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Seasonal Occurrence of Deep Sea Fish Species in Maungmagan Coastal Area, Tanintharyi Region

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Abstract

Deep sea fish species of Maungmagan coastal area, Tanintharyi Region were recorded from three sites; sandy, muddy and rocky areas within the study period from March 2011 to February 2012. Identified monthly samples of deep sea fish species from respective study sites included 82 species of 65 genera belonging to 46 families under 12 orders. Six types of fishing gears were categorized based on the fishing effort to assess the respective effectiveness of fishing gears utilized. Among the identified species; *Euthynnus affinis, Pampus argenteus, Sphyraena jello, Trachinotus botla* and *Arius maculatus* were top on list in the catch weight. The species; *E. affinis, P. argenteus* and *T. botla* fetch high price. The largest numbers of fish species were recorded in the cool season during the study period. Correlation between recorded deep sea fish species and catch weight related to physical environmental factors is presented. The distributional patterns recorded from different depths of water level; < 200 m, 201m-400m, 401m > are presented with graphs. Obtained data of deep sea fish species and their microhabitat in Maungmagan coastal area are comparatively discussed.

Key words: Deep sea fish, microhabitat

Introduction

Myanmar consists of terrestrial and aquatic ecosystems. Marine waters cover a total area of approximately 486,000km^2. Myanmar marine fisheries waters have rich and varied aquatic resources. Myanmar has a long coast line and the swamp along the coast serve as spawning, nursery, and feeding grounds for aquatic life (Anonymous, 2009). It was found that one million tonnes of pelagic fish and 0.75 million tonnes of demersal fish exist as Myanmar fish in the marine waters. Coastal areas are commonly defined as the interface on transition areas between land and sea. The length of the coast line from the mouth of Naff River to Kawthoung is approximately 2,832 km. Deep sea fish showed specific patterns of micro-habitat and environmental association. The most important physical characteristics, depth, temperature and current determine the distribution of fish species (Anonymous, 2009).

Deep sea fishes are widely distributed in the world. They have a wide range of life history traits. Some are characterized by low productivity, low fecundity, high age at first maturity and high longevity. These species are more sensitive to exploitation than typical shallow water species (FAO, 2008). Deep sea fish are of various shapes and sizes portraying fascinating life histories and ecological adaptations. They respond behaviorally to the diverse environmental conditions (Bartle, 2004). Many deep sea fish are bioluminescent, with extremely large eyes adapted to the dark environmental conditions. The life cycle of deep sea fish can be exclusively deep water although spawning grounds of some species are in shallow water and they sink to the bottom when they become adults.

Anonymous (2009) reported that some deep sea fish species swim to the surface at night and many species have developed special adaptations to survive in extreme environmental conditions. Human activity is responsible for a wide range of threats to the rich diversity of marine life. Causes of the damage to coastal and marine environments are varied and complex, but all are related to the high concentration of people in coastal regions (Corson, 1990). Consumer perception of fisheries sustainability is increasing, social

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awareness of fisheries resources on the environment continues to increase. Parallel to the increase of trade in fish and fishery products, the issue of fish trade and food security has become very important (FAO, 2007).

To date, millions of people depend on fish for their main daily source of protein and as a source of income. Overexploitation, ecosystem modification and international conflicts on management and fish trade are all key threats to the long-term sustainability of fisheries. At present, many major fisheries are in progress in every regions of Myanmar.

Maungmagan coastal area in Launglone Township, Tanintharyi Region is one of the well-noted grounds for offshore and deep sea fish. Detail study on the status of these fishes has not been undertaken in this area. Therefore, this study has focused on the deep sea fish with the following objectives:

- To study the seasonal occurrence and distribution of deep sea fish species in Maungmagan coastal area
- To determine the deep sea and offshore fish species and catch in weight related to environmental factors
- To record the relationship of deep sea fish species with the conditions of varying habitats in the selected study sites

Materials and Method

Study area and study period

Specimens of deep sea fishes were collected from the coastal area of Maungmagan in Launglone Townships, located between latitude 13° 40' to 14° 40' N and longitude 96° 0' to 98° 0' E. The distance from Dawei to study area is 12.8 km in the northwest. Study area is about 93.7 km long and about 194 km wide. The study area was divided into three sub study sites according to their habitats: sandy, muddy and rocky (Figure1; Plate1).

Monthly collection of specimens made from deep sea trawlers and offshore fish vessel from each site was conducted during the study period from March 2006 to February 2010. Monthly surveys covered the hot season (February to May), the rainy season (June to September) and the cold season (October to January).

Method of collection

Fish samples were collected in association with the conditions of the microhabitats. Fishes were caught by trawling sampling of three depth strata (<200m, 201-400m, >401m) in three types of habitats: sandy, muddy and rocky. All fish samples were sorted, counted and measured. The total weights were calculated by raising factors.

Types of fishing gear

Six types of fishing gear; bottom set gill net, bottom trawl net, bottom set long line, drift gill net, beach seines net and traps were mainly utilized in the study area. Bottom set gill net (Kyauk ngyo pike) was commonly employed in the off-shore fishery.

Identification of collected specimens

The collected specimens associated with their respective localities related to the depth of sea water including off- and on-shores were study. The diagnostic features of collected specimen were noted. The sample specimen was study together with the type of respective

fishing gears. Scaled photographs were taken by digital camera soon after collection. The species diversity of deep sea fishes were systematically identified according to Allen (2000).

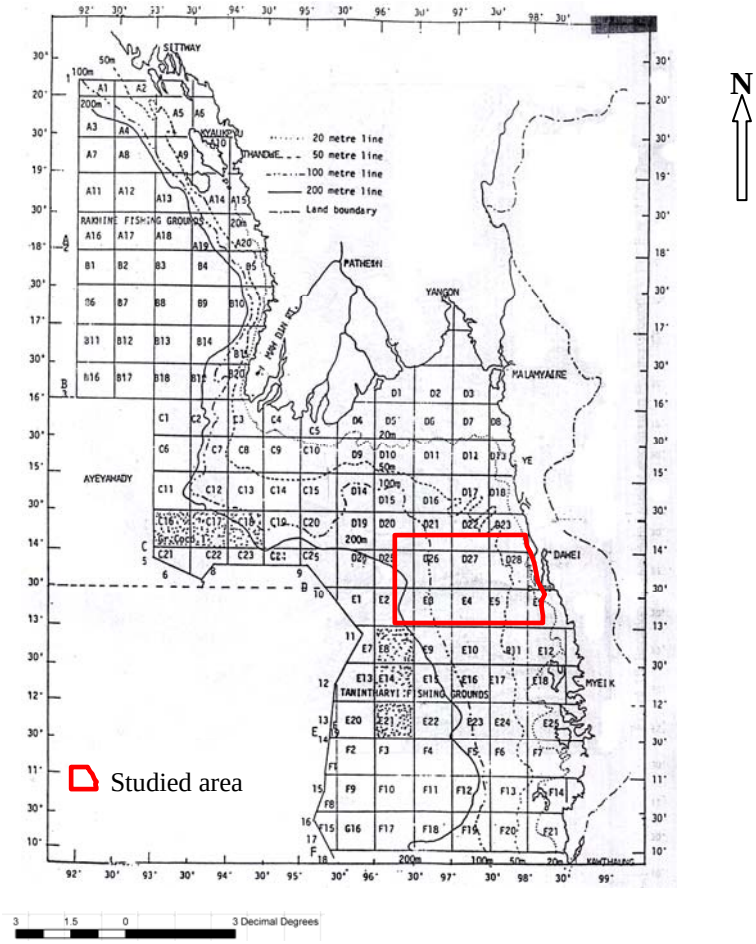

Figure 1 Location of Deep sea Fishing Grounds Surveyed
(Source: Academy of Livestock and Fishery Sciences)

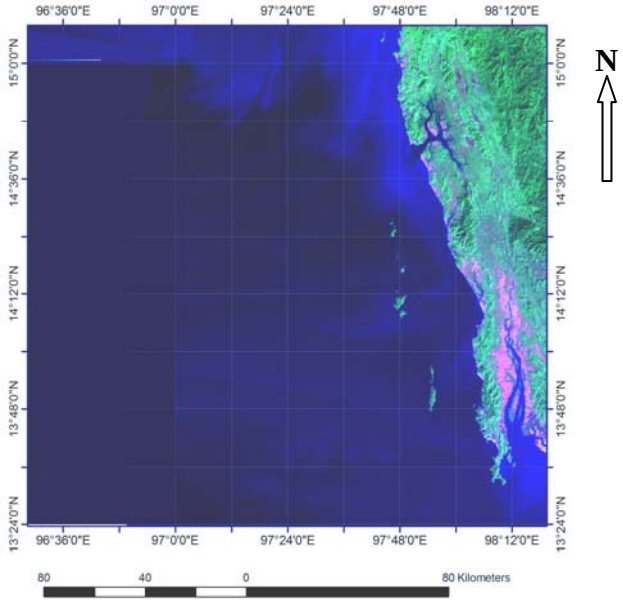

Figure 2 Satellite image of Dawei and Maungmagan sea (source: Google Earth)

Recording of environmental factors

Monthly temperature and humidity of the surrounding area of the study site were recorded with a thermo-hygrometer. The data of monthly rainfall during the study period was obtained from the Department of Meterology and Hydrology, Dawei District.

Statistical analysis

Data and analysis were analyzed by Analysis of Variance (ANOVA) and Student's "t" test to determine significances of the species composition in different seawater levels from three habitats. Pearson Correlation Coefficient was computed to analyze the relation with species occurrence and their abundance from the study area by using SPSS (Statistical Package for the Social Sciences) Version 16. Graphic presentations were performed by Microsoft Office Excel Programmes.

Results

Species composition

The percentages of deep sea fish species were recorded to be 62.19% under order Perciformes, 8.54% of order Pleuronectiformes, 6.09% of order Beloniformes, 4.88% under Clupeiformes and Siluriformes, 3.66% of Myliobactiformes, 2.44% of orders Orectolobiformes and Anguiliformes, 1.22% of orders Elopiformes, Aulopiformes, Scorpaeniformes and Tetraodontiformes. Order Perciformes was thus included the highest number of collected fish species (51 species, 39 genera and 28 families) as shown in Figure3. Among the families of the Order Perciformes, a large number of species was recorded in families Carangidae (17.64%), Serranidae and Lutjanidae (11.76%).

Monthly and seasonal species variation

The largest species number was collected in the month of January, followed by October and December. The smallest number was recorded in the month of March. Monthly recorded species related to the study area were not significant ($p>0.05$) in three study years.

The highest fish species of 63.00 ± 4.47 were recorded in the cold season during the study period. Few fish species of 42.00 ± 1.65 were recorded during the rainy season (Figure 4, Table 1). Seasonal recorded number of fish species was found to be significantly different at $p < 0.05$.

Table 1 Comparison of fish species in three seasons

Hot Season (Feb to May)	Rainy Season (Jun to Sep)	Cold Season (Oct to Jan)
45.00 ± 4.62 (30.00%)	42.00 ± 1.65 (28.00%)	63.00 ± 4.47 (42.00%)

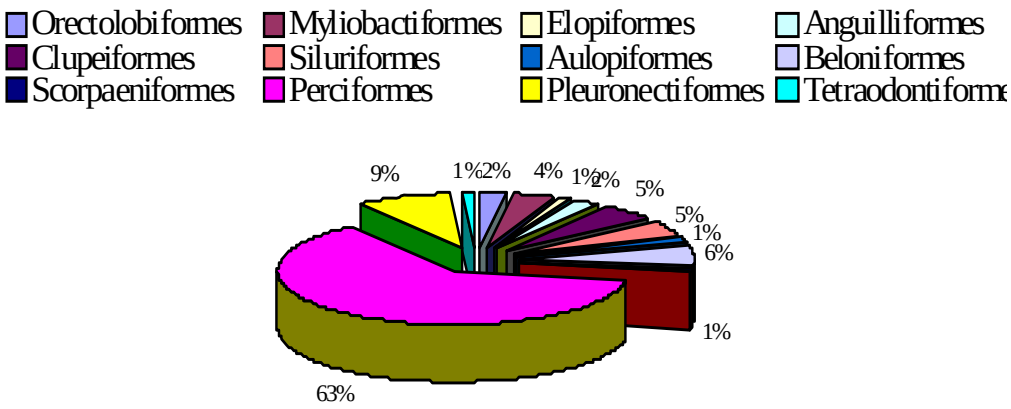

Figure 3.Proportion of collected fish species from the study area

Abundance of deep sea fish

The maximum catch weight (8852.00 ± 967.31 MT) was recorded in the month of October (the cold season) and the least catch weight (6065.50 ± 696.08 MT) in the month of March (the hot season) (Figure 5, Table 2).

Distribution of deep sea fish species in different habitats

The largest species number of fishes (38.33 ± 3.51) was recorded from sandy habitat, and the lowest species number (21.00 ± 3.46) in muddy habitat (Figure 6, Table 3). Significant difference between the habitats was recorded at ($p < 0.05$). The species from different habitats recorded seasonal wise in 2007-08 showed high significant difference ($p < 0.01$). However, significant difference was not recorded in the year 2008-09 ($p > 0.05$). In the year 2009-10, high significant difference was recorded at $p < 0.05$ among the fish species collected from different habitats.

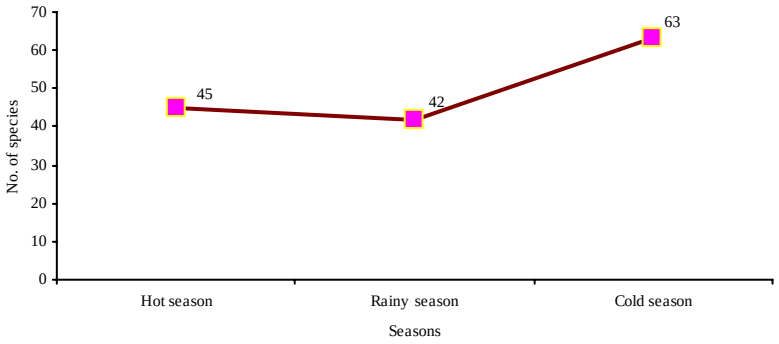

Figure 4 Seasonal fish species variations from the study area

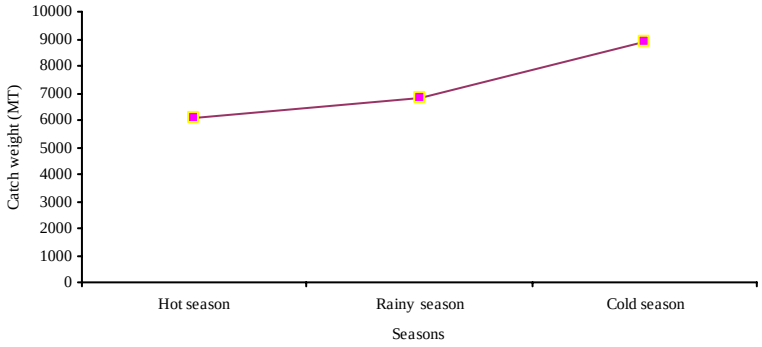

Figure 5 Seasonal variations of catch weight of fishes in the study area

Table 2 Comparison of catch fishes in three seasons

Hot Season (Feb to May)	Rainy Season (Jun to Sep)	Cold Season (Oct to Jan)
6065.50 ± 696.08 (27.96%)	6778.00 ± 599.11 (31.24%)	8852.00 ± 967.31 (40.80%)

Table 3 Comparison of fish species number in different habitats during the study period

Seasons	**Sandy**	**Muddy**	**Rocky**
Hot season	28.33 ± 1.52 (46.19%)	13.33 ± 2.30 (21.74%)	19.67 ± 1.52 (28.37%)
Rainy season	27.00 ± 1.00 (44.51%)	16.33 ± 1.52 (26.92%)	17.33 ± 1.52 (28.37%)
Cold season	31.00 ± 4.58 (41.15%)	16.00 ± 4.35 (21.24%)	28.33 ± 4.50 (37.61%)

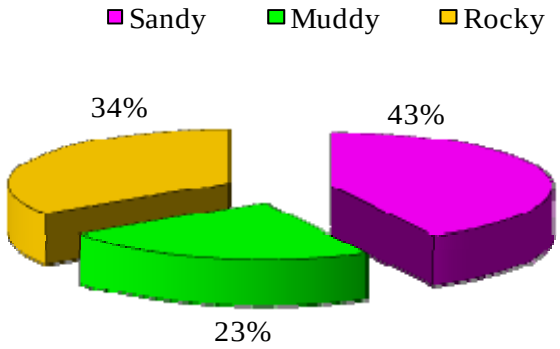

Figure 6 Proportion of recorded deep sea fish species in different habitat during the study period

Distribution of deep sea fish species in different water depths

The maximum number of deep sea fishes was recorded below 200m (45.83%), followed by those collected from 201 m - 400 m (32.64%). The least number of fish species was recorded from 401m and above (21.53%) in all seasons (Figure 6, Table 5). However, the highest deep sea fish species were recorded from rocky areas of 201m to 401m and above (Figure 7, Table 4). The species recorded seasonal wise from different layers showed that significant difference was recorded from the aspect of varying seasons in the study period.

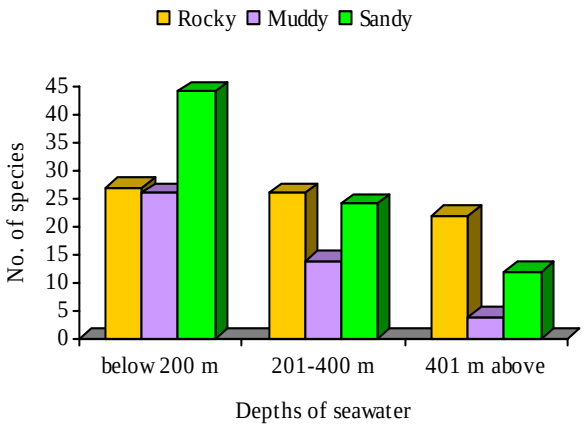

Figure 7 Distributional patterns of fish species among the different habits from the study area

Table 4 Comparison of fish species of different sea water depths during the study period

Seasons	< 200m	201m - 400m	401m >
Hot season	40.33 ± 1.52 (33.07%)	22.00 ± 2.00 (28.95%)	13.67 ± 1.52 (17.99%)
Rainy season	35.33 ± 0.57 (47.74%)	25.67 ± 3.05 (34.69%)	13.00 ± 1.73 (17.57%)
Cold season	45.00 ± 4.58 (44.26%)	33.33 ± 6.50 (32.79%)	23.33 ± 5.13 (22.95%)

Occurrence of deep sea fish species from on-and off-shore area

Off-shore fishing ground was recorded and the higher number of fish species (43.34 ±4.34) was recorded from off-shore fishing ground than that of on-shore (29.67 ±1.73) in all seasons during the study period (Figure 8, Table 5).

Table 5 Comparison of fish species of on-shore and off-shore area

Seasons	On-shore	Off-shore
Hot season	23.67 ± 1.52 (44.38%)	29.67 ± 3.21 (55.62%)
Rainy season	19.33 ± 0.57 (42.02%)	26.67 ± 2.30 (57.98%)
Cold season	25.00 ± 3.46 (38.66%)	39.67 ± 8.02 (61.34%)

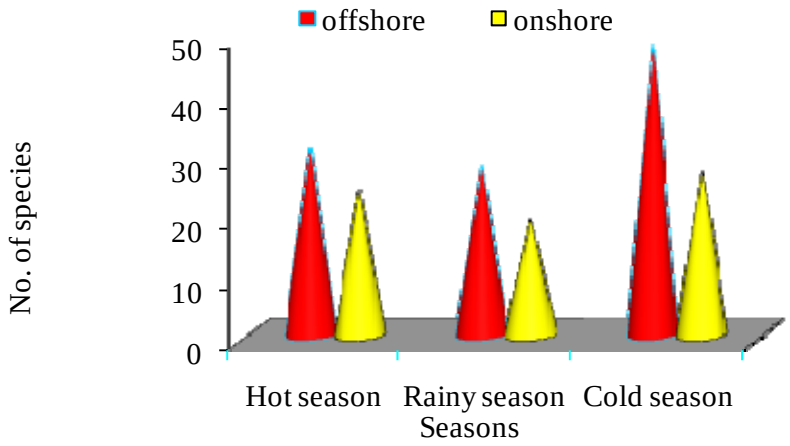

Figure 8 Comparison of deep sea fish species from off-shore and on shore area of Maungmagan

Table 6 Correlation between collected fish species and environmental factors (Analysed by Pearson's Correlation Coefficient Test)

Value	Temperature		Humidity	Rainfall
	Maxi	Mini		
r	0.262	- 0.196	- 0.339	- 0.358
p	0.410	0.541	0.281	0.253

Table 7 Seasonal comparisons of catch species and catch weight

Fish	Seasons	N	Mean	SE	df	F	p
Species	Hot season	3	44.00	1.52	2	6.91	p < 0.05
	Rainy season		40.66	0.88			
	Cold season		55.00	4.61			
Catch weight	Hot season	3	5427.00	460.26	2	1.60	p >0.05
	Rainy season		5446.41	707.61			
	Cold season		7155.58	1062.78			

Discussion

Most of the recorded fish species were from the catches conducted in the cool season since maximum catch size was found in this season. Deep sea fish species were reported to be common in the month of November and are caught in large number by FAO (1993). This report by FAO is in agreement with the finding of this study. It is assumed that majority of deep sea fish species spawn during the cold season since juveniles were recorded in the cold season catches. Salinity ranges recorded in the cold season is higher than those of other seasons in the present study. It thus indicated that the abundance of fish species in the cold season could be related to salinity range. The importance of salinity associated deep sea fish has also been reported in FAO (1993).

Moranta, *et al.,* (2006) in their work with deep sea fish reported that the community structure of several deep sea faunal groups changes with the seasons. This could be the reason why the species *Chiloscyllium griseum, Elops hawaiiensis, Coryphaena hippurus, Platax tiera, Monodactylus argenteus, Pomacanthus annularis, Tetrapturus angustirostris, Aesopia cornuta* and *Strabozebrias cancellatus* were only found in the cold season and the species *Amblygaster sirm, Saurida undosquamis, Platycephalus indicus, Sillago sihama* and *Scatophagus argus* only recorded in the rainy season. Moranta *et al.,* (2006) assumed that seasonal changes in deep sea fauna are linked to the influence of rich organic matters. The number of deep sea fish species recorded in the cold and rainy seasons thus indicated that the habitats are enriched with organic matters as sources of food during these seasons. The hot season seemed to be poor in organic matter since only few species were recorded in this season.

The choice of fishing gears depended on fish size, and types of fishing ground. The type of fishing gear mostly employed were bottom set gill net and bottom trawl net in the study area. Utilization of trawl net could cause depletion of deep sea fish species since immature fish species were recorded in the catches by trawl nets during this study. This factor should be taken into account from the aspect of conservation to maintain long-term sustainable food resource. Public awareness should thus be undertaken to avoid overexploitation and the maintenance of natural environmental conditions, which could adversely affect the lives of human beings.

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