Biological aspects of fish indo pacific tarpon (*Megalops cyrinoides* Broussonet, 1782) at Belawan River

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**Abstract.** The purpose of this study was to analyze the distribution pattern, size and high-length relationships of the Indo Pacific tarpon *Megalops cyrinoides* in the Belawan River. This is exploratory research with purposive randomly sampled method. The results showed that Morisita index value were reached of 0.299 in station 1, 0.121 (station 2), 0.277 (station 3), thus the distribution of indo pacific tarpon have a uniform spread pattern. Based on total sample of fishes divided into 3 classes: small size from (9.0 – 24.9 cm), medium from (25 – 40.9 cm) and large (> 40 cm). The dominant fish belongs to the young fish category. Similarly, caught fish was light and medium weight category (young fish). The results of the morphometric fish followed the equation: \( W = 0.3978 L^{0.9980} \), with coefficients of determination (\( R^2 \)) = 0.8732.

1. **Introduction**

The Indo Pacific tarpon (*Megalops cyprinoides* Broussonet 1782) are classified into, Order: *Elopiformes*; Family: *Megalopidae*; Genus: *Megalops*, Species: *cyprinoides* [1]. The fish body shape is long and flat, with a smooth abdomen. Have a single dorsal fin with total fin fingers of 16-20 pieces. At the end of the dorsal fin is extended by the presence of filaments. When seen from the side, the upper part of the body is convex. The pectoral fin has 14-15 fin fingers, 10-11 pelvic fins and 23-28 anal fins. The upper jaw extends to almost behind the eye boundary and has a mouth shape that can be opened wide. Based on the life cycle, many adult fish spawn in coastal waters. After hatching, fish in the form of *laptocephalus* larvae migrate to freshwater (rivers) where they stay and mature for 2-4 years before returning to the sea [2].

Bioindicators are groups or communities of organisms whose presence or behavior in nature correlates with environmental conditions hence it can be used as an indication of environmental quality [3]. Indo pacific tarpon has low economic value but has an important role in tropical levels in the ecosystem and environment, which can be used as a bioindicator of the water quality [4]. Another important role is to control animal populations in nature. Based on the research results by [5] they have carried out gastric analysis on Indo Pacific Tarpon and obtained shrimp, larvae and aquatic insects, *Chironomus* larvae, crustacean larvae, *Polychaeta*, worms, and other materials in its stomach.

Internationally, this fish is known as oxeye herring or indo pacific tarpon and with the scientific name of *Megalops cyprinoides* Broussonet (1782). This fish is known to be close relatives of *Megalops atlanticus*. In various countries, it is known by several names, in India (*Alanku*), Australia (Indo Pacific Tarpon), in Japan (*Hairen, Isegoi*) in Sri Lanka (*Ileya, Mareva*), in Philippines (*Abulong, Buan-buan*).
In the IUCN list contained in the article of [6] indo Pacific tarpon fish (Megalops Cyprinoides Broussonet, 1782) has been in the red list and has been threatened. This category is caused by lack of data and information about this fish. In Indonesia, the indo pacific tarpon fish are spread in the coastal waters of Java, Sumatera, Kalimantan, Sulawesi Selatan and Arafuru [7].

Indo Pacific Tarpon in the Belawan River has experienced a decline in population from year to year. Allegedly the causes are overfishing, habitat degradation and water pollution. In regard to still few studies that examine aspects of this fish life in Indonesia hence data and information about these fish are still very minimal [8]. The city of Belawan and Tanjung Balai have almost identical characteristics, namely the high population, the central industrial location, trade and port, so that coastal waters in both locations have a big chance of heavy polluted industrial waste containing heavy metals [9].

There are still few studies that examine aspects of tarpon life in Indonesia hence this study aims to obtain data on the distribution pattern, size and morphometric of the fish on the Belawan River. Therefore I am interested in conducting this research to find out the existence of its population in the waters of the Belawan River.

2. Materials and Methods
2.1 Research Location
The research was conducted on three rivers in the Belawan region. Observations were carried out at three locations, namely: station 1 at the mouth of the Baharu River (30°45'7.60" N, 1°98'03'51.2" E1); station 2 at the Sungai Buluh estuary (30°44'22.1" N, 1°98'03'26.6" E1); and station 3 at the Sungai Terjun estuary (30°44'20.2" N, 1°98'03'39'8.59" E1). The main rainy season starts in January and extends to the end of March, 2014.

2.2 Procedure
Sampling was done by purposive sampling method. The sampling tool used was a net with an area of 12.56 m². Sampling was done once per month by spreading nets 30 times at each observation station. measure the length-height of the fish using a 1 mm accuracy bar and to measure the weight of the fish using analytical scales with accuracy of 0.01 g.

2.3 Data Analysis
Distribution patterns use the formula by Khouw [10]. The measurements of total length was done by grouping fish into long-size classes. This grouping was done by first setting the "range" or class interval and the length of the class boundaries based on the number [11]. The relationship of length and weight of fish was measured using formula based on Effendie [12].

3. Result and Discussion
3.1 Distribution of Abundance
Morisita Index value at station 1 (id = 0.299), station 2 (id = 0.121), and station 3 (id = 0.2773). This showed that the pattern of fish distribution was uniform/even. This was presumably due to competition for food and differences in water condition factors. According to Simanjuntak [13] distribution patterns can occur due to the availability of niches (habitat and food) and changes in water quality. In India, the percentage of Megalops cyprinoides ranged from 0.28 in March and 6.87 in April [14]. According to Zorica [15] each type of fish requires optimum environmental conditions for life and growth. Stated that the decline in fish populations will usually progress faster due to degradation of the aquatic environment [16]. Habitat degradation will result in a decrease in fish catch and extinction in the habitat [17].
Table 1. Indo pacific tarpon distribution pattern based on observation stations on the Belawan waters

| Observation | Morisita Index Value | Category          |
|-------------|----------------------|-------------------|
| Station 1   | 0.299                | Uniform/Even      |
| Station 2   | 0.121                | Uniform/Even      |
| Station 3   | 0.273                | Uniform/Even      |

3.2 Size Distribution

Based on the sampling results, the total number of fish caught was 160. After measuring the length of 160 fish, it was identified that the size of the fish was 9.4 cm–42.2 cm. Furthermore, fish were divided according to size class based on Total Length (TL), but first, the interval for the size class must be determined based on the fish caught. In this research the size of the fish class was divided into 3, namely: small (9 - 24.9 cm), medium (25 - 40.9 cm), and large (> 40 cm). Dominant fish caught in small size classes, then medium and the least large size. Allegedly there has been overfishing for indo-pacific tarpon hence large size fish were very difficult to obtain on the Belawan River.

Overexploitation or overfishing can cause fish resources to decline continuously, where large fish are rarely found and the remaining small fish become the target of catches [18]. Stated that the number of fishermen in the Belawan Coast was 5,172 people [19]. Furthermore, based on data from the Belawan Ocean Fisheries Port in 2013 the number of fishermen increased to 10,659 people. Significantly this clearly accelerates the occurrence of overfishing of Fish Resources in Belawan Waters, because the area of the waters does not increase but the number of fishermen, the number of fleets, and fishing gear are definitely increasing. According to Manik [20] if the estimate that fish stocks are more capture-able (overfishing) then prevention efforts are needed hence fish resources are not used up.

Table 2. Indo Pacific Tarpon Abundance and Size Composition

| Size Classes (TL=cm) | Station 1 | Station 2 | Station 3 |
|----------------------|-----------|-----------|-----------|
|                      | Abundance/ | Abundance/ | Abundance/ |
|                      | Distribution | Distribution | Distribution |
|                      | %          | Mean      | %          | Mean      | %          | Mean      |
| 9-24.9               | 35         | 81.39     | 0.39       | 51        | 83.61      | 0.57       | 38         | 67.86     | 0.42       |
| 35-40.9              | 8          | 18.61     | 0.08       | 9         | 14.75      | 0.10       | 18         | 32.14     | 0.20       |
| > 41                 | -          | -         | 1          | 1.64      | 0.01       | -          | -          | -         | -          |
| Total                | 43         | 100       | 61         | 100       | 56         | 100       |

3.3 Morphometric

The relationship between the length and height of Indo-Pacific Tarpon fish obtained from the catches in the Belawan River followed the equation: y = 0.629 + 0.504, with a coefficient of determination (R2) = 0.983. According to Lestari et al [21] the value of coefficient of determination (R2) amounted to 0.904 that the alleged model was able to explain the diversity of data by 90.4%. The value of the correlation coefficient (r) of 0.905 or 90.5%, indicating the pattern of positive allometric growth.

Morphometric studies are not only to understand the taxonomy of fish but variations in measurements that may be related to habits and habitat among variants in fish species [22]. Opinions stated that environment influences, selection, and genetics at the individual ontogeny stage causing morphometric differences within a species [23, 24]. The difference in the number and size of fish in a population on the waters can be caused by patterns of growth, migration, and changes in new fish species in an existing population [25].
According to Effendie [12] environmental factors and hereditary factors also influence differences in growth in one species of fish. The born offspring when environmental conditions are less supportive for their growth such as in the dry season tends to have a lower growth rate than those born in the rainy season. This was because the offspring born in the rainy season can easily obtain food due to the abundant supply of nutrients in the estuary hence their growth is relatively high.

![Figure 1. Height length relationship of indo pacific tarpon in the Belawan River](image)

According to Deni et al [26] variations in the size of fish can be different due to environmental conditions, habitat, and food. Differences in aquatic productivity, exploitation rates and fish migration processes are thought to be the main factors in differences in the biological characteristics of fish [27, 28].

4. Conclusion
The distribution pattern of tarpon fish in the Belawan waters on all observation stations had id<1 value, then categorized as uniform/even. Based on the size class, both the length and height of the fish caught, more small size, then medium size and only a few large size fish. The analysis result of the relationship between the length and height of fish are negative allometric properties.

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