

Master Thesis Laura Puk – Proposal

Title: Assessment of key fish species controlling macroalgae growth in a coral reef of Koh Panghan, Gulf of Thailand

Objective: Identifying important fish species possibly contributing to the prevention of a phase shift due to their role as macroalgae removers. Assessing whether local fisheries have an impact on these species.

Background: Coral reefs are biodiversity hotspots which provide many goods and services to the communities depending on them. For many years they have been in serious decline with an estimated 30% being already severely damaged¹. This is due to a range of disturbances, such as over-fishing², diseases³ and climate change⁴. Many of the reefs have undergone phase shifts from coral dominated systems to macroalgae dominance, which is often associated with overharvesting of herbivorous fishes^{5,6}. The ability of a reef system to withstand these impacts and resist phase shifts, namely the resilience⁷, depends to a large amount on an intact herbivorous fish community^{8,9}. More and more research highlights the importance of not just protecting general biodiversity but especially important functional groups, which can prevent or even reverse such a phase shift^{10,11}. It is widely accepted that parrotfish and surgeonfish play an important role in the prevention of a phase shift^{5,6} but only current research highlights the importance of a “sleeping functional group” in the reversal of a phase shift¹¹. There are major regional differences in species diversity, functional group composition and resilience⁶. It is to be expected that the important species for prevention and reversal of a phase shift vary on regional and temporal scales¹¹.

Gaps of Knowledge: Several studies documented the removal of macroalgae by fish, but the exact species remain largely unknown¹². This is of great importance as the resilience of a system may be highly dependent on a small number of species to perform specific functions¹². While some groups are generally accepted as being important herbivores, only some of the species within these groups actually seem to feed on macroalgae to a significant extent¹¹. Since there are major regional differences and most research has been carried out in the Caribbean and on the Great Barrier Reef there is a lack of knowledge for other regions of the world, such as the Gulf of Thailand.

Justification: In order to keep the ecosystem as healthy as possible and to provide local communities with the resources needed, it is vital to figure out which species are especially important and, by doing so, enable the local fisheries to act on it. Many metrics for monitoring reef status still include coral cover and target species to a majority. In order to improve the monitoring it is essential to include important functional groups, functional redundancy and response diversity⁶. There is still a big gap of knowledge in this area⁶. Since there have been few studies carried out in the Gulf of Thailand, it is important to carry out research that can help to implement sustainable fishing practices.

Key questions:

1. Which herbivorous fish species are removing macroalgae in the coastal coral reefs of Mae Haad bay?
2. Which herbivorous fish species are missing in the coastal coral reefs of Mae Haad bay?
3. Are these fish species targeted by local fisheries?

Methods and Sampling Design:

1. To observe which fish species remove macroalgae in the bay “Mae Haad”, an area will be selected, where macroalgae are present but are kept in check by herbivores. This area will be caged for several weeks, until the algae will have grown to substantial size. Before presenting these macroalgae strands to the local fishes in replicates of three, wet weight will be measured. The species feeding on the macro algae will be recorded deploying cameras. This experiment will be set up in different locations in the bay, always at the same time of day to avoid bias by changing conditions. After the observation, wet weight of the algae will be measured again and the video footage will be analyzed for species feeding, their size and biomass, the time spent feeding and their bite rate. Possibly influencing factors, such as nutrients will be measured.
2. Macroalgae which grow in Mae Haad bay, but are absent in the nearby marine-protected area “Ang Thong”, will be selected, sampled and their wet weight measured. They will be presented in the same set-up as explained for research question 1 (for Mae Haad) to the herbivorous fish species in Ang Thong and data will be analyzed as described above.
3. Fishery landings information will be collected and analyzed to find out whether important herbivorous fish species are removed in Mae Haad bay. This will be done by visual observation and questioning of the local fishermen. Collected data will be compared with the findings of research questions 1 and 2.

References:

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