Until recently, corals have been considered a product of a mutualistic interaction between corals and zooxanthellae, disregarding the symbiotic potential of the large, diverse and sometimes specific populations of other coral-associated micro-organisms. To understand the interactions between the coral animal and the associated microbiota, it is critical to regard the coral as a holobiont, implying a dynamic relationship between all associated, symbiotic micro-organisms and corals.

Micro-organisms are the most diverse and numerous organisms associated with reef building corals. The mucus layer, skeleton and tissue of healthy corals all contain large populations of eukaryotic algae, bacteria and Archaea which confer a large variety of benefits to their coral host, including photosynthesis, nitrogen fixation, the provision of nutrients and infection prevention. Nonetheless, certain microbes can cause coral bleaching and other diseases during conditions of environmental stress.

Recently the importance of microbial-coral interactions for coral health and disease has been increasingly recognised, with studies demonstrating a conserved microbiota associated with some species potentially active in maintaining coral health. However the specificity of coral-microbial associations is still not well understood and little is known about the dynamics of coral-microbial associations over time and space.

This study investigates the dynamics of coral-associated microbial communities over a two years period, in the Ningaloo Reef system of Western Australia and specifically looks at the seasonal and coral-life-cycle related changes in diversity and community structure of microbes harboured by corals.

Coral-microbial studies have not previously been conducted in Western Australia. Considering the uniqueness of Ningaloo Reef in terms of its location on the western side of a continent and the associated unusual oceanographic regime, the data of this study will provide interesting and novel insights about the dynamics of coral-associated microbial communities in a previously unexplored coral reef system.

Progress made on the project

Janja continues to make excellent progress with her research. She is a highly motivated and creative student, eager to push her research as far as it can go. She has made excellent linkages with other researchers and these new links have enabled her to develop her research further. Janja has been able to present her work at an international forum in Sweden and is working towards writing up papers from her PhD research (one submitted last week). She is about to depart for Townsville to complete the field studies phase of her project, with follow-up laboratory work expected to be complete by the middle of 2010. I am very satisfied with her progress.

Major risk issues

None to report.

Research Student Annual Progress Report 2009

Thesis Title: Microbial communities associated with reef-building corals of Ningaloo Reef in Western Australia

What's done

The findings of the 2008 year round study on coral-associated microbes on Ningaloo Reef corals have been presented at the FEMS (Federation of European Microbiological Societies) meeting in June 2009. The paper 'Dynamics of coral-associated bacterial communities on Ningaloo Reef, Western Australia' will be submitted to the ISME journal early next week. A second manuscript is in progress.

All 16S rRNA gene sequences have been submitted to the GenBank and will be openly accessible from the day of publication. Field work has been carried out in March and April 2009 in Coral Bay, these samples were used to establish and learn microscopy methods (SEM, TEM, confocal/fluorescence, SIMS, etc.) at the CMCA (Centre of Microscopy, Characterisation and Analysis at the University of Western Australia) and to culture, isolate and identify coral larvae-associated bacteria.

What's to be done

Further field work is planned within the next 6 months and the visualization part of the study has commenced a few weeks ago. The research focus for the coming year will be:

1. The functional role of microbial symbionts associated with early coral life stages; brooder (*Pocillopora damicornis*) versus spawner (*Acropora tenuis*)
2. Coral larval associated microbial symbionts – species specificity or simply a matter of choice