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Diversity of reef fish at Royal Thai Naval Base, Sattahip, Chonburi Province, Thailand

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Fish diversity and abundance were investigated at reefs around Royal Thai naval base, Sattahip area. A total of 46 species in 17 families were recorded in the area. Hin Luk Bet had the highest number of fish species (32 species) while the lowest number of fish species was found at Ko Kham (14 species). Most abundance families were Pomacentridae followed by Chaetodontidae and Labridae. The results from the Jaccard similarity index showed that the similarity index was ranged between 0.3-0.6. Highest similarity was found between at Ko Kham and Ko Tao Mo. This is the first report on the diversity and abundance of fish species in the Royal Thai naval base.

[**Keywords:** reef fish, fish diversity, naval area, abundance, Gulf of Thailand]

Introduction

Coral reefs are one of the most diverse natural communities. Reefs have their biologically generated physical complexity, high species diversity, elaborate specialization of component species, and coevolved associations between species. In Thailand, coral reefs are located between 6° N and 13° N, and there are over 300 major reef groups covering an estimated area of 12,000 square kilometers[1-2]. Thailand ranks the third in total reef area among the Southeast Asia countries, following the Philippines and Indonesia[3]. Coral reefs in Thailand play a crucial role in the fisheries and tourism industries, and therefore are of paramount importance for the economy.

Fish is a major component in typical reef systems. They play a major role, and act as a herbivore, carnivore, or omnivore in reefs. Diversity and abundance of fish depend on several factors including habitat complexity, food selection, predation, and environments[4-12]. In Thailand, there are around 900 species of fish, and their occurrences vary among different locations[13-16].

The compositions of the substrates are shown to influence the fish diversity[17-18]. Some studies also demonstrated that there was a correlation between proportion of live corals and diversity of fish species[4,9,15].

This study addresses the species diversity of fish in various locations in the Royal Thai Naval Base. Many reef fish of Thailand are now heavily exploited in many areas including in the marine protected area. However, in reef areas at the naval base, several activities are restricted and prohibited. This restriction can influence in higher both diversity and abundance of fish. Yet, only few have assessed fish abundance in this area[16]. This study examined the diversity of fish in the Royal Thai naval base in the upper Gulf of Thailand, and determined whether there was a difference in the diversity of fish outside of the naval base.

Materials and Methods

The study was conducted at the Royal Thai naval area, Sattahip Base, Chonburi Province, Thailand (Fig. 1). There were six study sites: Ko Tao Mo, Ko Maeo, Khao Maa Cho, Ko Pla Muk, Ko Kham, and Hin Lak Bet. The surveys were done using scuba diving technique during 2004. At each study, three 50-m line transects were laid parallel to the shore line of each island. Fish within 2.5 m of each side and 5 m above of the transects were visually counted and identified to the species names, except the cryptic species. Transect method was not be able to apply at Ko Maeo, Khao Maa Cho and Hin Lak Bet since the locations are submerged rock and low percent coral cover. Thus, the roving diving technique was applied, covering an area as large as possible between 3-15 m

depth at each of the 6 sites. After fish species were identified by fish visual census method, they were divided into three groups based on English[19]: target species, indicator species, and major trophic families.

The results from the Jaccard similarity index showed that the similarity index was ranged between 0.3-0.6. The highest similarity index was found between at Ko Kham and Ko Tao Mo (Table 2).

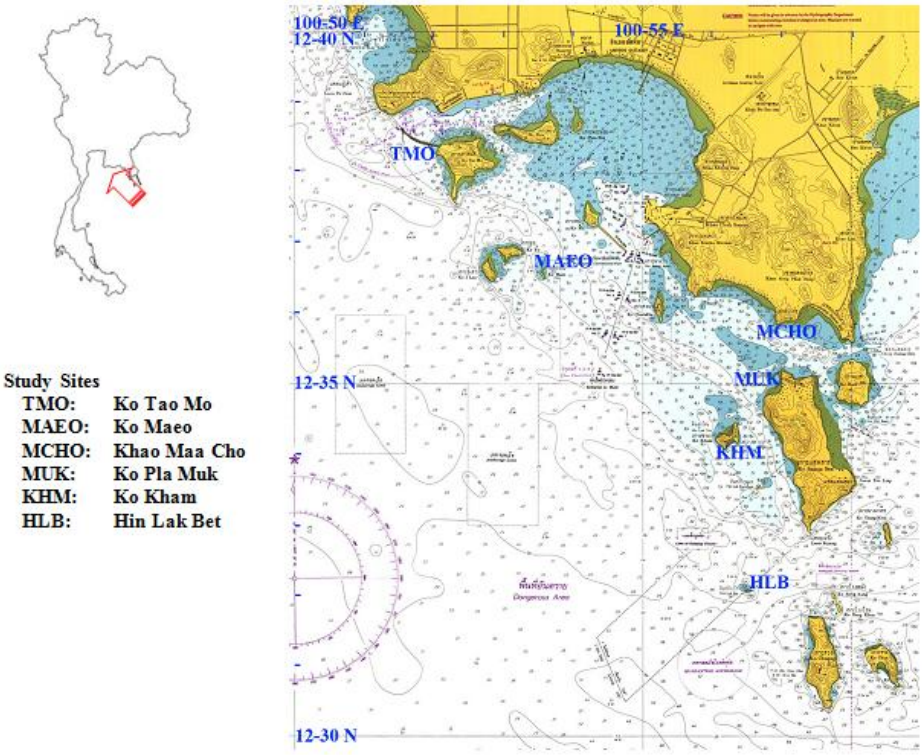

Fig. 1— Study sites of reef fish at Royal Thai naval base, Thailand.

Results

The results showed that 46 species in 17 families were found in six study sites (Table 1). Target species included Family Serranidae, Family Serranidae, and Family Haemulidae. Indicator species comprised of Family Chaetodontidae and Family Pomacentridae. Major trophic families composed of 12 families: Family Pomacentridae, Family Apogonidae, Family Labridae, Family Scaridae, Family Gerridae, Family Holocentridae, Family Nemipteridae, Family Siganidae, Family Pemperidae, Family Mullidae, Family Dasyatidae, and Family Monocanthidae. Hin Lak Bet had the highest number of fish species (32 species) followed by Khao Maa Cho (24 species). Lowest number of fish species was found at Ko Kham (14 species). *Cephalopholis boenak, Chaetodon octofasciatus*, *Abudefduf bengalensis*, *Pomacentrus cuneatus*, *Halichoeres chloropterus*, and *Halichoeres nigrescens* were recorded in every study site.

From the surveys, the results in the log graph showed that the most abundance families among the study sites were Family Pomacentridae followed by Family Chaetodontidae and Family Labridae (Fig. 2).

Discussion

This is the first report on the diversity and abundance of fish species in the Royal Thai naval base. The results showed that a total of 46 species of fish were found in the area. In the Gulf of Thailand, 353 fish species were recorded[20]. In Chonburi Province, Manthachitra and Sudara[13] found 62 fish species in 25 families. Dominant species were in Families Pomacentridae, Labridae and Apogonidae. Similar to other study, in this study, the Pomacentridae was the dominant group followed by Chaetodontidae and Labridae (Fig. 1). In the Gulf of Thailand, Manthachitra and Sudara[13] and Satapoomin[20] found that the most dominant species were *Neopomacentrus cyanomos* and *Cephalopholis boenak.*

Table 1 - Composition of reef fish at six study sites of Royal Thai naval base, Thailand.

Fish Species	Study Site *					
	TMO	MAEO	MCHO	MUK	KHM	HLB
TOTAL Species	17	20	24	19	14	32
TARGET SPECIES						
Family Serranidae						
Cephalopholis boenak (Bloch, 1790)	X	X	X	X	X	X
Cephalopholis formosa (Shaw, 1812)		X	X	X		X
Epinephelus fasciatus (Forsskål, 1775)						X
Family Lutjanidae						
Caesio cuning (Bloch, 1791)			X			X
Lutjanus carponotatus (Richardson, 1842)			X			X
Lutjanus russeli (Bleeker, 1849)			X			
Lutjanus lutjanus Bloch, 1790				X		
Lutjanus vita (Quoy and Gaimard, 1824)		X				X
Family Haemulidae						
Plectorhinchus gibbosus (Lacepède, 1802)			X			
INDICATOR SPECIES						
Family Chaetodontidae						
Chaetodon octofasciatus Bloch, 1787	X	X	X	X	X	X
Chelmon rostratus (Linnaeus, 1758)	X		X	X		X
Family Pomacanthidae						
*Pomacanthus annularis (*Bloch, 1787)						X
Pomacanthus sexstriatus (Cuvier, 1831)						X
MAJOR TROPHIC FAMILIES						
Family Pomacentridae						
Abudefduf bengalensis (Bloch, 1787)	X	X	X	X	X	X
Abudefduf sexfasciatus (Lacepède, 1801)			X	X		X
Abudefduf vaigiensis (Qouy and Gaimard, 1825)			X			
Amphiprion perideraion Bleeker, 1855	X	X				X
Chromis sp.	X					
Dascyllus trimaculatus (Rüppell, 1829)	X			X		X
Neopomacentrus bankieri (Richardson, 1846)		X	X			X
Neopomacentrus cyanomos (Bleeker, 1856)	X	X	X		X	X
Pomacentrus coelestis Jordan & Starks, 1901		X				X
Pomacentrus chrysurus Cuvier, 1830	X	X		X	X	
Pomacentrus cuneatus Cuvier, 1830	X	X	X	X	X	X
Family Apogonidae						
Cheilodipterus quinquelineatus Cuvier, 1828			X			
Ostorhinchus cookii Maclaey, 1881		X				X
Ostorhinchus cyanosoma (Bleeker, 1853)	X		X		X	
Family Labridae						
Halichoeres chloropterus (Bloch, 1791)	X	X	X	X	X	X
Halichoeres melanurus (Bleeker, 1851)		X				
Halichoeres nigrescens (Bloch & Schneider, 1801)	X	X	X	X	X	X
Thalassoma lunare (Linnaeus, 1758)						X
Family Scaridae						
Scarus ghobban Forsskål,1775		X		X		
Family Gerreidae						
Gerres sp.						X
Family Holocentridae						
Myripristis hexagona (Lacepède, 1802)				X		X
Sargocentron rubrum (Forsskål, 1775)		X	X		X	X

* TMO: Ko Tao Mo, MAEO: Ko Maeo, MCHO: Khao Maa Cho, MUK: Ko Pla Muk, KHM: Ko Kham, and HLB: Hin Lak Bet.

Table 1 - (Contd.)

Fish Species	Study Site *					
	TMO	MAEO	MCHO	MUK	KHM	HLB
MAJOR TROPHIC FAMILIES (contd.)						
Family Nemipteridae						
Pentapodus setosus (Valenciennes, 1830)	X	X			X	X
Scolopsis affinis Peters, 1877				X		
Scolopsis ciliata (Lacepède, 1802)			X			
Scolopsis monogramma (Cuvier, 1830)	X		X	X	X	X
Scolopsis vosmeri (Bloch, 1872)	X					
Family Siganidae						
Siganus guttatus (Bloch, 1787)			X			X
Siganus javus (Linnaeus, 1766)				X		X
Family Pempheridae						
Pempheris oualensis Cuvier, 1831		X	X	X	X	X
Family Mullidae						
Upeneus tragula Richardson, 1846	X		X	X	X	X
Family Dasyatidae						
Taeniura lymma (Forsskål, 1775)						X
Family Monacanthidae						
Monacanthus chinensis (Osbeck, 1765)		X				

* TMO: Ko Tao Mo, MAEO: Ko Maeo, MCHO: Khao Maa Cho, MUK: Ko Pla Muk, KHM: Ko Kham, and HLB: Hin Lak Bet.

Table 2 - Jaccard similarity index of six study sites.

Study site *	Jaccard similarity index					
	TMO	MAEO	MCHO	MUK	KHM	HLB
TMO	1	0.3	0.4	0.4	0.6	0.4
MAEO		1	0.3	0.3	0.5	0.4
MCHO			1	0.3	0.5	0.4
MUK				1	0.5	0.4
KHM					1	0.3
HLB						1

* TMO: Ko Tao Mo, MAEO: Ko Maeo, MCHO: Khao Maa Cho, MUK: Ko Pla Muk, KHM: Ko Kham, and HLB: Hin Lak Bet.

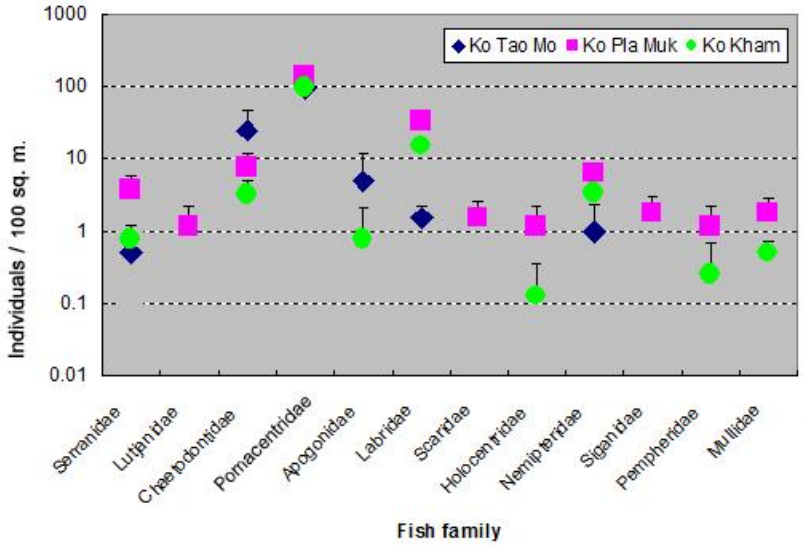

Fig. 2— Abundance of reef fish at three study sites at Royal Thai naval base, Thailand.

From the surveys and statistical analysis, the results showed that fish assemblages differed significantly among each location. The closed similarity in fish assemblages was between Ko Kham and Ko Tao Mo where the low diversity of fish occurred. Similarity in fish diversity among these two study sites may be caused by coral compositions and percentages of coral cover. Both Ko Kham and Ko Tao Mo has similar coral diversity and abundance[16]. Other study sites, Ko Maeo, Khao Maa Cho and Hin Lak Bet, the substrates were dissimilar to the other two sites. Those three areas either have different percents of coral covers or is a deep submerged rock. Depth may influence the composition and distribution of fish species in tropical reefs[12]. Higher numbers of fish species are usually attracted by submerged rock due to the higher habitat complexity and high diversity of marine invertebrates. At those three sites, not only the diversity of fish is high, but diversity of coral species recruiting into the areas is also high[16]. Other than habitat complexity, shelter and food sources also influence the distribution pattern and abundance of reef fish[12,21]. Sale[21] showed that Pomacentrids in small sizes preferred branching corals for their protection from predators. The different utilization of feeding resources by the fish species should also be taken into account since this can influence the pattern of fish distribution[22].

Conclusion

The present study reveals the diversity and abundance of fish species in the Royal Thai naval base. However, more studies are needed to determine factors influencing the diversity and abundance of fish species in the reef areas at the Royal Thai Naval Base. This basic knowledge is important for future management and conservation efforts.

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References

1 Burke, L., Selig, E. & Spalding, M., *Reefs at Risk in Southeast Asia*, (World Resources Institute., USA) 2002, pp. 72.

2 Chansang, H., Boonyanate, P. & Charuchinda, M., Features of fringing reefs in shallow water environments of Phuket Island, the Andaman Sea, in: *Proceeding of the Fifth International Coral Reef Congress, Tahiti*, edited by C. Gabrie & M. Harmelin, (Antenne Museum-EPHE, Tahiti) 1985, pp. 439-444.

3 Craik, W., Kenchington, R. & Kelleher, G., Coral-reef management, in: *Coral Reefs: Ecosystems of the World Series Vol 25,* edited by Z. Dubinsky, (Elsevier Science, Amsterdam) 1990, pp. 453-467.

4 Bell, J. D. & Galzin, R., Influence of live coral on coral-reef fish communities, *Mar. Ecol. Prog. Ser.*, 15 (1984) 265-274.

5 Green, L. A., Spatial, temporal and ontogenic patterns of habitat use by coral reef fishes (family Labridae), *Mar. Ecol. Prog. Ser.*, 133 (1996) 1-11.

6 Luckhurst, B. E. & Luckhurst, K., Analysis of the influence of substrate variables on coral reef fish communities, *Mar. Ecol. Prog. Ser.*, 49 (1978) 317-323.

7 McCormick, M. I., Comparison of field methods for measuring surface topography and their associations with a tropical reef fish assemblage, *Mar. Ecol. Prog. Ser.*, 112 (1994) 87-96.

8 Munday, P. L., Interactions between habitat use and patterns of abundance in coral-dwelling fishes, *Env. Biol. Fishes*, 58 (2000) 355-369.

9 Munday, P. L., Jones, G. P. & Caley, M. J., Habitat specialization and the distribution and abundance of coral-dwelling gobies, *Mar. Ecol. Prog. Ser.*, 152 (1997) 227-239.

10 Nanami, A. & Nishihira, M., The structures and dynamics of fish communities in an Okinawan coral reef: Effects of coral-based habitat structures at sites with rocky and sandy sea bottoms, *Env. Biol. Fishes*, 63 (2002) 353-372.

11 Syms, C., Multi-scale analysis of habitat association in a guild of blennioid fishes, *Mar. Ecol. Prog. Ser.*, 125 (1995) 31-43.

12 Williams, D. McB., Patterns and processes in the distribution of coral reef fishes, in: *The Ecology of Fishes on Coral Reefs*, edited by P. F. Sale, (Academic Press, San Diego) 1991, pp. 437-474.

13 Manthachitra, V. & Sudara, S., Community structure of coral reef fishes at sink reef in the inner Gulf of Thailand, *Science Asia*, 28 (2002) 327-337.

14 Phuket Marine Biological Center, *Guide to Coral Reef Fauna and Flora of Surin and Similan Islands*, (Department of Marine and Coastal Resources, Thailand) 2003, pp. 109.

15 Songploy, S., Hemachandra, W., Chavanich, S. & Viyakarn, V., Fish assemblages in coral communities at Chao Lao Beach, Chanthaburi Province, Thailand, *Galaxea*, 15S (2013) 189-194.

16 Viyakarn, V., Chavanich, S., Raksasab, C. & Loyjiw, T., New coral community on a breakwater in Thailand, *Coral Reefs*, 28 (2009) 427.

17 Risk, M. J., Fish diversity on a coral reef in the Virgin islands, *Atoll Res. Bull.*, 153 (1972) 1-6.

18 Roberts, C. M. & Ormond, R. F. G., Habitat complexity and coral reef fish diversity and abundance on Red Sea fringing reefs, *Mar. Ecol. Prog. Ser.*, 41 (1987) 1-8.

19 English, S., Wilkinson, C. & Baker, V., *Survey Manual For Tropical Marine Resources,* (Australian Institute of Marine

Science, Australia) 1994, pp. 368.

20 Satapoomin, U., *Comparative study of reef fish fauna in Thai waters: The Gulf of Thailand versus Andaman Sea*, Phuket Marine Biological Center Technical Paper, Department of Fisheries, Thailand, 2002.

21 Sale, P. F., Influence on corals on the dispersion of the pomacentrid fish *Dascyllus aruanus, Ecology*, 53 (1972) 741-744.

22 Scott, F. J. & Russ, G. R., Effects of grazing on species composition of the epilithic algal community on coral reefs of central Great Barrier Reef, *Mar. Ecol. Prog. Ser.*, 39 (1987) 293-304.