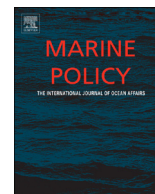




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Fishing the last frontier: The introduction of the marine aquarium trade and its impact on local fishing communities in Papua New Guinea



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ABSTRACT

Papua New Guinea has sometimes been called the world's last frontier for relatively undamaged coral reefs and their resources. In 2007, the country joined its neighbours in the marine aquarium trade. By licensing a private company, Papua New Guinea tried an alternative approach to the introduction of this activity. Under the so-called SeaSmart Programme, over 100 fishers were trained in sustainable collection techniques and handling of organisms, until the programme was shut down in 2010, and replaced by its successor, EcoAquariums PNG. This article contains the first study on the introduction of the marine aquarium trade into Papua New Guinea. It evaluates the overall outcomes of the SeaSmart Programme, lists targeted species, and their prices. The main focus is on the local collectors, and on the impacts of this new activity on them and their communities. Benefits from collecting marine ornamentals are assessed and their contribution to household income is quantified. Perceptions on non-financial benefits of the SeaSmart Programme are also gathered. The empirical work was carried out between September 2010 and February 2011 in the Central Province of Papua New Guinea. A total of 199 fishers including 44 aquarium fishers were interviewed in eight different communities in the Central Province of Papua New Guinea. The results show that marine aquarium fishing does provide benefits to local resource collectors, but also that this "sustainable" way of collecting of marine ornamentals might lead to some depletion.

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1. Introduction

The marine aquarium trade supplies aquarium keepers with ornamental species such as fish, corals, sea anemones, crustaceans, echinoderms and polychaetes. Although the real volume is unknown, it has been estimated that 14–30 million fish from over 1800 species, 1.5 million live stony corals, and 9–10 million other vertebrates are traded annually [1,2]. Over 90% of all ornamental species are caught in the coral reefs of at least 45 countries including Brazil, the Maldives, Vietnam, Sri Lanka, and the United States (Hawaii). More than two thirds of all organisms come from Indonesia and the Philippines [3]. Main importer is the United States with over 60%, followed by the European Union and Japan [2,4].

The catching of ornamental fish started in Sri Lanka in the 1930s [5]. Through the 1950s, it extended in the Philippines and Hawaii. By the 1980 s, the collection of ornamental species had already spread throughout large parts of Southeast Asia, the Pacific islands, and the Caribbean [1]. Over the last two decades, technological developments in the aquarium industry promoted a shift in preferences from simple fish-only tanks towards the creation of marine reef mini-ecosystems [6]. This caused a sharp increase in the demand for marine ornamentals, especially invertebrates [1,7]. By the early 2000, the marine aquarium trade was already a multi-million dollar industry with an estimated global value of 200–330 million USD per year [8].

From ocean to aquarium, marine ornamentals pass through a complex supply chain represented by collectors, middlemen, exporters, importers, retailers, and final buyers. Values of organisms increase throughout the supply chain, but only a very small amount of the profit goes to the collector [8,9]. Nonetheless, it has been argued that catching of marine ornamentals could potentially create significant benefits to low-income coastal communities, especially in regions where other income alternatives are largely absent [8,10]. But until now, there is little empirical evidence for a

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contribution of ornamental fishing to the livelihoods of local resource collectors. A recent study from Indonesia has shown that fishing for marine ornamentals was part of a wider marine resource use portfolio, and that income from ornamental fishing varies substantially between individual fishermen [11].

Indonesia's neighbour Papua New Guinea (PNG) did only recently join the marine aquarium trade. Papua New Guinea has more than 40,000 km² of coral reefs to a depth of 30 m [12]. These reefs belong to the most species diverse ecosystems in the world [13]. Exploitation of marine resources is for the most part limited to small-scale artisanal and subsistence fisheries. While coral reefs and their associated marine resources in Indonesia, Malaysia, and the Philippines have been heavily impacted by overexploitation and destructive fishing activities, Papua New Guinea's reefs still remain comparatively pristine. This makes them an interesting location also for catching marine ornamental species.

Until 2007, the National Fisheries Authority (NFA) of Papua New Guinea was opposed to the involvement of the country in the marine aquarium trade. Negative impacts associated with the collection of marine ornamentals had raised concerns about the sustainability of this activity. High mortality of organisms caused by poor catching and holding equipment [9], detrimental effects upon targeted populations caused by selective catching and over-exploitation [14,15], and the loss of corals after the application of cyanide [16] are major issues in this respect. However, a number of large marine aquarium retailers had contacted the NFA and expressed their interest in establishing the marine ornamental trade also in PNG.

In 2007, the National Fisheries Authority contracted a US-based consultancy to conduct a first assessment of marine resources of potential interest for the aquarium trade. This consultancy was later developed into a three year project under the name "Sea Sustainable Marine Aquarium Resources Trade" (SeaSmart Programme). A total budget of 5 million USD was spent by the NFA in order to develop a sustainable approach to marine ornamental fishing that was supposed to generate benefits to local fishing communities while avoiding the negative ecological consequences listed above.

In this article, the results of the SeaSmart Programme are evaluated. The overall outcomes of the project in establishing

the marine aquarium trade in Papua New Guinea are assessed, target species are listed, and their collection and handling is described. The main focus of this analysis, however, is on the local collectors, and on the impacts of this new activity on them and their communities. Specifically, (1) the general characteristics of marine ornamental fishers and their communities are described; (2) the benefits from collecting marine ornamentals are assessed and their contribution to household income is quantified; and (3) the perceptions on the impacts of the SeaSmart Programme on household and community level are gathered.

2. Materials and methods

2.1. Study area

Papua New Guinea (PNG) comprises the eastern part of the island of New Guinea and a number of smaller islands in the Indo-West Pacific. The country is part of the Coral Triangle, the centre of global marine diversity and a hot-spot of endemism. The majority of coastal people in Papua New Guinea engage in fishing, but there are few full-time fishers. Signs of local overexploitation have been reported since the 1980s [17,18], but are largely restricted to commercially important species, such as giant clams [19], and specific areas [20]. Papua New Guinea still has strong tenure systems for marine areas and their resources, consisting of restrictions on fishing techniques, species-specific catch regulations and temporal closures of reef areas [21].

The SeaSmart Programme chose the Southern coast of the Central Province for introducing marine ornamental fishing. This densely settled coast has vast coral reefs, and the majority of the population strongly depends on marine resources for their livelihood [22]. The area is also close to the country's capital Port Moresby, and comparatively well developed: several roads connect the coastal areas with Port Moresby, and allow for regular transport. Fig. 1.

2.2. The SeaSmart Programme and its goals

The underlying principle of the SeaSmart Programme was to develop a co-management approach tied to traditional marine

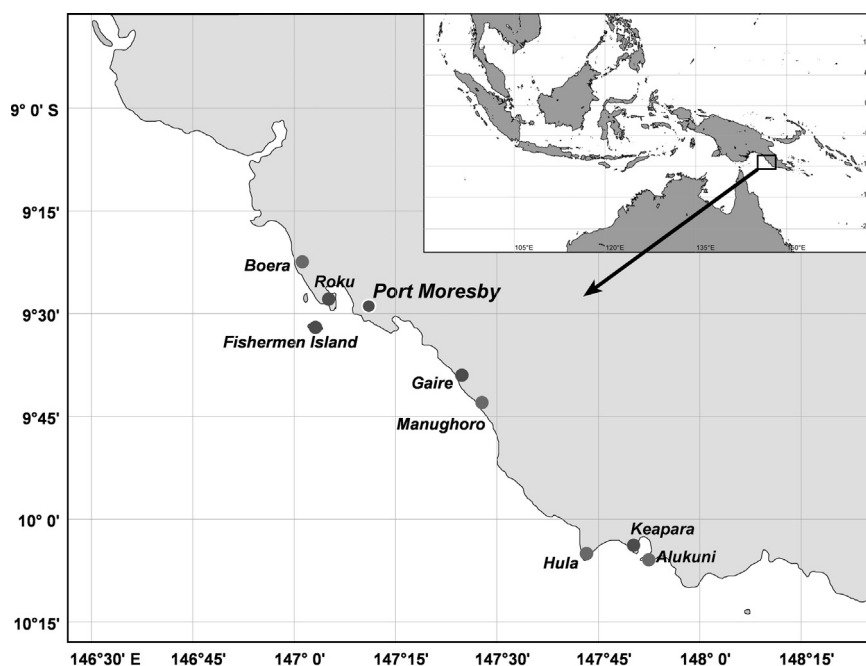


Fig. 1. Map of the case study area.

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