

The Small-scale Reef Fishery at Phuket Island, Thailand Andaman Sea Coast

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ABSTRACT

Questionnaires were used to collect general socioeconomic information on local fishing communities in the southern part of Phuket Island, Thailand. The majority of household representatives interviewed in target communities were strongly fishery dependent, having been fishing for their entire working careers (76%), or being primarily fishermen also engaging in other supplemental livelihoods (13%). Important small-scale fishing practices included fish trap, hook-and-line, dive-fishing, and gill net fisheries; the former two being the most common. Fishing grounds were not always strongly restricted to coral reef areas, and varied depending on the types of fishing gear used. Monitoring of catches from hook-and-line and trap fisheries of selected individual fishers was carried out to estimate fishing effort and yield. Catch rates of hook-and-line fishing for each individual boat-trip (usually spending 1-2 days with 2-4 persons per trip) ranged between 8.7 and 155 kg, with an average weight of 38.8 kg/trip. Trap-fishing yielded 10-92 kg for each individual boat trip (usually taking 7-8 traps left in the sea for 7-15 days) with an average weight of 31.1 kg/trip. Because catch monitoring was carried out during the south west monsoon season, it is assumed that fishing effort and catch were relatively low. However, a minimum estimate of annual fishing yield was extrapolated for the area. Based on data from the present study, fishing yields from the southern part of Phuket for hook-and-

line and trap fisheries collectively were in the range of 515-772 metric tons per annum.

INTRODUCTION

Fishing is a common reef-use pattern among local communities on the Andaman Sea coast of Thailand. The livelihoods of indigenous people in particular (including 3 ethnic groups, Moken, Moklen and Urak Lawoi, collectively referred to as 'sea gypsies'), are traditionally completely dependent upon reef resources. However, over the recent past their fishing opportunities have been greatly limited due to several constraints such as expansion of proclaimed protected areas (i.e. marine parks, marine sanctuaries) and tourist areas, legal restrictions on fishing equipment and species caught, degradation of marine resources, and rising cost of fuel and fishing equipment (Arunotai et al., 2006, Arunothai this volume). There are 13 Marine National Parks along the Andaman Sea coast of Thailand, covering a variety of marine and coastal habitats. Most notably, almost all major coral reefs are located in marine parks. In the southern part of Phuket, the area encompassing Hi, Lon, and Aeo Islands and the south-east tip of Phuket Island was proclaimed a sanctuary in 1969. In 1992, Phuket Province was designated as an environmental protection area, and fishing of ornamental fishes was totally banned. Dynamite and cyanide fishing have been prohibited since 1985, and "muro-ami" dive-in net fishing has been banned since 1997.

Obura, D.O., Tamelander, J., & Linden, O. (Eds) (2008). Ten years after bleaching - facing the consequences of climate change in the Indian Ocean. CORDIO Status Report 2008. Coastal Oceans Research and Development in the Indian Ocean/Sida-SAREC. Mombasa. <http://www.cordioea.org>

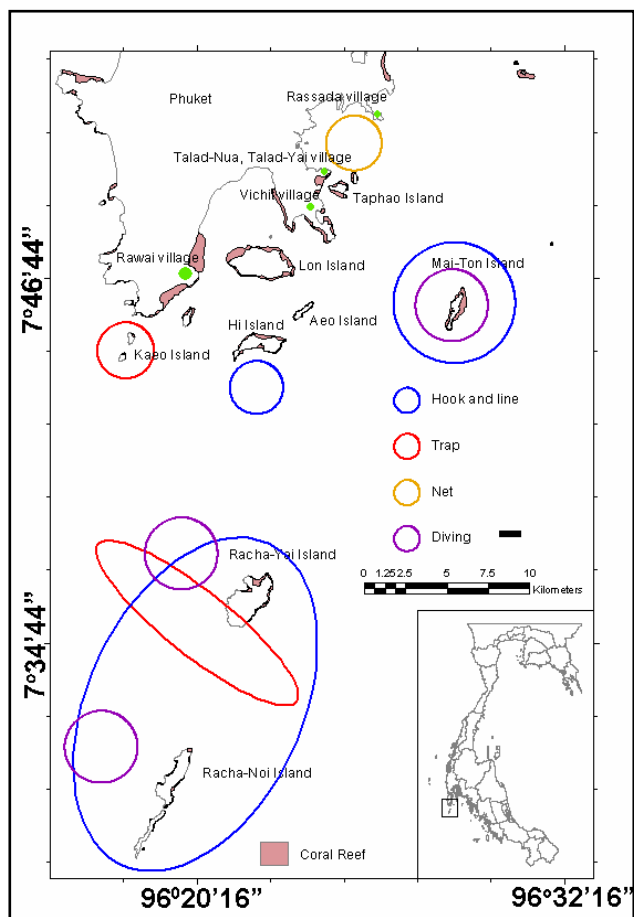


Figure 1. Fishing grounds of the small-scale reef fisheries in the southern part of Phuket Island.

While poverty and hardships are common in local fishing communities, there are significant gaps in knowledge about the socio-economic situation of local and/or indigenous fishing communities. Similarly, information on the magnitude of reef fisheries is either insufficient or lacking completely. This study was carried out to compile information on the small-scale reef fishery and to determine the dependence of these communities on reef fisheries.

SCOPE AND METHODS

Project activities included a questionnaire survey,

informal discussion with key informants, and recording catch data in 5 local fishing communities in the southern part of Phuket Island: Rasada, Talad Nua, Talad Yai, Vichit, and Rawai sub-districts (Fig. 1). Through interviews household members were asked about their personal background (e.g. age, education, occupation and income) and more specifically about their fishing activity (e.g. type of fishing boats, fishing gears, fishing grounds, and species targeted). In addition, monitoring of catches from hook-and-line and trap fishing among selected individual fishers was carried out between July and December 2006. Data sheets were distributed to a number of fishers to record total catch, species composition, and the value of the catch obtained from each boat trip. Data sheets were retrieved once a week. As keeping this kind of record of fishing operations was unfamiliar to many fishermen, particularly among the indigenous community, data sheets were filled and returned somewhat inconsistently. Three to five trap fishers and 7-10 hook-and-line fishers cooperated well in provision of data.

RESULTS AND DISCUSSION

Socioeconomic Data

A total of 63 interview responses were obtained from local fishermen in the 5 sub-districts surveyed, of which 62 were men. The age of respondents ranged between 23 and 74 years, with an average of 47, while education backgrounds were mostly at primary school level, with 38 % attaining 4th grade and 33% 6th, followed by junior high school (6%) and high school (5%). Eighteen percent of respondents were illiterate, primarily from the 'sea gypsy' communities at Rawai and Rasada sub-districts. It should be noted that there has been much improvement in education level among young people in these fishing communities as they are increasingly encouraged to study. About 76 percent of the interviewees were relying solely on fishing for an occupation, 13% were primarily fishermen that also engaged in other kinds of supplemental occupations, and the remaining 11%

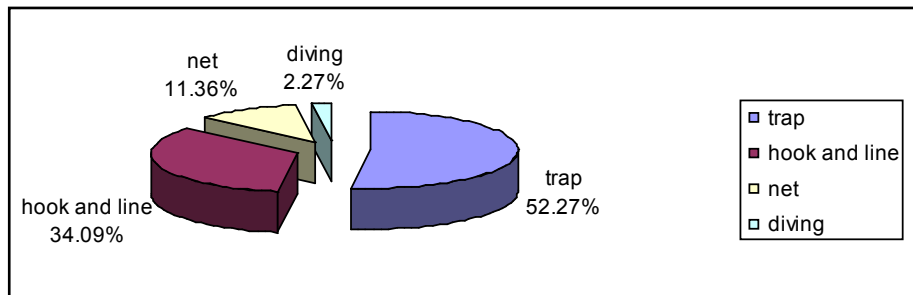


Figure 2. Fishing gears used in the small-scale reef fishery in the southern part of Phuket, based on data on number of fishers using each gear.

fish as a supplement to other primary livelihoods they are engaged in, such as working on tour-boats, as handicraft makers, and gardeners. The yearly income ranged from 12,000 to 228,000 Baht, with an average of about 65,000 Baht (~ \$US 1,625). Based on findings and opinions and concerns expressed among respondents, it is clear that the majority of households in these communities depend greatly on fishing, both as the main source of income and as food for household consumption.

Fisheries Characteristics

The survey carried out shows the small-scale fishery in southern Phuket relies primarily on long-tail motorized boats and simple gear to collect nearshore species. The fishing boats ranged in size from 9 to 12 m long and were equipped with 5.5-18.5 hp engines. Fishers use just one (68%) or a combination (32%) of fishing gears. Trap and hook-and-line were among the most common fishing practices (Fig. 2). Fishers from different villages seemed to have a preference to certain types of fishing gear. Hook-and-line was primarily used by local fishers from Talad Yai and Talad Nua sub-districts. Indigenous villagers of both Rawai and Rassada sub-districts used trap as primary fishing gear. Local fishers from Vichit sub-district commonly used both trap and hook-and-line. Shrimp trammel nets and fish gill nets were also used as secondary fishing gears among Rassada's fishers. Dive fishing, incorporating hand-collecting together with a spear was restricted mainly to indigenous fishers from Rawai sub-district. "Hookah" diving, the use of a compressor on a boat with a long air hose connected

to a diving mask, has facilitated deeper and longer dives. Most trap-fishers from Rawai also use diving to place and fix traps on the sea floor, as well as for recovering the traps. In the case of large and heavy traps, fishers do not haul up the traps on the boat, but rather dive down and scoop fish out of the traps with hand nets.

Among these four main types of fishing activities, dive-fishing had the most direct connection to or closest proximity to coral reef habitats. Divers, usually 4-7 on daily trips, collect shells (both ornamental and edible species), spiny lobsters and fishes at depths ranging from <10 m to 40 m. This fishing practice was restricted to the calm season, approximately from December to May, and carried out both during the day and night (around new moon phases). Catches varied greatly, ranging from 5 to 100 kg per trip.

Trap fishing was also generally linked to coral reefs. Typically, fishers do not place their traps directly on coral reefs, but rather in the shallow fore reef zone (to about 20 m). Sandy to muddy-sand bottoms, or deep rocky areas (as deep as 80 m) are preferred for deploying the traps. Indigenous fishers were found to be skillful in spotting "underwater fish paths" in the channels around islands where they regularly placed their traps. Trap fishing is operated both in the dry season, with calm sea conditions, and the rougher wet season. Catches comprised mostly reef-associated fishes, with catch size varying greatly depending on number and size of traps deployed. A minimal operating effort of less than 10 small traps (dimensions 1.5-2 x 2-3 x 3-4 m) yielded a few to a hundred kilogram of fish at every retrieval cycle of 7-

10 days, while higher operating effort of 10-15 traps of larger size (2.5 x 4 x 5 m), or 30-50 traps of 2 x 3 x 4 m, yielded a few hundreds up to a thousand kilograms at every retrieval cycle of 10-20 days. In general, each boat trip commonly involved 4-8 fishers working 7-8 traps.

Hook-and-line fishing was found to be spatially widespread and covering a variety of habitats, including the pelagic, bare sandy bottoms, heterogeneous-substrate bottoms, coral reefs, or rocky areas. Fishers usually use still lines with 1-5 hooks with fish-baits, or 4-6 hooks with artificial lures depending on target fish species and habitats. The former technique is used to target demersal or bottom dwelling fishes, while the latter is suitable for pelagic fishes. The relative distances to reef habitats varied greatly from 10 m up to 5 km away (Fig. 2), with a range of operating depths of 10-80 m. Boat trips, commonly lasting 1-2 days and involving 3-4 fishers, are led by a boat master who locates fishing spots by experience. Fishing sites are changed without uniform patterns. Catch size ranged between a few and 50 kg per boat trip.

Shrimp trammel nets and fish gill nets were found not to be used in coral reef areas. Fishers deployed their nets above bare and flat seabed at depths of 1-20 m. Each daily boat trip involves 2-4 men, and the yield varies between 10-100 kg of target species.

Catch Monitoring of Selected Fisheries

Participatory monitoring of catches in the hook-and-line and trap fisheries provided reasonable estimates of fishing yield and effort. At least 50 species in 20 families of fishes were recorded. Catch using hand-line ranged between 8.7 and 155 kg for each individual boat-trip, with an average value of 38.8 kg/boat-trip (usually spending 1-2 days with 2-4 persons per trip). The lowest average catch was measured in October (Fig. 3) when the fishery came to an almost complete stop due to intense and prolonged rough sea conditions. Based on occurrence and relative importance in biomass of fish groups in the catches reported by fishers, the major target species of the hook-and-line fishery includes emperors, groupers, trevallies, snappers and threadfin breams (Table 1).

Trap-fishing (commonly using 7-8 traps left in the

Table 1. Occurrence (%) and biomass contribution in the pooled catch (%) of target fish families reported by fishermen deploying hook-and-line (68 records) and trap fishing (33 records).

Fish family	Common name	Hook-and-line		Trap	
		% occurrence	% biomass	% occurrence	% biomass
Serranidae	Groupers	49.4	20.3	90.9	26.2
Lethrinidae	Emperors	88.2	27.8	39.4	6.7
Lutjanidae	Snappers	55.9	6.5	69.7	13.6
Carangidae	Jacks and Trevallies	45.6	17.4	54.5	22.2
Nemipteridae	Threadfin breams	29.4	10.5	–	–
Scombridae	Tunas and Mackerels	23.5	4.9	3.0	1.0
Haemulidae	Grunts and Sweetlips	8.8	1.4	21.2	7.5
Sphyraenidae	Barracudas	7.4	1.0	3.0	0.3
Dasyatidae	Stingrays	5.9	3.4	6.1	0.7
Rachycentridae	Cobia	5.9	2.0	3.0	0.7
Scaridae	Parrotfishes	–	–	12.1	2.4
Siganidae	Rabbitfishes	–	–	9.1	7.3
Balistidae	Triggerfishes	–	–	3.0	5.8
Caesionidae	Fusiliers	–	–	3.0	3.6
Acanthuridae	Surgeonfishes	–	–	3.0	1.2
Polynemidae	Threadfins	–	–	3.0	0.4

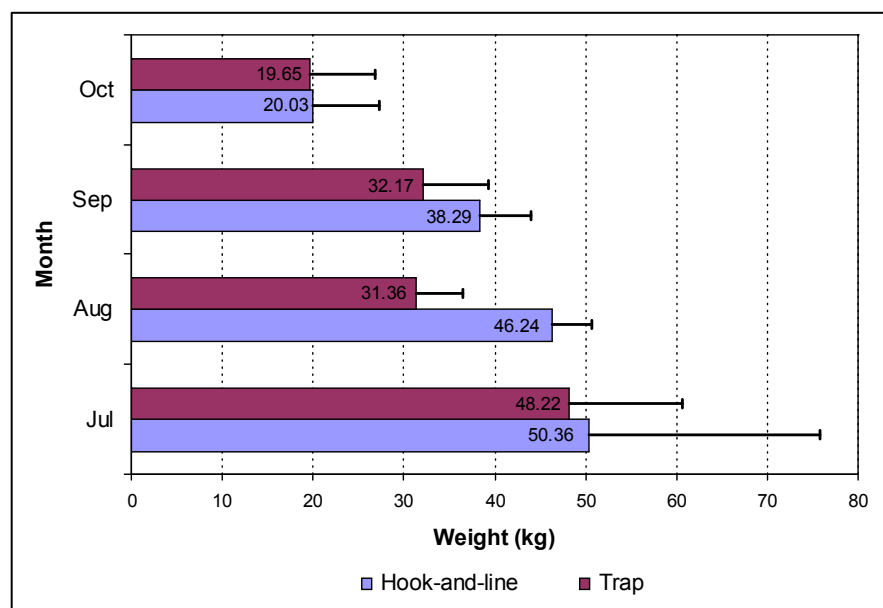


Figure 3. Monthly average (+ standard deviation) yield (kg/boat-trip) for each type of fishing gear.

sea for 7-15 days) yielded 10-92 kg, with an average weight of 31.1 kg/boat-trip, with the lowest catch observed in October (Fig. 3). Major target species included groupers, trevallies, snappers, emperors and sweetlips (Table 1). A number of other typical reef fishes were caught exclusively using traps, such as parrotfishes, rabbitfishes, fusiliers and surgeonfishes.

Since this catch monitoring program was carried out during the strong south west monsoon season, the

fishing effort in terms of number of operating boats or fishing intensity, as well as fishing yield, is expected to be comparatively low. However, the data obtained can, with some extrapolation be used as a basis for estimating the minimum annual fishery yield of the area. As presented in Table 2, the ranges of annual yields for hook-and-line and trap fisheries were approximately 410-615 metric tons, and 105-157 metric tons respectively. Trap fishing seemed to target

Table 2. Estimated annual yields for hook-and-line and trap fisheries in southern part of Phuket Island, extrapolated from data reported by fishers. (Total annual effort $C = A \times B \times 12$ (months in a year); Total annual yield $E = C \times D$).

Parameter	Hook-and-line	Trap
A) Total number of fishing boats	110	140
B) Frequency of fishing (trips/boat/month)	8-12	2-3
C) Total annual effort (boat-trips/year)	10,560-15,840	3,360-5,040
D) Average catch (kg/boat-trip)	38.8	31.1
E) Total annual yield (kg/year)	409,728-614,590	104,496-156,744

more reef-associated fishes than using hook-and-line, and provides an indication of the direct contribution of coral reef resources to local fishing communities.

DISCUSSION AND RECOMMENDATIONS

At present, although the small-scale fisheries of local communities in southern Phuket have faced several constraints (restrictions on area, equipment, and species, increase in fishing cost, and degradation of marine resources) that place limitations on their fishing livelihoods, the majority of the household members are still engaged in fisheries. There is also a general perception about advantages of fishery occupation in supporting income and subsistence (Arunotai et al., 2006). This study shows that at least a number of small-scale fishing practices in the area, i.e. dive-fishing, traps and hook-and-line, are to some extent directly dependent upon coral reef resources. In view of this it would be worthwhile to collect more specific socio-economic information regarding the dependence of local fishers on coral reefs, including e.g. economic benefits, welfare and ethic values, as well as community perceptions and attitudes toward reef management. This can include ownership and social responsibility of local communities with respect to their reef resources, and can be a basis for pushing forward management interventions. Other studies in the area have stressed the importance of community involvement for the success of coral reef management (Panchiyaphum, 2007).

This study provides information that can contribute to strengthening an ongoing government program on establishment of marine and coastal resources conservation volunteer groups. Such conservation volunteer groups have been established among stakeholders of common interest or similar occupations (e.g., long-tail boat operator groups, dive-tour together with individual diver groups, and local fisher groups), since 1992 up to the present. Networking of established conservation groups has proved to be a significant success in supporting

management. Through workshops and discussion among these stakeholder groups, reef-use conflict (e.g. reef fishery vs. diving tourism) has been resolved by building understanding and agreement among groups. For example, in the past, indigenous fishers in Rawai village were engaged in illegal fishing, particularly catching ornamental reef fishes using cyanide. The established indigenous-fisher group has proved important in eliminating illegal fishing in the community through generating collective will. Official records since 1997 indicate that arrests due to illegal fishing for and/or trading in ornamental fishes in Phuket have markedly decreased in recent years, from about 5 cases per year before 2000, 2-3 cases per year during 2000-2006, and none on record this year (Satapoomin unpubl.). It also appears that while strict law enforcement has contributed to this, strengthening dialogue and understanding between officers and local fisher group as partners in conservation of marine resources has been a stronger force, and proved successful in diminishing illegal fishing in the area (P. Panchiyaphum, pers. comm.). This further stresses the importance of co-management in marine resource conservation.

With limitations of the data acquired from this preliminary study, it is not possible to draw conclusion pertaining to the crucial questions of the sustainability of the reef fishery in Phuket. Results from this study, however, can serve as a reference point for further studies and for quantifying future changes in local fisheries. Further detailed studies are needed to assess the impacts of reef fisheries on coral reefs. This could include developing an observation-based sampling strategy for certain types of reef-associated fisheries, such as dive-fishing and trap-fishing, which could provide more precise information regarding fishing effort and yield. Intra- and inter-seasonal variation in the fishery should also be studied in more detail, as well as basic data particularly on fishing-pressure parameters and maximum sustainable yield of individual target species following research protocols established elsewhere (e.g., Laroche et al., 1997; Kulbicki et al., 2000; Labrosse et al., 2000;

Letourneur et al., 2000). This information will be useful for further development of fisheries management and conservation in the area.

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