

COASTAL FISHERIES DEVELOPMENT AND MANAGEMENT IN POHNPEI, FEDERATED STATES OF MICRONESIA

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Introduction

Fisheries development is given the highest priority in the national policies of most Pacific island countries. Exploitation of coastal resources has particularly important consequences because of its potential impacts on social and economic well-being in domestic communities. This report deals with the present status and future prospects of coastal fisheries development in Pohnpei, Federated States of Micronesia (FSM) with particular emphasis on possible fishing regulations on the basis of a field survey.

Materials and Methods

The present survey consists of two aspects, i.e. field investigation of fishing activities and studies on interview with relevant officers with legislative documentations.

The field investigation focused on; (1) observation of fishing gear and methods and coastal environment around fishing villages, (2) recording gear materials available in the island, and (3) collecting fish samples at the local market. Six villages were visited and seven fishermen were interviewed. Four shops were visited. In the other field, five officers and extension workers of both FSM and Pohnpei State governments were interviewed to find out policies for coastal fisheries development and management.

Geomorphological characters of aquatic environment were measured on a chart, U. S. Defense Mapping Agency, No. 81435, 'Senyavin Islands - Pohnpei'.

Results

Coastal Environment The aquatic environment in Pohnpei Island is characterized by alignment of mangrove, fringing reef, lagoon with patch reef, barrier reef and pelagic water, which encircle around the main island (Fig. 1). Its fishing ground conditions are, therefore, nearly consistent among inhabitants around the island. On the basis of measurement on a chart, the mangrove wet land was determined 45.8km² in area; the reef and lagoon, 304km²; and the circumference of the barrier reef, 105km in length (excluding detached atolls) (Fig. 1).

Fishing Gear and Fishing Activities Only eight types of fishing gear are popularly used in Pohnpei (Table 1). Among the eight, trap cages, cast-nets and harpoons are used against confined targets, i.e. crabs, small finfishes and sea turtles respectively. Drop-lines and trolling lines are specific to fishing grounds together with associated finfish species, i.e. the former is used in deep slope waters outside the barrier reef for tunas and snappers and the latter, at surface waters for tunas and other pelagic species. Remaining three types of gear aim at some common species of finfishes in shallow waters. Gillnets (49, 59, 65, 77, 82, 85, 91 mm in mesh size) are mainly used in mangrove estuaries and hand-lines and spears, in shallow

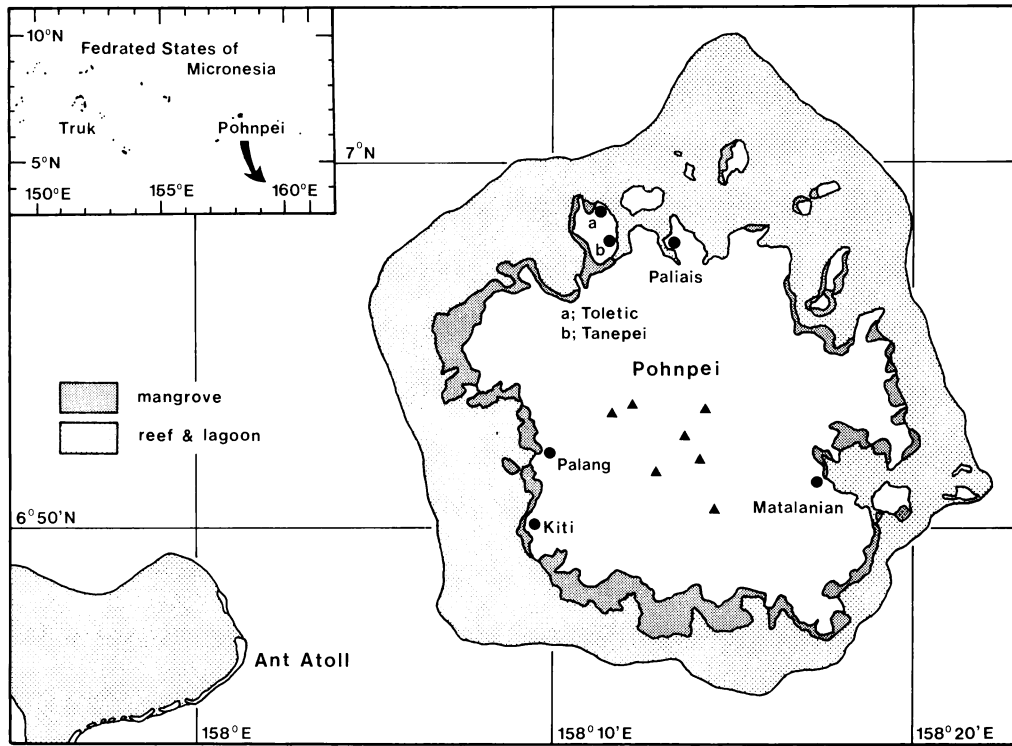


Fig. 1 Surveyed sites and distribution of coastal fishing grounds (mangrove wet land and lagoon/reef waters) in Pohnpei Island, Federated State of Micronesia (closed triangles represent major mountains)

Table 1. Fishing gear, relevant fishing grounds and target organisms observed in Pohnpei

Gear	Fishing ground	Target organisms
trap cage	mangrove	mangrove crab, sand crab
gillnet	estuary	mulletts, emperors, goatfishes, groupers
cast-net	shallow waters	sardines, anchovies, splats
hand-line	Reef	emperors, rabbitfishes, groupers, trevallies
spear	Reef	groupers, parrotfishes
harpoon	lagoon	sea turtles
drop-line	barrier reef slope	tunas, snappers
trolling	pelagic water	tunas

Traditional poison-fishing by using two species of plants, traditional turtle aggregation for hunting, traditional ambient scoop net transferred from Mokil Atoll for flyingfish, illegal fishing by using toxic chemicals are excluded from the list.

reef waters. In other words respective fishing gear in a small variation are assigned to both/either target organisms and/or fishing grounds (Fig. 2). A room to choose fishing gear is, therefore, small for fishermen in given fishing grounds around individuals' villages.

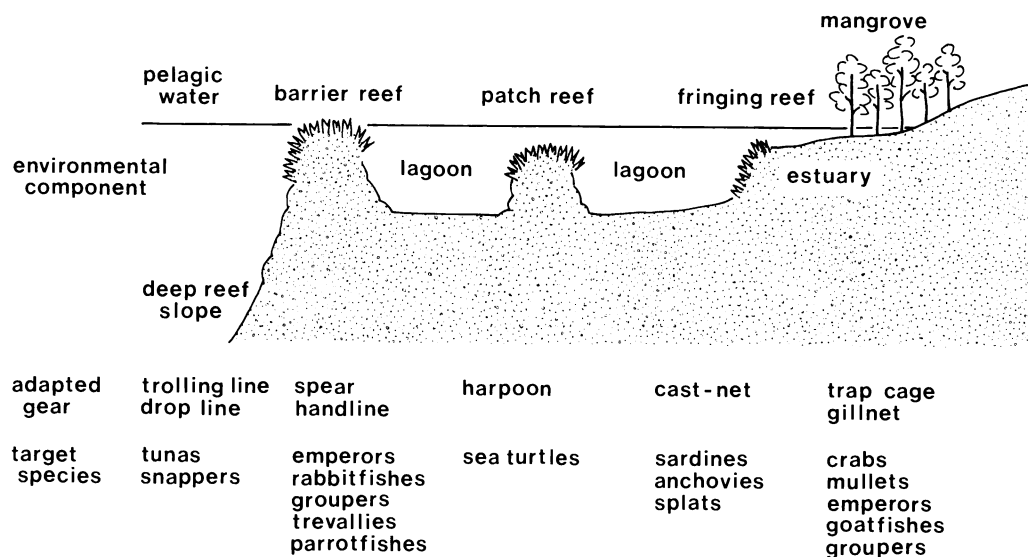


Fig. 2 Schematic illustration of relationship among aquatic environment components, major fishing gear adapted and dominant aquatic organisms

Table 2. Surveyed sites, interviewed fishermen and observed fishing activities

Village	Fisherman's Status (Age)	Boat	Fishing Gear*								
			TC	CN	GN	HL	SP	HP	DL	TL	
Palang	Full T. (46)	Canoe	+					+			+
	Full T. (34)	Canoe		+	+			+			+
Kiti	Full T. (71)	Canoe	+	+	+						
Toletic Pt.	Full T. (56)	FRP	+	+	+						
Paliais	Part T. (37)	FRP	+	+	+				+		+
Matalanian	Part T. (51)	FRP				+			+	+	+
Tanepei	Part T. (48)	FRP			+					+	

* Abbreviations stand for; TC for trap cage; GN, gillnet; CN, cast-net; HL, hand-line; SP, spear; HP, harpoon; DL, deep drop-line; and TL, trolling line.

The fishing gear used by seven fishermen were summarized in Table 2. Prevailing fishing gear are trap cages, cast-nets, gillnets and trolling lines. Fishing in mangrove and pelagic waters seem their preferences. No fishermen possess the entire variation of the fishing gear locally available, however, they are all equipped with a combination of a couple of types of fishing gear for different environmental components. Part-time fishermen tend to be equipped with a modern but costly boats and fishing gear, i.e. FRP dinghies, gillnets, drop-lines and trolling lines. It was explained that part-time fishermen who are usually urban employees are advantageous to acquire bank loan for better equipment and vigorous with non-fishery income to stand against occasional poor landing.

Availability of Fishing Gear and Materials No proficient fishing gear dealers were observed

Table 3. Fishing gear and gear materials available at shops in Kolonia, Pohnpei

Fishing gear and materials	Dealers			
	A	B	C	D
Gillnet		+	+	+
Cast-net	+	+	+	+
Net webbing	+			
Monofilament lines	+	+	+	+
hooks	+	+	+	
Artificial baits (<i>tako</i>)	+	+		
Fins & masks		+		

in Pohnpei. Four ordinary shops in Kolonia deal with some gillnets, cast-nets, net webbing, monofilament lines, hooks, artificial baits (*tako*) and fins and masks (Table 3). Cast-nets and monofilament lines were dealt at all the four shops.

Gillnets on sale were made of polyamide monofilament webbings of 40, 62, 68, 72, 77 and 90mm in mesh size, which were slightly further varied in comparison to those observed in villages. Cast-nets were made of either monofilament or multifilament webbings of 17, 21, 25, 37mm meshes. Monofilament lines were 0.40, 0.50, 0.55, 0.70, 1.60 and 1.70mm in diameter, among which two groups of thickness are distinctive between 0.70mm and 1.60mm. They seemed to be materials for hand-lines and drop-lines respectively. The only one old bundle of webbing seen at a shop was 27mm mesh polyamide monofilament webbing, which had been imported to be a material of cast-nets.

No materials for net fishing gear, such as net webbing, floats and sinkers, were observed with an exception of the old bundle above and, therefore, all the gillnets and cast-nets are those imported as prefabricated gear. No net mending twines were observed.

Fishes sampled at local market A total of 40 specimens of finfishes were sampled at the local fish market in Kolonia. A total of 19 species in 9 families were identified, where Lethrinidae species (emperors) were predominant in terms of both numbers of species and individuals, which was followed by Holocentridae (soldierfishes), Mullidae (goatfishes) and Mugilidae (mullets) fishes (Table 4). The four families were comprised of 13 species and 31 individuals in the specimens.

Serranidae (groupers) and Nemipteridae (butterfly breams) species which are the most prevalent fishes in tropical shallow waters and municipal markets were lacking or minor here. On the other hand, Holocentridae which is usually of lesser commercial value was quite dominant. Mugilidae which is mainly from mangrove waters was also distinctive.

A total of 16 fish individuals were determined to have been gillnetted and three, speared. The gear applied to the remaining 21 individuals were unidentified, however, possibly caught by gillnets or hook-and-line gear.

Coastal Fishing Regulation Neither fisheries management policies nor fishing regulations legislated in a unified law were found in Pohnpei. The fishing regulations appeared in differ-

ent official documents were compiled in Table 5. Prohibited methods are only usage of explosives, poisons and chemicals and diving with a scuba tank. The most popular management measures seemed catch regulations defined for size of organisms and seasons, such as those to sea turtles, mangrove crab and export-oriented sedentary resources including sponges, mother-of-pearl shells, trochus and black coral. Trade regulations are applied to groupers,

Table 4. Finfishes sampled at the main local market in Kolonia, Pohnpei

Finfish families (English names)	No. of		No. of samples caught by:		
	species	samples	gillnet	spear	unknown
Holocentridae (soldierfishes)	3	7	2	1	4
Mugilidae (mulletts)	2	5	3	0	2
Serranidae (groupers)	2	2	1	0	1
Carangidae (trevally)	1	2	1	0	1
Mullidae (goatfishes)	4	6	3	0	3
Kyphosidae (sea chub)	1	1	1	0	0
Lethrinidae (emperors)	4	13	4	1	8
Scaridae (parrotfish)	1	3	1	1	1
Siganidae (rabbitfish)	1	1	0	0	1
Total	19	40	16	3	21

Table 5. Regulations relevant to coastal fisheries in Pohnpei State

Categories of regulations	Prohibitions
Fishing technique	(1) use of explosives, poisons, chemicals or other substances which kill marine life (2) diving with a tank
Species, sizes and seasons	(1) sea turtles and their eggs on shore anytime and sea turtles of any size from April to June and from October to December (2) sponges artificially planted or cultivated (3) black-lip mother-of-pearl shell from August to December and anytime less than six inches along the longest dimension (4) trochus of designated size, in designated seasons and in designated reefs (5) black coral with no permit (6) mangrove crab carrying eggs
Trading	(1) grouper in March and April (2) bump-head parrotfish anytime (3) sea turtles anytime

bump-head parrotfish and sea turtles. The authority assesses that banning destructive methods is functioning, however, it was stated that prohibited methods such as using toxic materials, e.g. *sarashiko*, are still used by some fishermen.

The typical management scheme in coastal fisheries of Pohnpei seemed regulations on catch for trading, while that for self consumption is free, such as those to mangrove crab, groupers and bump-head parrotfish and sea turtles seasonally. Ordinary gear regulations such as mesh size limitation is missing.

Discussion

Resources and Coastal Fisheries Development Potential The maximum sustainable yield (MSY) of the coastal waters in Pohnpei was estimated as some 46 ton/year of mangrove crab and 700 tons/year of finfishes. These are based on the coefficients applied in coastal fisheries development planning in Papua New Guinea, or 1.0 tons/km²/year for the crab in mangrove areas and 2.0 tons/km²/year for finfishes in coastal shallow waters (ANON., 1989). These would provide with 1.35kg of mangrove crab and 20.6kg of finfish per capita a year for potential consumption by 34,000 of the local population (ASHBY, 1993). The outer reef slope has 11.9 to 30.8 tons/year of estimated MSY of snappers, or mainly *Pristipomoides spp.* and *Etelis spp.* (MATSUOKA *et al.*, 1991). This was based on the method used in Vanuatu (BROUARD and GRANDPERRIN, 1985), or 210 to 544kg/year a unit nautical mile of 100 fathom isobath. The length of the isobath is unmeasurable in Pohnpei, however, it must not differ largely from that of the circumference of the barrier reef because of steep reef slopes around the island.

These estimations are assessed to have insufficient capacities to support export-oriented coastal fisheries in Pohnpei. Coastal fisheries development aiming at local food supply and import substitutes should be potential, although pelagic species and sedentary resources are not taken into account here. The large diversity and distribution of species from mangrove to reef is also a character which does not support trading of fish overseas.

Needs of Fishing Regulation There are several indications of depleted status of coastal resources; (1) trade regulations for groupers, parrotfish and sea turtles, and (2) a small number of popular tropical fishes, or groupers and butterfly breems, and a large number of inferior species sold at the local market. Resource management seems to be taken into account well in fisheries administration, however, inadequate fishing gear regulation, relying upon prohibitions of trading, is assessed a negative feature of methodology for coastal fisheries management in Pohnpei. Trade regulation is suspected to be unsatisfactorily functional in resource conservation in such islands where subsistent fishing for self consumption is widely undertaken.

A majority of reef and mangrove fish observed at the market were caught by gillnets. On the other hand, mesh sizes of gillnets observed in villages and shops, such as around 40mm to 50mm, are judged irrelevant to most marketed species from a view point of gillnets' size selectivity. Introduction of gillnet mesh size regulation must be urgently required in coastal resource management, particularly around circumstances where protected species may be incidentally caught.

Possible Fishing Gear Regulations There are positive factors to constitute an overall

fishing regulation in coastal waters in Pohnpei from technical view point; (1) consistent aquatic environment around the island which gives fishermen common bases of fishing grounds, and (2) a small variation of fishing gear corresponding to the respective environmental components. Despite of the simple situation above, gear-making techniques of villagers are limited. Unavailability of net webbings, accessory parts and mending twines reflects that, at least, net fishing gear are neither constructed nor mended by most fishermen. Consequently, less understanding of capture mechanisms is an opposing factor against potential fishing gear regulation. Technical extension services in addition to researches on the basis of selective fishing technology are, therefore, required for introduction of fishing gear regulations.

From the view point of objectives of coastal fisheries development, the present situation, such as part-time fishermen who are urban employees are equipped with superior fishing gear and boats is some offset. Further involvement of rural villagers in cash-oriented coastal fisheries is anticipated, therefore, in order to support them and to overcome the contradictory situation at present, a marketing scheme must be also established in line with fishing regulations.

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