

## Fish Fauna and Fisheries in the Coastal Waters of Similajau, Bintulu, Sarawak, Malaysia

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### Abstract

The coastal waters of Similajau serve as traditional fishing grounds for fishermen from Kuala Nyalau and for those from as far away as Bintulu. This study on fish fauna and fisheries in the area was carried out before the construction of Samalaju Industrial Park and Samalaju Port. It was aimed at documenting fish fauna composition and fisheries in the area so that data collected could provide future baseline information. Subjects for the study were collected using monofilament gill nets of three different mesh sizes and monofilament drift nets. A total 1,336 fish comprising 42 families and 120 species were caught from the area. The five dominant families were Carangidae (17.8%), Engraulidae (16.2%), Pristigasteridae (10.7%), Ariidae (8.3%) and Synodontidae (7.8%). The five dominant species collected were *Parastromateus niger* (13.1%), *Harpodon nehereus* (7.6%), *Setipinna taty* (4.3%), *Setipinna tenuifilis* (4.2%), and *Ilisha elongate* (3.9%). Fishing activities were carried out within 10 km of the coastline using a small size fiberglass boat powered by a 15 to 40 hp engine. Fishing methods employed included gill nets, drift nets, hooks and lines, long lines, trap nets, cast nets and push nets. The fishing season is from March to September, when the sea is calmer, and peaks in June and July. The quantity of fish caught ranged from 50 to 200 kg per fishing trip.

Key words: coastal fisheries, length-weight, Samalaju Port, Kuala Nyalau

### Introduction

In Malaysia, marine fisheries contribute significantly to the national economy as they are an important source of protein, employment and foreign exchange. Landings from marine fisheries sector increased from 570,754 mt in 1985 to 1,373,105 mt valued at RM6.939 billion in 2011. This sector provided employment to 134,110 fishermen and contributed to about 1.1% to the gross domestic product of the nation in 2011 (DOF, 2011).

In Sarawak, landings from marine fisheries sector were 119,459 mt in 2011, and it provided employment for 16,000 people (DOF, 2011). However, the landings from marine fisheries started to decline from 2005.

The coastal waters of Similajau in Bintulu, Sarawak have always been traditional fishing grounds for fishermen from Kuala Nyalau. With development taking place along the coastal zone, especially the demarcation of Samalaju Industrial Park and the construction of

Samalaju Port within the area, potential changes in fish fauna and fisheries in the area are expected to occur in the next few years when the industrial park and the port start operation. This study on fish fauna and fisheries was carried out before the construction of the industrial park and port. It was aimed at documenting the fish fauna composition and the diversity and status of fisheries in the coastal waters of Similajau so that the results obtained could act as baseline data for future studies.

### Materials and Methods

#### Study Sites and Fish Fauna Sampling

There is no official boundary of the coastal waters of Similajau. Nonetheless, in this study, the coastal waters of Similajau were identified as the aquatic environment stretching from the mouth of the Similajau river in the south to the Cape of Payong in the north. It is a straight coastal marine environment with a few small bays and

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caples, whereas brackish water only occurs at the mouths of the Similajau and Nyalau rivers. The seabed is predominantly sand and mud with patches of shoals and reefs. During the study, the beaches were sandy with rocky features at the caples, adjoining intact forests on the land. The area is occupied by one community, which lives at the mouth of the Nyalau river.

Sampling of fish fauna was carried out at 15 stations in March, June, September, October and November 2008 and March and April 2011 (Figure 1). Subjects for the study were collected at all stations (except Station 11) using monofilament gill nets of three different mesh sizes of 2.5 cm, 5.0 cm, 7.5 cm with length of about 310 m each. At station 11, a monofilament drift net with mesh size of 12.5 cm and length of 2.7 km was used. At station three, an additional fishing method consisting of hook and line was used to catch freshwater prawns. Each type of fishing method was employed in a similar manner at all the stations (except station 11). When gill nets were employed, they were placed at each station for a period of four hours from 0700 to 1100 hr. The drift net was placed at 0400 hr and lifted at 0630 hr. Fishing for fresh-

water prawns using hooks and lines and baited hooks using earthworms were carried out by six persons from two different boats.

Fish species were mostly identified *in situ*. Only specimens that could not be identified in the field were preserved in 10% formalin and later transferred to 70% ethanol for identification in the laboratory. Fish were identified based on Masuda *et al.* (1984), Kottelat *et al.* (1993), Mansor *et al.* (1998) and Lim & Gambang (2009). The total length and weight of every fish was measured with a fish measuring board and portable electronic balance (Shimadzu ELB-600) respectively.

Additional data on the fisheries at Kuala Nyalau Village were obtained through open-ended interviews with full time fishermen in the study area.

### Diversity Indexes

At each station, the diversity (H), richness (D) and evenness (J) indices were calculated following Shannon and Weaver (1963), Margalef (1968) and Pielou (1966), respectively.

### Results

#### Fish Composition

A total 1,336 individuals comprising 42 families, 73 genera and 120 species were caught from the study area. The ten dominant families recorded were Carangidae comprising 17.8% of the total number of individuals caught, followed by Engraulidae (16.2%), Pristigasteridae (10.7%), Ariidae (8.3%), Synodontidae (7.8%), Lutjanidae (3.9%), Serranidae (3.5%), Sciaenidae (3.4%), Stromateidae (3.3%) and Kurtidae (3.1%) (Figure 2). The dominant species was *Parastromateus niger* comprising 13.1% of the total number of individuals caught, followed by *Harpodon nehereus* (7.6%), *Setipinna taty* (4.3%), *Setipinna tenuifilis* (4.2%), *Ilisha elongata* (3.9%), *Coilia macrognathus* (3.8%), *Kurtus indicus* (3.1%), *Pampus argenteus* (2.7%), *Ilisha megaloptera* (2.4%) and *Lutjanus vitta* (2.2%) (Figure 3).

The diversity index was highest at station ST5,

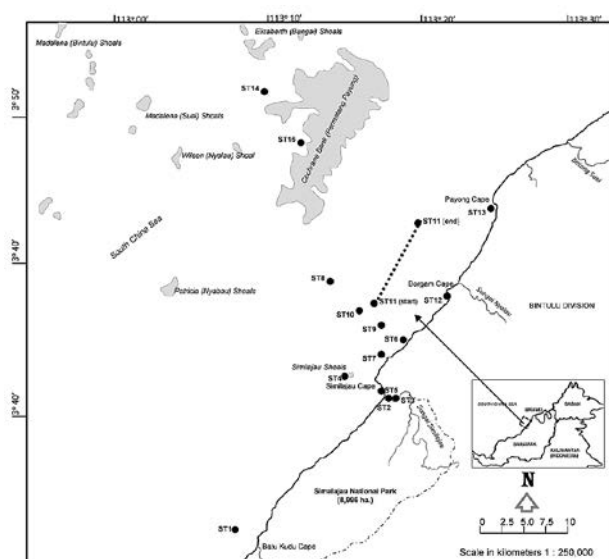


Figure 1. Location of the fish fauna sampling stations at the coastal waters of Similajau, Bintulu.

Table 1. The values of diversity, evenness and richness indices for each station.

| Station | H    | D     | J    |
|---------|------|-------|------|
| ST1     | 1.12 | 10.54 | 0.91 |
| ST2     | 1.14 | 10.28 | 0.92 |
| ST3     | 1.27 | 11.56 | 0.93 |
| ST4     | 0.71 | 5.70  | 0.71 |
| ST5     | 1.29 | 11.67 | 0.96 |
| ST6     | 1.01 | 11.00 | 0.69 |
| ST7     | 1.25 | 12.03 | 0.96 |
| ST8     | 0.99 | 6.38  | 0.91 |

| Station | H    | D     | J    |
|---------|------|-------|------|
| ST9     | 1.21 | 11.86 | 0.84 |
| ST10    | 1.13 | 8.96  | 0.90 |
| ST11    | 0.35 | 3.00  | 0.39 |
| ST12    | 0.86 | 5.22  | 0.90 |
| ST13    | 0.98 | 5.74  | 0.98 |
| ST14    | 0.99 | 7.97  | 0.84 |
| ST15    | 0.96 | 6.07  | 0.89 |

showed the most richness at station ST7, and the highest similarity at stations ST5 and ST7. The diversity, richness and similarity indices were lowest at station ST11 (Table 1).

**Fisheries**

There were 107 fishermen and five fish dealers in Kuala Nyalau. Fishermen used fiberglass boats with lengths of about 9 m powered by 15 to 40 hp engines. Fishing activities were mainly carried out within 10 km of the coastline except during certain fishing seasons (e.g., for black pomfret *Parastromatesu niger*) where fishermen would go up to 15 km offshore or 40 km out when fishing at reefs and rough ground. The popular fishing grounds included the coastal area from Payong cape to Likau shoals and as far as a few kilometers north

of Pematang Payung (Figure 1).

The fishing season was during the months of March to September, when the sea was calmer, and peaked in June and July. Fishing equipment used included gill nets, drift nets, hooks and lines, long lines, trap nets for reef fishes and mangrove crabs, and push nets. The quantity of fish caught varied greatly, ranging from 50 kg to over 200 kg.

During *Acetes* spp. (locally known as *bubuk*) season from February to June and peaking in March and April, push nets and purse seine nets with a small mesh size were used. A push net operated manually could catch 30 kg per fishing trip of four hours, whereas a push net operated using an outboard powered engine could catch up to 200 kg per fishing trip. A purse seiner could catch as much as 400 kg per fishing trip. The Similajau river

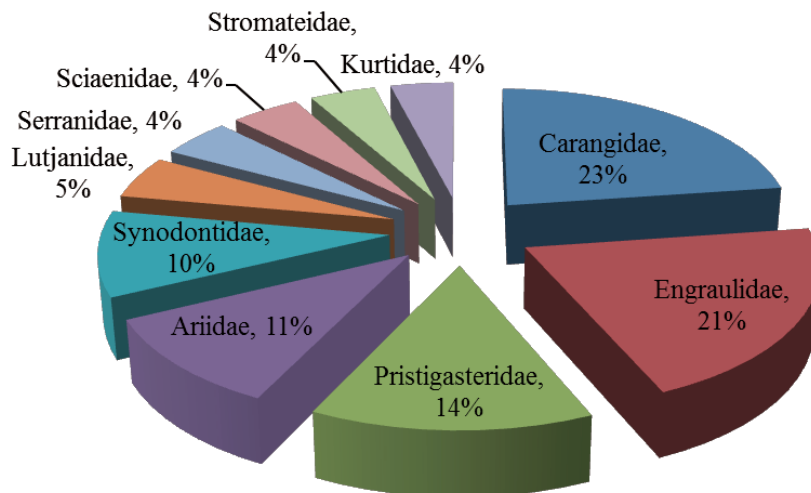


Figure 2. The ten dominant families caught in the coastal waters of Similajau, Bintulu.

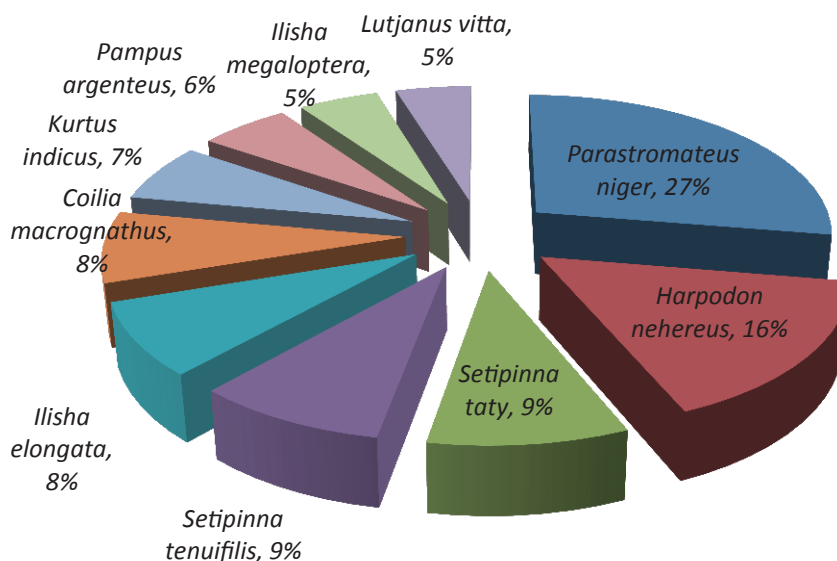


Figure 3. The ten dominant species caught in the coastal waters of Similajau, Bintulu.

was also a popular fishing area for the fishermen from the Kuala Nyalau village, especially during the period of rough seas. The normal catch per fishing trip was approximately 20 to 30 kg of fish. The most commonly caught species were sea catfish from the family Ariidae (*Arius* spp.) and made up about 70 percent of the total catch.

## Discussion

The species of fish prevalent in the study area were typical of the fish species reported elsewhere in coastal areas of Sarawak (Nyanti & Gambang, 2010). The sizes of the fish caught were also similar to those reported for the Semariang mangrove area by Nyanti *et al.* (2012a) and for the area of Lutong river (Nyanti *et al.*, 2012b).

Construction activity for the Samalaju Industrial Park and Samalaju Port as well as operation of these facilities could affect fish and fishing activities in the area. The major effects will likely be due to the potential significant increase in silt and total suspended solids added to the nearby coastal waters especially during dredging, disposing of dredged sediments to the spoil ground and piling works related to port construction.

Marine fish landings in Bintulu have been decreasing since 2004. In 2009, the landing had decreased by 35 percent compared with the 2003 landings (DOF, 2008). This scenario is also reported for other areas in Malaysia, where the coastal waters are overfished as large numbers of fishers exploit fisheries resources in the area. This has led to changes where small and low-values fish species dominate the landings rather than high-value species.

Fish at all life stages are sensitive to increased levels of suspended sediment. However, juvenile and adult fish are more resilient to high concentrations of suspended sediment than the eggs or larvae stage (Newcombe, 1994). Fish populations may be affected by the presence of a high amount of suspended solids in the water, resulting in clogging and abrading of gill rakers (Cordone and Kelley, 1961) and stress and suppression of the immune system leading to increased susceptibility to disease and osmotic dysfunction (Redding *et al.*, 1987). Growth of fish could be impaired due to excess suspended sediment as it could reduce the quality of light, thereby reducing fish ability to see and secure food (Singler *et al.*, 1984). A significant reduction in fish growth was reported in concentrations of suspended sediment ranging from 100 to 1000 mg/l (Canadian Environmental Quality Guidelines, 2002).

An increase in shipping will cause a general increase in background noise (Popper and Hastings, 2008) and

depending on the intensity, the response to sounds might range from no overt change in behavior to exhibiting a mild awareness of the sound or a startle response (Wardle *et al.* 2001) to small temporary movements for the duration of the sound to larger movements that might displace fish from their normal locations (Slotte *et al.* 2004) for short or long periods of time.

Although fish mortality is not likely to occur in open sea water in areas near Similajau as fish are highly mobile and are able to respond quickly to changes in their physical environment (Russell *et al.*, 1978), the factors noted above are likely to create an avoidance response from the fish population where migratory or sporadic visitors will avoid the area (Anderson *et al.*, 1996) leading to a smaller population of fish coming to the area and therefore, less fish being caught by the fishermen. In addition, the movement of marine traffic will cause inconvenience to the fishermen. Therefore, the operation of Samalaju Industrial Park and Samalaju Port will be likely to affect fishing activities and the fish catch in the area.

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