Feeding Habit of Fish Living Around Floating Net Cages in The Koto Panjang Dam, Riau

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Abstract. Feeding habit of fish is related to the presence of food source in their habitat. As there is fish feed pellets remains present in the water around the floating net cage, the feeding habit of wild fish living around the cage may be affected by that food source. To understand the type of food consumed by the fish living around the floating net cage in the Koto Panjang Dam, a study has been conducted on December 2018. Samplings were conducted 3 times, once/ 2 weeks and the fish were captured using gill net and lure placed in the surface and in the 15 m depth. Stomach of the fish were removed and the content was then analyzed and identified. There were 9 fish species present. In all fish sampled, the remains of fish feed pellets were present in the stomach and the percentage of fish pellets were as follows: 15% in the Puntius schwanefeldii; 67% in Hampala bimaculata; 25% in Tynnichtys vaillanti; 83% in P. bramoides; 23% in Macrones nigriceps; 25% in Mastacembelus unicolor; 50% in Osphronemus goramy; 67% in Cyprinus carpio and 100% in O. niloticus. High portion of fish feed pellets in the stomach of several wild fish species indicates that the wild fishes are greatly affected by the presence of fish feed pellets remains, while the presence of the pellets in the stomach of M. unicolor and M. nigriceps indicates that the remain of the pellets also affects the fish that live in 15 m depth.

Keywords: Pellets, floating net, stomach content, Koto Panjang Reservoir

1. Introduction

The Koto Panjang Dam is a man mad lake that is located in Riau Province, Sumatra, Indonesia. This dam was constructed from 1992 to 1997. The area of the dam was 12,400 hectares, with 73-85 m depth, and 96 m height of water gate. The water of the dam is flown from the Kampar and Batang Mahat Rivers [1]. The construction of this dam aims mainly for hydroelectric power plant. During the last decades, however, the dam was also used for conducting floating net cage aquaculture activities.

In the Koto Panjang dam, there are numbers of fish floating cages aquaculture. The fish culture is intensively conducted as the fish is kept in high density and the farmers fed the culttuted fish with nutritious commercial fish pellet. So far, the aquaculture in the Koto Panjang dam was succeed, however there was amount of fish feed pellets that were uneaten by the cultured fish and they were distributed around the cage. Around 30% of feed provided might not be consumed [3].
Food remains flown to the water may serve as food resources for wild fishes living around the cage. Fish feed flavor may attract wild fishes to come in the area around the cage and consume the remaining pellet [2]. Many type of fishes living around the cage were fed on the remains of fish feed pellet[3].

The ability of wild fishes in consuming fish feed pellets may be changing. By the year of 2007, there was 52.2% of feed remains present in the stomach of Puntius schwanenfeldii [3]. In the year of 2013, however, more than 90% of the stomach content was fish feed pellets. This fact indicates P. schwanenfeldii could consume the remaining fish feed pellets escaping from the cages. [2] also stated that the presence of the floating net cage aquaculture in the Koto Panjang Dam affects the type of food and feeding habit of wild fishes living around the cage.

Hence, the conducted study aims to understand the feeding habit of wild fishes living around the floating net cages in the Koto Panjang Dam nowadays by observing, measuring and characterizing the ingested pellet from the fish stomachs.

2. Materials and Methods

This research has been conducted from December 2018 to January 2019, in the Koto Panjang Dam. Fish was captured around the cages located in the dam site (Figure 1). Fish samplings were conducted 3 times, once/ 2 weeks. The fish was captured using big gill net (1.5 x 4 m; mesh size 4 inches); small gill nets (1 x 3m) with 3 inches and 1.5 inches mesh size and scoop net (mesh size 1 inch). The nets were places in 5 different depths, namely in the surface, 4 m; 8 m; 12 m and 15 m depths. To get the fish, the nets that were placed in the morning were removed in the evening, while those that were placed in the evening were removed in the following morning. Scoop nets were used to capture fish that inhabit the surface. Lures were also used to capture fish in 15 m depth. The fish captured were kept in a cool box filled with crushed ice and then they were froze. No chemical fixative used in this study.

![Figure 1. Study site](image-url)

The captured fishes were then grouped based on their species [4]. Then the fish were measured (TL and SL) and weighed. The stomach of the fish was then removed and the fullness of the stomach was noted. Only fish with around 25% stomach fullness were used in this study. Fish with empty stomach was discarded. The selected stomachs were then dissected and the content were removed and fixed in 70% alcohol. The type of food present were then grouped and identified. The stomach content was analyzed.
using a gravimetric method [5]. Each type of food was weighed and the data of food weight were then used to calculate the Preponderance Index [6] by this following formula:

\[
IP = \frac{V_1 O_1}{\sum V_1 O_1} \times 100
\]

\( V_1 \) = Volume of the particular food item
\( O_1 \) = Occurrence of the particular food item
\( IP \) = Index of Preponderance

3. Results and Discussion

During the study, 9 species of fishes were captured. Those fishes were categorized into 2 groups, the endemic and the non-endemic fish. The endemic fishes consist of *Hampala bimaculata*, *P. schwanefeldii*, *Tynnichtys vaillanti*, *P. bramoides*, *M. nigriceps*, *Mastacembelus unicolor* and *Osphronemus goramy*. While the non-endemic species were *common carp* (*Cyprinus carpio*) and *nile tilapia* (*O. niloticus*). It is predicted that the non endemic fish might be originated from the culture and escape from the cage.

Stomach content analysis showed that the remains of fish feed pellets present in the stomach of all fish captured. The proportion of the pellet remains is various. In *O. niloticus* and *T. vaillanti*, 100% of their stomach content was pellet remains. In the stomach of other fishes such as *H. bimaculata*, *P. schwanefeldii*, *P. bramoides*, *C. carpio* and *O. niloticus*, more than 50% of the stomach content was pellet remains. In *M. nigriceps* and *M. unicolor* that live in 15 m depth, the pellet remains in the stomach was around 20% only (Figure 2). These data suggested that the feeding habit of all wild fish present around the cage was affected by the presence of pellet remains originated from the aquaculture activities.

Based on the composition of food types present inside the stomach, the fish captured around the cages can be categorized as “opportunistic fish” that is able to use the feed pellet remains present in the water and directly and that food became their main food. As there are plenty pellet remains around the cage, the fish use this materials as its main food. In the stomach of these fishes, more than 50% of the food is pellet remains. The pellet remains can be identified by its soft texture with light brownish color. The presence of high amount of pellet remains in the stomach of these fishes indicate that those are able to use the food sources available and they may less consume their natural food. In other words, these fishes are able to change their natural diet into another food resources. The fish are able to change their diet as feeding habit of fish may be changed due to the type of food resources available. The feeding biology of fish is depending on prey availability, season, habitat differences and size of the fish [7].

![Figure 2. The Preponderance Index of stomach content of wild fish living around the floating net cage](image-url)
In this study, the fish that feed mainly on pellet remains are *H. bimaculata*, *P. schwanefeldii*, *P. bramoides*, *O. goramy*, *C. carpio* and *O. niloticus*. These fishes, however, are belonged to diurnal fish. During the day time, these fishes may wandering around the cage. When the fish in the cage were fed with fish pellets, the wild fishes may come around and gathering in the out side of the cage. The attractant that is added in to fish feed pellet is improved the feed flavor, and it may be detected by the wild fish. These fishes were then come to the cage area to be close to food resources. As the cultured fish feeding schedule is coincidence with the natural feeding time of these wild fishes, the uneaten feed that escape from the cage become valuable food resources for these wild fishes. Supplementation of artificial, dry diets with attractants (feeding stimulants) can increase acceptability of the fodder and as a consequent, the consumption of the fodder is increased [8]. Food flavor is mediated chemically by substances inherent to the food, and it effectiveness is affected by the chemosensitivity of the species. Therefore, mixtures of attractants are more effective to invite more species than individual components [9].

Other types of fishes present around the fish cage are not directly affected by the presence of aquaculture activities. In the stomach of *O. goramy* the fish feed pellets was occur, but 40% of its stomach content was the remains of plant materials. This fact suggested that the goramy may come to the area around the cage due to the presence of fish feed pellets, and they may consume aquatic plants and algae that grew well in the cage area due to organic material enriched water.

Figure 2 shown that other fishes, namely *M. nigricep* and *M. unicolor* feed mainly on fishes and insects. As the water around the cage is fertile, phytoplankton grow properly and it supports the population of small fishes, shrimp and aquatic insects. The presence of these small organisms attract carnivorous fishes such as *M. nigricep* and *M. unicolor* to come and feed on those organisms.

*M. nigricep* and *M. unicolor* are categorized as nocturnal catfish. During day time they prefer to stay in the depth or bottom of the dam. In this study they were captured in 15 meters depth. In the stomach of both species, however, around 30% of their stomach content was consisted of fish feed pellet remains. This fact indicate that the life of wild fish presence up to 15 meters under the cage was affected by the fish feed remains that enter the water.

Fish pellet remains originated from aquaculture activities clearly affects the feeding habit of fish living around the cage. The fish may prefer to consume the pellet remains, but they also consume their natural food such as plant, fish and insects. The amount of feed pellet remains in the stomach of wild fish was fluctuated. In the stomach of *P. schwanefeldi*, the amount of fish feed pellet remains was 52.2 % by the year of 2007 [3], became 90 % in the year of 2013 [2] and 90 % in this recent study. Another food type present in the stomach of this fish was plant remains. These data indicates that *P. schwanefeldii* prefer to consume fish feed pellets, but they do not lost their natural ability in consuming their natural food.

The feeding habit of carnivorous fish living around the cage may slightly affects by the presence of feed remains in the water. In 2007, the carnivorous fish *Wallago* sp feed mainly on fish and there was no fish feed remains in the stomach. In this recent study, however, small amount of fish feed pellets were present in the stomach of *M. nigricep* and *M. unicolor*. The stomach content of these fishes were dominated by fish and insect remains. This fact indicates that the natural feeding habit of *M. nigricep* and *M. unicolor* is almost unchanged, they are depended more on their natural food, while the fish feed pellet remains were consumed as complementary food.

The presence on floating net cage aquaculture activities in the Koto Panjang Dam affects all of wild fish species living around the cage. Several fish species such as *H. bimaculata*, *P. schwanefeldii*, *P. bramoides*, *O. goramy*, *C. carpio* and *O. niloticus* are able to feed on the remains of fish feed pellets directly and this material become their main food (IP > 40%). Other fish species such as *M. nigricep* and *M. unicolor* that live around 15 meters below the cage consume less amount of fish feed pellet remains (IP around 30%) and also consume their natural food such as fish and insect. Based on data obtained, it can be concluded that the presence of fish feed pellet remains spill from the floating net cage aquaculture activities directly and indirectly benefit the wild fish living around the cage.
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