IH279 The abundance and impact of coral bioeroding invertebrates across environmental gradients, Indonesia

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The wave-resistant structure of coral reefs (framework) harbours a great variety of organisms which increases structural complexity thus enhancing biodiversity, as well as providing important protection to coastlines against natural events (e.g. storms, hurricane) and rising sea levels. The vision of healthy coral reefs related only to coral cover and macroalgae have been outclassed by a more holistic view which considers the entire system and the intimate relationship between reef organisms structure. Reef framework is substantially built by skeletons of successive generations of corals and other calcareous reef-biota thus that any modification of one of the reefal components have great consequences on the entire reef system. The high biodiversity encountered in this ecosystem is profoundly related to its architecture and structural complexity and loss of structural complexity can reduce the range of habitats and shelter available for reef-associated organisms.

The ecological role played by the reef framework in sustaining biodiversity and connectivity as well as service provision is still not clearly explored in relation to the dramatic environmental changes depicted from both climate change scenario and increasing human pressures along many tropical coastlines. Altered environmental conditions have been prove to lead to a decrease in carbonate deposition on coral reefs , producing shifts from accretive to erosive dominated reefs which are likely to result in a decline of reef biodiversity and production.

Bioerosion (erosion imputable to some reef organisms) is one of the main components in structuring coral reef framework; this process is potentially able to remove high quantity of carbonate from the reef structure. By removing carbonate substrates bioeroders have a negative influence on the carbonate budget of the reef, in particular those reef with limited growth (e.g. subjected to chronic pollution/stresses) can potentially be eroded away with negative consequences for the entire coastline system.
Bioeroder organisms can be distinguish in those able to actively remove coral substrate while feeding on the algae attached to the reef (external bioeroders) such as Parrotfish (Scaridae) and sea urchins and those able to settle into the reef structure and live corals and remove carbonate from inside the framework (internal bioeroders). Parrotfish are considered ecologically important to sustain reefs health by controlling macroalgae populations and releasing substrate for coral larvae settlement by systematically remove carbonate substrate when feeding. Quantification of the carbonate (intended as reef structure) removed by Parrotfish across environmental gradients will allow to better understand the influence that the environmental variables may have upon the erosive activity of this group. Internal erosion plays an important role in weakening coral reef structure; previous studies have showed that internal bioeroders (macroborers) activities increase in high sedimentation environments. Sedimentation appeared to influence not only rates of bioerosion but also the structure and diversity of macroborers community. Despite the relevant function played by borer organisms in structuring coral reef, their role is generally underestimated and not entirely studied when assessing coral reef health. Moreover, internal bioeroders community composition and taxonomic classification are mostly under examined in the Wakatobi area. Such classification will enable to evaluate the influence of environmental gradients on bioerosion rates and to better understand the influence of sedimentation on the overall reef carbonate structure.

By assessing Parrotfish bite rates (number of bites on dead and living corals), identify Parrotfish at species level and recording the biomass of all individuals observed along 50m transect belts will be possible to

examine the influence of this group on the coral reef structure across environmental gradients. At the same time to evaluate the impact and changes in community composition of the internal bioeroders (macrobores) across environmental gradients, a series of rubble bags, placed during summer 2011, will be collected and processed for analysis. Photos of the rubble will be taken to assess the surface area available to the borer organisms and processed using an image analysis tool; macroborers identification and densities will be assessed by using a USB microscope.
Difference in sedimentation rates across sites will be assessed through sediment traps deployed across environmental gradients.

Reading List

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