Ningaloo

WAMSI Node 3

Understanding seasonal changes at Ningaloo Reef

Along the Western Australian coast, the Ningaloo Reef is an exceptional resource in terms of ecology, diversity and associated tourism.

In addition, the unique tropical Leeuwin Current flows along the coast towards the South Pole. The unusual circumstances of the pole-ward flowing Leeuwin Current, low rainfall and runoff result in a highly diverse reef system.

The Leeuwin Current flows year-round, but its flow is strongest in autumn and winter. There is a direct link between the strength of the current and the success of Western Australian fisheries – both vertebrate (i.e. fish) and invertebrate (i.e. rock lobster).

At the base of the oceanic food chain are microscopic single-celled plants called phytoplankton. Just like land plants, phytoplankton require nutrients and light to grow. When these conditions are met phytoplankton can thrive (commonly known as phytoplankton bloom). These plants are the direct food source of tiny invertebrates (zooplankton) that support fish species, and can also be eaten directly by invertebrates such as prawns, mussels, oysters, sponges, and possibly even the corals themselves. So phytoplankton is a key food source supporting Ningaloo Reef.

Satellite images of ocean colour commonly reflect the annual development of a phytoplankton bloom that occurs during June and July off the west coast of Australia. This research project is investigating the different mechanisms that replenish the surface waters with the nutrients, supporting this bloom.

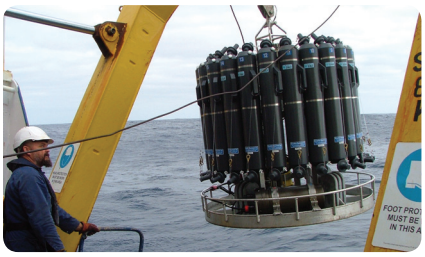
Observations and outcomes

As part of this project, it was shown that nutrients in the surface waters off Ningaloo Reef increased during autumn and winter, thus supporting more phytoplankton and possibly more reef production. This may also explain why whalesharks choose this time of the year to feed near the reef.

The results show that surface waters mix more deeply in autumn/winter which replenishes the surface waters with deep nutrient-rich waters supporting the winter phytoplankton bloom. In summer, on the other hand, most phytoplankton can be found in a thin layer at about 75 metres.

In addition, field observations show that the bloom observed during autumn 2008 was mainly represented by diatoms (very small single-cell plants). This group of phytoplankton is typically known to strongly contribute zooplankton as fish food. In summer, the phytoplankton community is more diverse and dominated by smaller phytoplankton which are suited to low nutrient levels. This means their surface to volume ratio is greater and therefore they have a larger surface to take up the surrounding nutrients. The dominance of smaller phytoplankton in summer suggests that the production of food for fish, corals, etc. may be less efficient than in winter.

Understanding the mechanisms driving the production and transport of phytoplankton in this region has enhanced the understanding of potential changes observed in the Ningaloo Reef (such as abundance



and diversity of species, and coral growth) as a result of seasonal changes and climate-driven mechanisms such as El Niño/La Niña.

We have executed the first comprehensive study of the seasonal variation of phytoplankton population and the underlying physico-chemical (such as temperature, nutrients, etc.) conditions off Ningaloo. This information is highly valuable when it comes to understanding the potential impact that seasonal changes and, on a longer timescale, climatic changes, may have on the abundance and diversity of organisms in the Ningaloo Reef. Satellite data also suggests that the phytoplankton concentration varies a lot between years. Therefore, further sampling is required to better understand the efficiency of the food chain on longer (decade) timescale.

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