Application of radiotelemetry in tracking the movement of mahseer fish (Tor spp.) in Batang Toru River, North Sumatera Province Indonesia

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Abstract. Mahseer fish or tor fish (Tor sp.) are fish that migrate from upstream to downstream or vice versa. Knowing the habitat of Mahseer fish will provide information on how to manage these fish. The purpose of this study was to apply radiotelemetry to determine the migration of Tor fish (Tor sp.). This research was conducted in the Batang Toru River, North Sumatra. This research was conducted by attaching a tracking device to the Mahseer fish (Tor sp.) After which it was observed for 2 months. The results of this study indicate that there is an up and down movement as far as 300 meters from the release location of Mahseer fish. The conclusion of the use of radiotelemetry can be used to determine the area of the cage fish (Tor sp.).

Keywords: Batang Toru Rivers; fish migratory; radiotelemetry; Tor sp.

1. Introduction

Mahseer fish or tor fish (Tor sp.) is one of the fish found in the Batang Toru River, South Tapanuli. This fish has a high economic value, which is due to its good taste and is also one of the things that must be in the wedding ceremony in several areas, for example the North Sumatra region [1]. Therefore, it is necessary to manage Mahseer fish (Tor sp.) So that its existence is sustainable.

The existence of mahseer in Indonesia has been known to spread in three major island areas, i.e. Java, Kalimantan and Sumatra Islands. However, the existence of various industrial, agricultural, fishery and household activities around the river as a habitat of the fish that impose a pollution burden on these waters will more or less affect the existence of the fish.

Mahseer fish (Tor sp.) have the habit of conducting roving or moving locations in search of food, avoiding predators, and spawning [2]. Therefore, the main requirement for carrying out fish management...
is to know the pattern of its habitat, so that it can determine what form of management is suitable for this fish.

One of the efforts to determine the habitat pattern of mahseer fish (*Tor* sp.) is by applying Radiotelemetry technology. Radiotelemetry is a technology that is useful in recording fish movements, with the working principle of reading fish movements through signals generated by chips that have been installed in the fish. Research using radiotelemetry technology has been carried out by several researchers who have found that the use of radiotelemetry technology can help determine the movement of fish [3, 4]. Telemetry studies have also been carried out on several types of aquatic biota, a.l. freshwater anomurans [5], crabs [6], marine mammals and reptiles [7]. Based on this, the application of Radiotelemetry technology was carried out to determine the movement of mahseer fish (*Tor* sp.).

2. Methods

This research was conducted in the Batang Toru River, North Sumatra. This research consists of several stages, fish catching, chip installation, and observation. Fish catching, the fish to be paired with chips must be over 500 grams in size and above 30 cm in length. The fish that are caught must stay alive so they need fishing gear that is not lethal. Fishing gear used in this study is fishing rods. Chip installation (radio tag), fish that have been caught and are still alive, are then immersed in an anesthetic solution so that the fish faints. After that, surgery was performed on the abdominal cavity without injuring the inside of the fish, then inserting a chip (Radio tag MCFT2-3BM) into the fish's stomach (figure 1), after that suturing and applying salem were performed to prevent infection. The last step is to put the fish in a basket which flows with water so that the fish can recover quickly. Observation, fish that are aware and move actively. Then the fish are released into the river which is the route of the fish habitat. After that, the movements were observed visually and audio. Visual is by seeing directly, while audio is by using a radio device Radiotelemetry (Radio Receiver SRX-800 from Lotek wireless Canada) (figure 2). Observations were made for 2 months (September and October).

![Figure 1. Chip (Radio tag MCFT2-3BM).](image1)

![Figure 2. Radiotelemetry (Radio Receiver SRX-800 from Lotek wireless Canada).](image2)
3. Results and discussion

3.1. Fish catching
The catch using a fishing rod gets results in the form of mahseer fish (*Tor* sp.) measuring 600 grams and 45 cm long. This fish is the object of this study (figure 3).

![Figure 3. Fish research object.](image)

Based on figure 3, it can be seen that the fish obtained are suitable for this research activity. This is because these fish are large so that the chips that are paired are suitable and do not cause death.

3.2. Chip installation (radio tag)
The installation of the chip on the fish goes well, so that the chip can be installed properly and cannot be separated (figure 2).

![Figure 4. Installation of chips (Radio tag MCFT2-3BM) on fish.](image)

Based on figure 4, it can be seen that the chip installation on the fish is going well, this is indicated by the fish staying alive and moving actively after the process of installing the chip on its body (figure 5).

![Figure 5. Mahseer fish live and move after chip installation.](image)
3.3. Observation
Observations made for 2 months (September and October) are presented in figure 6 and figure 7.

![Figure 6. Signal obtained during observation.](image)

Based on figure 6, it can be seen that the signal captured by the Radio Receiver SRX-800 from Lotek Wireless comes from the same fish. This indicates that the fish is still alive after the chip is installed, but it also indicates the fish but at the release location.

![Figure 7. Fish observation locations.](image)
Based on figure 7, it can be seen that the mahseer fish experience movement from the initial location of the release. The initial location of the fish release is to the left of the bridge, then in the observation in the first month the fish move upstream against the current as far as 300 meters or to the right of the bridge, but in the observation in the second month the fish move downstream as far as 150 meters from the observation location 1. Based on this, it can be seen that the mahseer fish move during the observation. Tor fish should move upstream for spawning [2], however, in this study, mahseer fish did not move far from the location where they were released. This is thought to be due to the fact that the mahseer fish is doing migration during the rainy season, while the research time has not yet entered the rainy season so that the fish are still in the release area to find food and gather energy for culture. The habit of mahseer fish has a habit of cultivating in the rainy season because the volume of water increases making it easier for the mahseer fish to move [8].

4. Conclusions
Radiotelemetry technology can be used to determine the migration pattern of mahseer fish (Tor sp.) in River Toru Batang has characteristics rocky, steep, and swift.

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