

Project Update: January 2016

Background:

As the natural mechanisms to replenish populations, sexual reproduction and larval recruitment is essential for the growth, persistence and resilience of coral reefs. In Vamizi Island, the particularly high temporal synchrony of coral reproduction, across numerous species, may underlie a remarkably high resilience of these reefs to adult mortality, but the concentration of reproductive effort over a very short period may also put them at risk of losing an entire yearly cohort if disturbances occur during this sensitive window.

Here, we are investigating in depth the aspects of reproductive synchrony and its effects on seasonal rates of larval recruitment and dispersal. This is done to produce information to support the effective management of these reefs, especially in the light of the offshore natural gas industry that is developing in the area.

The project also aimed to transfer knowledge and skills to the local conservation project in the long-term monitoring of these variables in order to provide continuity to the project.

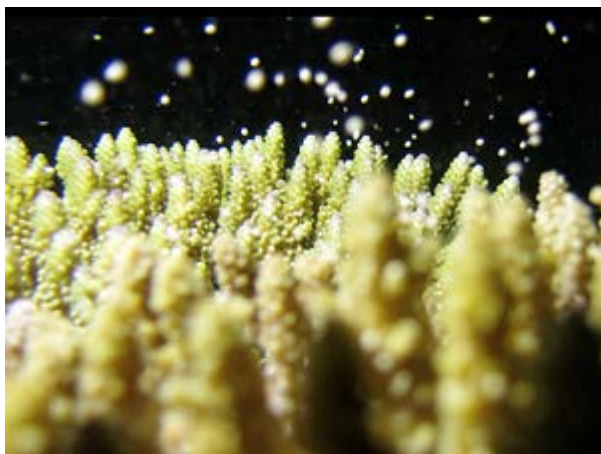


Figure 1 A coral colony spawning under the cover of darkness on the mass-spawning night. Gametes bundles of eggs and sperm float up to the surface where they will break open to give way to fertilization.

Research activities and preliminary results

Along 2015, over 80 coral colonies from six species have been monitored every 2nd month and individually for maturation of gametes, in order to identify the main breeding season and quantify the synchrony within and between species. The preliminary results show that synchrony within species can reach 100% of individuals of a single species; all maturing gametes simultaneously and spawning the same night once a year. Synchrony between species is usually around 50% of all species participating to the annual mass-spawning event. The project has also helped to increase the predictability of the events. Using systematic monitoring of gamete maturation, starting August each year, and correlating these observations with lunar cycles allowed predicting accurately the week of spawning and detecting events of 'split-spawning', i.e. year in which the spawning event is split between two consecutive months.

This high synchrony within population and assemblage seems to result in high fertilisation success, with high larval production. This was implied by the drastic increase in larval recruitment just following the mass-spawning event, as evidenced by the peak in larval settlement found on artificial plates deployed at various sites around the island during this period.

During the mass-spawning event of September 2015, the use of surface drifters to track water circulation around the island suggested that larval dispersal is probably confined to

the bay system in which the island lies (c. 20 km) rather than to long distance. This does not exclude some larvae may reach far reefs, but the bulk of the larval production is probably retained relatively close to natal reefs, i.e. the same island or adjacent ones. This local retention is certainly related to the calm sea conditions during which spawning event happen.



Figure 2 Release of surface drifter for current tracking. The home made drogue is fitted with a GPS transmitter that acquires and sends the drifter coordinates to the user at a set time interval of 10 min.

Implications of the findings for conservation and management

These finding is assisting to establish a formal monitoring plan to detect upcoming spawning event. We are now able to estimate accurately when spawning event each year.

The combine use of settlement plates and surface drifters helped consolidate the idea that larvae dispersing from Vamizi Island spawning event are more likely to benefit coral population of the island itself and the island directly adjacent ones. This supports the notion that the reproductive synchrony and spawning events are essential to the health and resilience of these reefs. It also implies management measures should focus on protecting this crucial period by avoiding potentially harmful human activities in this period. Doing so would protect the natural resilience of the reefs.

The team of the Vamizi Island Marine Research Conservation Centre is now able to conduct the field monitoring independently. The scientific manager can plan and lead the activities accordingly and the technical staff is familiar with the techniques of sample processing. While some external expertise is still required, the team may be autonomous in this aspect very soon. The final step will be to bring the information gathered to relevant authorities and key stake-holders in the community and the Industry.

Figure 3 Erwan and Wakati (conservation team) setting up a larval settlement kit before deployment.

Project achievement

- Research field trips where conducted bi-monthly throughout 2015.
- In May 2015, the project was presented to local students in the Marine Biology course at a workshop at the University of Lurio in Pemba in collaboration with our partners there.
- Three scientific articles (arising from the previous research project and this one) were published in



regional and international scientific journals end of 2015.

- Data gathered during the course of this project is under analysis and aims to yield two more publications.



Figure 4 Setting up surface drifters before deployment.