



## INDONESIA DISSERTATION/THESIS PROJECT

### IN40 The biodiversity of coral patch reefs and their conservation value

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Coral reefs are one of the most biologically diverse and productive marine ecosystems. This is often enhanced by nearby ecosystems including mangroves and seagrasses, with significant connectivity between them. Connecting these systems are transition zones often scattered with coral patch reefs also known as coral bommies. A coral bommie is an isolated coral outcrop surrounded entirely by sand or rubble. They are centres of diversity and abundance that act as a refuge for fish and invertebrate communities. Research has commonly described the distinct habitats provided by the main reef crest, near-shore seagrass beds and intervening patch reef. However, there has been little characterisation of the fish and invertebrate assemblages that inhabit the patch reef zone, despite their significant addition to the overall biodiversity of coral reef ecosystems. Hence, there are many potential questions that remain regarding the patch reef zone.

Fish are an integral component of coral reef ecosystems for the movement of energy and materials within the reef and between systems. They utilize coral patch reefs for both refuge from predators and additional food resources. Some of these fishes are resident, and remain on the patch reef throughout either their entire life span post-settlement, or may use it during a certain life-stage often as nursery habitat. Other fishes are more transient and may make diurnal or tidal migrations from the reef proper into the patch reef zone maximizing their resource use from multiple zones. Patch reefs are also thought to be stepping zones from one ecosystem to another (i.e. seagrass to coral reef). The patch reefs provide additional refuge structure for fishes minimizing their travel through expanses of sand or rubble.

Coral patch reefs also provide a fascinating opportunity to study the ecological principles underpinning island biogeography theory. Although not islands in the true sense, coral bommies provide isolated havens of shelter and resources on an otherwise barren backdrop, and so island concepts can be applied. At the most simple level, larger and more complex bommies might be expected to support a greater abundance and diversity of fish or macroinvertebrates. Some bommies will also be more isolated than others, measured as the distance to their nearest neighbour bommie, and increased isolation could be expected to lead to lower associated diversity and abundance. Similarly, the primary source of biodiversity locals will be the main coral reef, and the distance from this population pool could also influence the communities found on a bommie.

Projects can focus on the ecological drivers effecting the species diversity and abundance on different bommies, for example the benthic community structure and structural complexity. Characteristics of individual coral bommies including size, habitat complexity, benthic composition, and their distance from reef crest can also be incorporated into project design. The idea of a coral bommies as "stepping stones" can be further investigated by examining physical and biological isolation of the coral bommies. If they are indeed being used as stepping zones, then more isolated coral bommies would likely have decreased abundance and diversity.

Conservation implications of this study are multifaceted. Investigations into the ecological contribution of coral bommies to the near shore environment help gain a better understanding of their conservation value. This is particularly important considering coral reefs are being threatened worldwide due to both natural and anthropogenic disturbances. Coral bommies may be particularly susceptible to global climate change, as the shallower zones that they tend to occupy are in habitats subjected to greater fluctuations in temperature. Alternatively, they could be buffered against future climate change because they already experience such extreme fluctuations in light and temperature. Outcomes of this research may also be relevant in construction of artificial structure. Artificial reefs have been proposed to alleviate habitat loss and in creating these structures, developers want to know the optimal size, composition and spatial distribution to enhance diversity and abundance of fish assemblages.

This research requires in water activity and is suitable for those primarily interested in snorkelling based research.

## Recommended Reading

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