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## Demersal Fish Assemblages of Moo-KhoBulon, Satun Province, Thailand: Species Composition, Distribution, Biomass and Diversity

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Demersal fish assemblages of Mo KhoBulon, Satun Province: species composition, distribution, biomass and diversity . From April 2012 - March 2013, but the fishing boat survey was only 5 months is May 2012 June 2012 July 2012 January 2013 and March 2013 because the climate is not conducive to fishing this year is fishing the least of which. Compared to several years ago. The boundaries of these assemblages are strongly connected to depth, whereas the relatively homogeneous oceanographic features have a relatively small influence. The composition of species Mo KhoBulon, Satun Province. The study found there are various species up to 69 species of fish, 64 species groups are 2 species of groups, squid, crab, crayfish 3 species, grasshoppers only 1 species. Dominant Species is found on the island of Mo KhoBulon, Satun Province by number Species is found *Sillago sihama* of 1,112 characters (representing 55.54%), followed by *Netuma thalassinus* 104 characters (equivalent to 5.19%), sand, white sandfish *Scolopsis taenioptera* the number 83 (or 4.15%), *Upeneus luzonius* of 79 characters (equivalent to 3.95%), respectively. Dominant Species is found on the island of Mo KhoBulon, Satun Province by weight. Species is found on the island of Mo KhoBulon, Satun Province by weight were found that fish with *Sillago sihama* total weight of 40,955.70 grams (equivalent to 52.39%), followed by fish spines *Netuma thalassinus* total weight of 6268.60 grams (equivalent. 8.02%), white fish *Scolopsis taenioptera* total weight of 3707.80 grams (equivalent to 4.74%), respectively. *Sillago sihama* total weight of 40,955.70 grams (equivalent to 52.39%), followed by fish spines *Netuma thalassinus* total weight of 6268.60 grams (equivalent. 8.02%), Saitama, sand fish, white fish *Scolopsi staenioptera* total weight of 3707.80 grams (equivalent to 4.74%), respectively. Standing Crop with an average of 125.07 kg. per hectare. By most in the month of July 2012 was 200.05 kg. per hectare. And lowest in May was 45.19 kg. per ha. The catch per unit effort with nets caught fish (CPUE) from this study at the fishery on average 6 hours showed an effect catch average of 2.61 kg. per hour. The study found that The index species (richness index) of the month of July 2012 with a variety of species, most, followed by the June 2012 January 2013 March 2013 and May 2012 respectively. The island of Mo Kho Bulon, Satun Province. Average water quality the salinity of the water

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was 30 ppt, pH was 7.8 and the average DO was 5.9 mg /L average water depth of 12 meters and an average water temperature of 30 °C.

**Keywords:** Demersal fish assemblages, Species diversity of fish, Species composition, Abundance, Dominant Species, biomass, diversity, Standing Crop, Moo KhoBulon, Satun Province.

## Introduction

The Andaman Sea and the Gulf of Thailand. Contains several species of marine fish, squid, shrimp, crab, demersal fish resources considered as an important economic. Depletion (Hilborn and Walters, 1992) and decline of fish stocks around the world (Messiah, 1989) in the last twenty years have pointed out the need to know the distribution of fish at diverse scales of study (Dalley and Anderson, 1993). Without such information, it will be impossible to achieve a better knowledge of the ocean's continental shelves whose ecosystems provide us with most of the world's fish resources. Shallow coastal habitats are ecologically dynamic and productive areas used by larvae, juveniles and adults of many estuarine-dependent species for reproduction, foraging and shelter (Peterson and Whitfield, 2000; Harris *et al.*, 2001; Schaffmeister *et al.*, 2006; Hajisamae *et al.*, 2013).

The fishing ground at Moo-KhoBulon Satun Province, is economically important fishery resources of the Andaman Sea.

In the Andaman Sea, although demersal fish, especially *Nemipterus hexodon*

(Quoy and Gaimard, 1824) *Pennahia anea* (Bloch, 1793) and *Sillago sihama* (Forsskål, 1775), are the main target species of fishermen, knowledge on the ecology of demersal fish in the sea and coastal areas, which is crucial for management of Demersal fish.

In the current study with structure and distribution of demersal fish are few and no continuing education. It is not enough data to assess demersal fish resources to manage the use of the

appropriate level. Therefore, it is necessary to study the structure and distribution of demersal fish. The results of the study were used to guide the assessment of resources and resource management

demersal fish yield response to maximum utilization and sustainability. For this research will study the structure and distribution of demersal fish can lead to results that will be used to plan and manage resources appropriately and effectively demersal fish such as the conservation area. To prohibit

fishing in protected areas such as basic information resources management demersal fish be sustained.

This study is aimed to (1) determine the community structure (abundance, species composition) and (2) determine distribution of demersal fish in Moo-KhoBulon, Satun Province, Thailand.

## **Materials and methods**

### *Study sites*

Satun is a province in the south west coast of Thailand. There are approximately 144.8 kilometers of coastline from Tambon Thung Bulun, Thung-Wa district down to the Tambon Poo-Yu Muang Satun district area of about 434 square kilometers. The fishing demersal fish main source of Moo-KhoBulon area, which includes Kho Bulon Lae Kho Bulon Don Kho Bulon Maipai and Kho Bulon Rangnok. Fishermen fishing the Kho Bulon. Mainly in La-ngu Especially in Ban Bo Chet Look Tambon Pak Nam-ngu, Satun Province, the local fishermen.

Households Houses in the Ban Bo Chet Look with a total of 219 households indigenous fishing occupation, representing 60.73 percent of the total number of households. The main fishing gear, Ban Bo Chet Look. Is a dragnet caught fish, about 70 percent of the fishermen fishing in coastal areas of Ban Bo Chet Look. There is a fishing gear such as nets, fishing nets, crab traps, fish traps, shrimp traps.

### *Sampling methodology*

Research by the 2 sampling method is a collection from fishing port. And the collection by gill nets. Sample were collect 12 times every month for a period of one year. Method for collect data. Specimen collection is divided into two sampling method.

1. Demersal fish randomly sampled from fishing port.

Demersal fish sampling from ban Bo Chet Look. The fishing gill nets caught fish fishing from the 4 boat (using fishing gill nets caught fish with mesh size from 2.8 to 3.5 cm) sampling demersal fish use. The randomized (Random Sampling) because the fishing boats are scattered around the islands. Demersal fish samples were collected monthly for 1 year.

2. Demersal fish sampled by gill net fishing.

Three replicated samplings were monthly done at 4 area from April 2012 to March 2013 using a gill net. Sampling demersal fish the 3 species by gill net the mesh size 2.0, 2.8, 3.0 and 3.5 cm. All (Random Sampling) sampling demersal fish samples at each of three replicated from 4 sample area. The gill

net is commonly used by traditional fishermen in the area and is considered the most

effective fishing gears suitable for catching demersal fishes in Moo-Kho Bulon.

. The demersal fish catches were immediately iced and transported to the laboratory for sorting, identification and measurements of total length. The demersal fish samples collected were

storage by freezing to the study.

-Fish identification, fish identification and take the number of each fish

- Size of the demersal fish by weighing and measuring the length (Total Length), standard length, standard length and width measurements of the body (Body Depth) using a ruler to measure the length of 0.1 cm.

- Surgery by sex of each fish. Count the number of male and female. And separation ovaries and testes of male and female fish.

- Ovaries of female fish sampled at mature stage at 3-5 (Mature) was weighed and counted eggs in ovarian preservation in 10% formalin for fecundity studies.

#### ***Water quality parameters analysis***

Prior to demersal fish sampling, dissolved oxygen, pH, salinity and temperature were measured *in situ* by a YSI 556 MPS meter at a depth of 0.5 m from the water surface. Salinity was

measured using the Practical Salinity Scale.

## **Results**

### **1. Species composition of demersal fish**

The study found that Moo-kho Bulon With aquatic diversity up to 69 species of the fish 64 species of squid 2 species of crabs 3 species and mantis one species. There are differences in the composition of the type and quantity of fish.

In May 2012 there found 187 fish only one species, *Sillago sihama* the total weight of 5648.6 grams.

In June 2012 there found 36 species of fish, *Saurida undosquamis* were found 17 fish, with total weight 1062.3 grams, *Sardinella albella* there found 13 fish total weight 268.8 grams, *Escualosa thoracata* there found only one fish with weight 9.4 grams, *Anodontostoma chacunda* there found only one fish with weight of 47.2 grams, *Thryssa mystax* there found 9 fish with total weight 362.6 grams, *Opisthopterus* sp. There found 3 fish with total weight 135.5 grams, *Megalaspis cordyla* there found only one fish with weight of 35.8 grams,

*Selaroides leptolepis* there found 24 fish with total weight 442.1 grams, *Scomberoides tala* only one fish with weight 13.5 grams, *Alepes melanoptera* only one fish with weight 62.4 grams, *Caranx ignobilis* only one fish with weight 59.6 grams, *Atule mate* there found 3 fish with weighing 88.8 grams, *Gerres oyena* only one fish with weighing 81.7 grams, *Gerres filamentosus* there found 5 fish with total weight 105.7 grams, *Diagramma pictum* only one fish with weight of 43.5 grams. *Lethrinus lentjan* were found 9 fish with total weight 262.6 grams, *Lutjanus lutjanus* were found 2 fish with total weight 123.2 grams, *Upeneus sundaicus* were found 26 fish with total weight 758.3 grams, *Upeneus luzonius* were found 48 fish with total weight 1540.9 grams, *Nemipterus peronii* were found 21 fish with total weight 713.6 grams, *Scolopsis taenioptera* were found 69 fish with total weight 2802.9 grams, *Scolopsis vosmeri* were found 2 fish with total weight 97.9 grams, *Otolithes ruber* were found 2 fish with total weight 210.4 grams, *Pennahia pawak* were found 2 fish with total weight 137.2 grams, *Pennahia anea* were found 8 fish with total weight 368.4 grams, *Johnius carouna* were found 18 fish with total weight 657.3 grams, *Rastrelliger kanagurta* was found only one fish with weight 26.5 grams, *Rastrelliger brachysoma* were found 3 fish with weight 127 grams, *Cephalopholis boenak* was found only one fish with weight 39.8 grams, *Epinephelus bleekeri* were found 4 fish with total weight 162.2 grams, *Epinephelus sexfasciatus* were found 2 fish with total weight 46.8 grams, *Sillago sihama* were found 159 fish with total weight 6069 grams, *Sillago Aeolus* were found 5 fish with total weight 158.5 grams, *Sphyraena putnamae* were found 6 fish with total weight 729.6 grams, *Platycephalus indicus* were found 3 fish with total weight 535.4 grams, *Netuma thalassinus* was found only one fish with weight 36.9 grams. All fish sample were found 474 fish with total weight of 18423.3 grams.

In July 2012 there found fish of 45 species of fish, *Setipinna taty* was found only one fish with weight 17.10 grams, *Megalaspis cordyla* was found only one fish with weight 48.50 grams, *Selaroides leptolepis* were found 7 fish with weight 197.80 grams, *Scomberoides tala* were found 2 fish weight 92.50.grams, *Ephippus orbis* was found only one fish with weight 32.80 grams, *Gerres oyena* were found 2 fish with weight 26.60 grams, *Amblyeleotris guttata* was found only one fish with weight 3.90 gram, *Lethrinus lentjan* were found 3 fish with weight 92.60 grams, *Karalla daura* was found only one fish with weight 24.40 grams, *Nuchequula gerreoides* were found 23 fish with weight 221.40 grams, *Leiognathus lineolatus* were found 18 fish with weight 163.10 grams, *Eubleekeria splendens* were found 4 fish with weight 30.70 grams, *Secutor ruconius* were found 3 fish with weight 10.10 grams, *Lutjanus*

*lutjanus* were found 8 fish with weight 204.50 grams, *Lutjanus* sp. Was found only one fish with weight 54.90 grams, *Upeneus Sundaicus* were found 9 fish with weighing 357.70 grams, *Upeneus luzonius* were found 31 fish with weight 1116.90 grams, *Upeneus tragula* were found 31 fish with weight 957.40 grams. *Nemipterus peronii* was found only one fish with weight 35.40 grams, *Scolopsis taenioptera* were found 6 fish with weight 555.60 grams, *Nemipterus japonicus* was found only one fish with weight 34.00 grams, *Otolithes ruber* were found 53 fish with weight 1042.30 grams, *Pennahia pawak* were found 16 fish with weight 386.40 grams, *Johnius carouna* were found 45 fish with weight 1150.50 gram, *Dendrophysa russelii* was found only one fish with weight 19.10 grams, *Scomberomorus guttatus* was found only one fish with weight 18.60 grams, *Cephalopholis boenak* was found only one fish with weight 14.80 grams, *Epinephelus bleekeri* were found 2 fish with weight 72.60 grams, *Sillago sihama* were found 342 fish with weight 13019.20 grams, *Sphyraena putnamae* was found only one fish with weight 188.50 grams, *Terapon puta* were found 2 fish with weight 36.20 grams, *Trichiurus japonicus* was found only one fish with weight 88.50 grams, *Trichonotus* sp. was found only one fish with weight 6.50 grams, *Cynoglossus bilineatus* was found only one fish with weight 7.70 grams, *Pseudorhombus arsius* were found 5 fish with weight 308.30 grams, *Platycephalus indicus* were found 7 fish with weight 1,600.90 grams, *Platycephalus japonica* were found 17 fish with weight 1842.30 grams, *Netuma thalassinus* were found 6 fish with weight 40.10 grams, *Monacanthus chinensis* was found only one fish with weight of 97.40 grams, Octopus (*Octopus* sp.) were found 2 sample with weight 113.20 grams, Squid (*Loligo* sp.) was found only one sample with weight 26.60 grams, Mantis (*Harpiosquilla raphidea*) were found 2 sample with weight 83.00 grams, Crab (*Portunus gladiator*) was found only one with weight 31.90 grams, Crab (*Matuta lunaris*) were found 2 sample with weight 23.80 grams, Crab (*Dromodia* sp.) was found only one sample with weight 110.10 grams. All samples were found 667 samples with total weight of 25006.40 grams.

In January 2012 were found samples in 21 species of fish, *Caesio cuning* Redbelly was found only one fish with weight 23.3 grams, *Selaroides leptolepis* was found only one fish with weight of 24.2 grams, *Gerres filamentosus* was found only one fish with weight of 50.4 grams, *Gazza minuta* Toothpony were found 3 fish with weight 162.2 grams, *Lutjanus madras* were found 28 fish with weight 679.3 grams, *Nemipterus peronii* was found only one fish with weight 45.6 grams, *Scolopsis taenioptera* were found 2 fish with weight 197.5 grams, *Scolopsis vosmeri* were found 4 fish with weight 468.6 grams, *Scolopsis monogramma* was found only one fish with weight 195.8 grams, *Otolithes ruber* were found 14 fish with weight 424.5 grams, *Pennahia pawak* were 2106

found 6 fish with weight 446.8 grams, *Johnius carouna* were found 2 fish with weight 63.1 gram, *Dendrophysa russelii* was found only one fish with weight of 25.7 grams, *Cephalopholis boenak* was found only one fish with weight 106.5 grams, *Epinephelus bleekeri* was found only one fish with weight 145.5 grams, *Siganus canaliculatus* was found only one fish with weight of 69.6 grams, *Siganus javas* were found 2 fish with weight 97.6 grams, *Sillago sihama* were found 77 fish with weight 3266.3 grams, *Sphyraena obtusata* was found only one fish with weight 52.3 grams, *Platycephalus indicus* were found 2 fish with weight 384.7 grams, *Netuma thalassinus* were found 96 fish with weight 5672.3 grams. All samples were found 246 samples with total weight of 12601.80 grams.

In March 2013 were found *Saurida undosquamis* 8 samples with weight 598.10 grams, *Nuchequula gerreoides* 13 samples with weight 172.30 grams, *Upeneus sundaicus* 20 samples with weight 774.70 grams, *Upeneus tragula* 5 samples with weight 110.40 grams, *Nemipterus peronii* 3 samples with weight 110.80 grams, *Scolopsis taenioptera* 6 sample with weight 151.80 grams, *Nemipterus japonicus* 5 samples with weight 96.40 grams, *Sillago sihama* 347 samples with weight 12952.60 grams, *Terapon puta* 2 samples with weight 86.50 grams, *Platycephalus japonica* 5 samples with weight 382.60 grams, *Netuma thalassinus* 1 sample with weight 119.30 grams, Octopus (*Octopus* sp.) 2 samples with weight 186.70 grams. The crab (*Portunus gladiator*) were found 11 samples with weight 751.00 grams. Total samples were found 428 samples with total weight of 16493.20 grams.

2. Distribution of Demersal fishes dominant species in Moo-kho Bulon Satun, Province. Species dominant observed at Moo-Bulon Satun Province were found in fish *Sillago sihama* of 1,112 samples (representing 55.54%), followed by *Netuma thalassinus* 104 samples (representing 5.19%). *Scolopsis taenioptera* 83 samples (representing 4.15%), *Upeneus luzonius* of 79 samples (representing 3.95%), *Platycephalus indicus* total of 12 samples (or 0.60%), *Platycephalus japonica* of 22 samples (representing 1.10%), *Upeneus sundaicus* of 55 samples (representing 2.75%). *Johnius carouna* of 65 samples (representing 3.25%), *Otolithes ruber* of 69 samples (representing 3.45%), *Saurida undosquamis* of 25 samples (representing 1.25%), *Upeneus tragula* of 36 samples. (representing 1.80%) *Pennahia pawak* of 24 samples (representing 1.20%), *Sphyraena putnamae* of 7 samples (representing 0.35%). *Nemipterus peronii* of 26 samples (representing 1.30%) with crab *Portunus gladiator* of 12 samples (representing 0.60%).

Species dominantly observed at Moo-Bulon Satun Province by total weight found in *Sillago sihama* total weight of 40,955.70 grams (representing

52.39%), followed by *Netuma thalassinus* a total weight of 6,268.60 grams (representing 8.02%), *Scolopsis taenioptera* total weight of 3707.80 g (representing 4.74%), *Upeneus luzonius* total weight of 2657.80 grams (representing 3.40%). *Platycephalus indicus* total weight of 2,521.00 grams (representing 3.22%). *Platycephalus japonica* total weight of 2224.90 grams (representing 2.85%), *Upeneus sundaicus* total weight of 1890.70 grams (representing 2.42%).

### 3. Demersal fishes dominant species with Descriptions in Moo-kho Bulon.



**Fig. 1** *Sillago sihama*

**Diagnostic Features:** First dorsal fin with XI spines and second dorsal fin with I spine and 20 to 23 soft rays; anal fin with II spines and 21 or 23 soft rays. Lateral-line scales 66 to 72. Vertebrae: 14 abdominal + 2 to 8 modified + 12 to 18 caudal, total of 34. Two posterior extensions to the swimbladder, two anterior extensions extend forward and diverge to terminate on each side of the basioccipital above the auditory capsule; two lateral extensions commence anteriorly, each sending a blind tubule anterolaterally and then extending along the abdominal wall below the investing peritoneum to just posterior of the duct-like process; two posterior tapering extensions of the swimbladder project into the caudal region, one usually longer than the other; the lateral extensions are normally convoluted and have blind tubules arising along their length. Colour: Body light tan, silvery yellow-brown, sandy brown, or honey coloured; paler brown to silvery white below; a midlateral, silvery, longitudinal stripe normally present; dorsal fins dusky terminally with or without rows of dark brown spots on the second dorsal-fin membrane; caudal fin dusky terminally; no dark blotch at the base of the pectoral fin; other fins

hyaline, the anal fin frequently with a whitish margin. After long preservation the coloration may become a uniform light brown. (Fig. 1)

**Geographical Distribution:** A wide ranging species throughout the Indo-West Pacific region from Knysna, South Africa to Japan. Although *Sillago sihama* has been recorded from Japan by numerous authors (see *S. japonica*) it appears that many records refer to *Sillago japonica*. The two species can be positively identified by reference to the swimbladder morphology, and the total vertebrae counts (33 in *S. sihama*, 34 in *S. japonica*). In Australia from Broome in the west to Townsville, Queensland.

**Habitat and Biology:** A nearshore species that frequently penetrates estuaries for considerable distances. The species has been recorded from freshwater by Günther and Macleay despite the absence of renal corpuscles or tubules in the kidney. It is common along the beaches, sandbars, mangrove creeks and estuaries; but very rarely captured by prawn trawling vessels. In depths ranging from 0 to 20 m (seldom 60 m). Like most members of the family, *S. sihama* may bury itself in the sand when danger approaches and commonly avoids seine-nets by employing this behaviour. The principal items of diet are polychaete worms (*Marphysa*, *Perinereis*, *Nereis*), small prawns (*Penaeus*), other Crustacea (*Ocypoda*, *Alpheus* and *Gonodactylus*), shrimps and amphipods. Small fish are often taken and filamentous algae is consumed. Australian specimens frequently contain polychaete worms and small Crustacea. The spawning season in India is November to March with advanced post-larvae appearing from December to February, reaching 25 mm by April.

The growth is rapid, attaining sexual maturity at a length of 13 to 14 cm at about 1 year, 16 to 20 cm at 2 years, 20 to 24 cm at 3 years and 24 to 28 cm by 4 years of age. Growth rings on the otolith are clearly defined and it is possible to discern rings with the naked eye. The egg is spherical, colourless and buoyant, 0.5 to 0.6 mm in diameter, and without a large oil globule. Palekar and Bal (1961) found numerous small oil globules that fused into a large single oil globule in the fully ripe ovum which measured from 0.57 to 0.80 mm. The presence of a single shining, translucent oil globule is characteristic of the mature ovum. Spawning takes place in the Kali river estuary during August to October and occurs only once during the season. Fecundity varied between 16 682 and 166 130. The size at first maturity is much larger (235 mm for females and 224 mm for males) than that and the time of spawning is at variance with that. Accurate identification of *S. sihama* is of crucial importance in such studies. It has

been shown that misidentification of this species, especially with *S. japonica*, *S. lutea* and *S. vincenti*, is widespread.

**Size:** To 30 cm standard length

**Interest to Fisheries:** An important foodfish throughout its range. Taken by seine net and cast net in the mouths of estuaries and along coastal beaches in bays. Large schools are common in estuaries and fleets of canoes with cast net fishermen encircle the school and cast together or in rapid succession. As the fish burrow into the sand to escape the seine net children and women follow the hauled net and feel for the fish with the feet; the buried fish is captured by hand and dispatched by biting the fish behind the head or threaded by the gills on cord and toggle. Considerable catches are made but generally not reflected in the fishery statistics. In Pakistan the main fishery takes place in June to July. The species is recognised as a superior fish for invalids and children. For this reason it does not always appear in small markets and is rarely salted or dried. Recipes for cooking frequently include milk or coconut juice, the flesh being simmered or steamed rather than deep fried. When steamed the flesh is of delicate texture, flavour and of clean white appearance. It is a potential candidate for aquaculture.

### **Discussions (with cited references)**

The species composition of demersal fish in Moo-Kho Bulon Satun, Province. The study found that Moo-Kho Bulon Satun, Province there are diversity up to 69 species of fish, 64 species of squid are two species of crab mantis shrimp one species.

Species dominantly observed at Moo-Kho Bulon Satun, Province of is found in fish *Sillago sihama* of 1,112 samples (representing 55.54%), followed by *Netuma thalassinus* 104 samples

(representing 5.19%) *Scolopsis taenioptera* 83 samples (representing 4.15%), *Upeneus luzonius* of 79 samples (representing 3.95%), respectively.

Species dominantly observed at Moo-Kho Bulon Satun, Province by weight found in fish *Sillago sihama* total weight of 40,955.70 grams (representing 52.39%), followed by *Netuma thalassinus* a total weight of 6,268.60 grams (representing 8.02%), *Scolopsis taenioptera* total weight of 3707.80 grams (representing 4.74%), respectively.

Several factors appear to contribute to this geo- graphical differentiation. These include the gradient in eutrophy, fresh/brackish water runoff, temperature and salinity differences and differences in the extent and the bottom type of the continental shelf. Similarly, in other stud- ies covering wide

geographical areas differentiated assemblages, associated in general with environmental variability, were described (Bianchi, 1991,1992a,b; Fariña *et al.*, 1997b).

In summary, the present study has clarified the impacts of habitat and season on the abundance, species richness and community structure of demersal fish in Moo-Kho Bulon Satun, Province and related with water quality parameters.

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### References

- Angsunee, C. and R. Julaporn, (2001). Status of fisheries in Songkla Lake. Institute of Coastal Aquaculture, Department of Fisheries, Songkhla. 17 pp.
- Bianchi, G. –(1991). Demersal assemblages of the continental shelf and slope edge between the gulf of Tehuantepec (Mexico) and the gulf of Papagayo (Costa Rica). *Mar. Ecol. Prog. Ser.*, 73:121-140
- Bianchi, G. – (1992)a. Study of the demersal assemblages of the continental shelf and upper slope off Congo and Gabon, based on the trawl surveys of the RV ‘Dr Fridtjof Nansen’. *Mar. Ecol. Prog. Ser.*, 85: 9-23.
- Bianchi, G. – (1992)b. Demersal assemblages of the continental shelf and upper slope of Angola. *Mar. Ecol. Prog. Ser.*, 85: 101-120
- Dalley, E.L. and J.T. Anderson. (1939)"Distribution and abundance of Demersal Juvenile cod from inshore to offshore locations on the Northern Grand Bank and NE Newfoundland shelf in December, 1992."NAFO SCR Doc. 93135 Serial No.N2215
- Farinã A.C., J. Freire and E. González-Gurriarán. – (1997)b. Demersal fish assemblages in the Galician continental shelf and upper slope (NW Spain): spatial structure and long term changes.*Estuar. Coast. shelf Sci.*, 44: 435-454.
- Hajisamae, S., Chou, L. M. and Ibrahim, S. (2004). Feeding habits and trophic relationships of fishes utilizing an impacted coastal habitat, Singapore. *Hydrobiologia* 520: 61–71.
- Hajisamae, S., Yeasin, P. and Ibrahim, S. (2006). Feeding ecology of two sillaginid fishes and trophic interrelations with other co-existing species in the southern part of South China Sea. *Environmental Biology of Fishes.* 76: 167–176.
- McKay, R. J. (1992). *FAO Species Catalogue, Vol. 14. Sillaginid Fishes of the World (family Sillaginidae). An Annotated and Illustrated Catalogue of the Sillago, Smelt or Indo-Pacific Whiting Species Known to Date.* FAO Fish. Synops. No. 125. Rome : FAO.
- Messieh, S.N. (1989). "Changes in the Gulf of St. Lawrence Herring Populations in the Past Three Decades." NAFO SCR Doc. 89174 Serial No. N 1655 : 1-47.

Sasaki, K. (2001). Sciaenidae. In. The Living Marine Resources of the Western Central Pacific. FAO Species Identification Guide for Fisheries Purposes. (Carpenter, K.E. & Niem, V.H. eds.) Vol 5. Bony fishes part 3 (Menidae to Pomacentridae), pp.3117-3174. Rome : FAO.