

# Histological Analysis of Gills and Liver of Tamba Fish (*Tor tambra*) From Batang Gadis River in Mandailing Natal North Sumatera

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## ABSTRACT

*Tor tambra* is one of the 10 species of fish that found in Batang Gadis River. This fish species has abundance and also the highest dominance at four observation stations in Sungai Batang Gadis. The purpose of this study was to look at the histology of gill organs and liver of *Tor tambra* in the Batang Gadis river. The study was conducted in June to August 2019 in the Zoology Laboratory of the Department of Biology, Padang State University. Direct observation and purposive sampling were conducted at two locations around Batang Gadis River (Tamiang and Muara Mais). Histological samples of gills and liver were isolated, fixated, dehydrated and embedded on paraffin and stained using Haematoxylin-Eosin. The results showed a number of histological changes in gill and Tamba fish liver from both locations. Those alterations varied from Melano macrophage center (MMC), hyperplasia, edema and necrosis. Those alterations varied from the two sampling locations. The level of alteration more in fish taken at station 2 (Muara Mais).

**Keywords:** *Batang Gadis River, Gills, Histopathology, Liver*

## 1. INTRODUCTION

Tamba fish (*Tor tambra*) is a type of freshwater fish that has high economic value. Tamba fish groups are river dwellers in tropical forests. The original habitat of Tamba fish is generally in the upper reaches of the river in hilly areas with clear air and strong currents [1]. Tamba fish is one of the 10 fish species found in Batang Gadis River. This species has abundance and is also the highest dominant in the four observation stations in Batang Gadis River [2].

Batang Gadis River is the estuary of several tributaries, namely the Lahantan river and the Batang Pungkut river originating from Mount Kulabu, Mandailing Natal Regency. This river is the longest and largest river along the Kotanopan area, while the Batang Gadis River is the main attraction of its clear water and large rocks neatly arranged. Batang Gadis River is also a very important river as a regular water provider to support the survival and main economic activities of the community, namely agriculture. Along the banks of the Batang Gadis riverbanks there are often found agricultural community areas that utilize irrigation from the Batang Gadis river flow.

Nowadays the use of pesticides is something that is difficult to separate from agricultural activities, especially in the cultivation of rice in the fields in order to increase the product both qualitatively and quantitatively. Pesticides used on rice fields, especially at the beginning of the planting season, some or even all of them will fall

into the water and pollute the waters. Water that is polluted by pesticide residues when it has reached a certain concentration will greatly affect the environment and aquatic organisms that live in it.

The research results of Atifah et al [3] showed that pesticide residues in the Batang Gadis river flow in water samples, soil sediments and fish found pesticide residues from organophosphate groups namely diazinon, malation, and chlorpyrifos and from organochlorine groups namely aldrin, dieldrin and endosulfan. The highest organophosphate residues were found in the soil while the highest organochlorine residues were found in fish. The level of pesticide residues found is still at the threshold limit of pesticide residues (BMR) of pesticides.

Fish that live in a pesticide-contaminated aquatic environment will absorb the active ingredients of the pesticide and are stored in the body, because fish is a good accumulator of various types of pesticides, especially those that are lipophilic (easily bound in fatty tissue). Under sublethal water conditions, the content of pesticide residues in the body of fish formed through the bioaccumulation process will be higher with increasing concentration and increasing exposure time until reaching steady state conditions. In addition, the continued influence of pesticide bioaccumulation at certain concentrations can significantly reduce the growth rate and impact on fish haematological conditions [4].

Based on the reasons that have been stated, then research on the histological analysis of the gills and liver of Tamba fish (*Tor tambra*) in Batang Gadis Mandailing Natal River is important to do. This research is expected to be

important information for efforts to preserve fish species and as one of the initial information considerations in the Batang Gadis river management policy.

## 2. MATERIALS AND METHODS

### 2.1. Material

The tools used in this study were fishing gear, basin, materials used in this study were the liver and gills of Tamba fish (*Tor tambra*) and a solution to make a prefabricated paraffin method and stained using Haematoxylin-Eosin

### 2.2. Method

Fish Sampling is done at two different points. Choosing where to take samples using the purposive sampling method, namely in river areas far from agricultural areas (Tamiang) and river areas that are in agricultural areas (Muara Mais). The method used is a survey method and observation of the histological conditions of the liver and gills of Tamba fish (*Tor tambra*) microscopically collected directly in the field by using purposive sampling method. Histological preparations of gills were made by the paraffin method and Haematoxylin-Eosin staining [5].

## 3. RESULT AND DISCUSSION

Based on the results of histopathological analysis of fish gills and liver there is tissue damage from mild to severe levels. With reference to the Tandjung [6], Ressang [7] and Sudiono [8] and Darmono [9] methods, the presence of MMC, edema, hyperplasia and degeneration is classified as mild damage. Congestion and hemorrhage are classified as moderate damage, whereas necrosis and anthyropy are classified as severe damage. Melano macrophage center (MMC) is commonly found in all three tissues. According to Agius and Robert [10] in Ersa [11]. MMC is a collection of macrophages that contain hemosiderin, lipofuchsin and ceroids as well as the melanin pigment. MMC is found in most lymphoid tissues, most of which are caused by inflammation.



Figure 1. Histopathological Gills of Tamba fish at Station 1

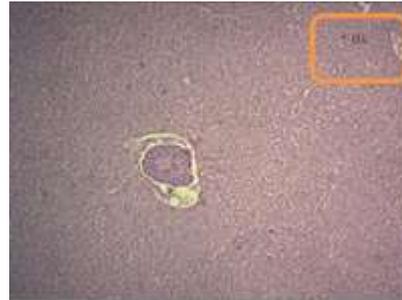


Figure 2. Histopathological Liver of Tamba fish at Station 1

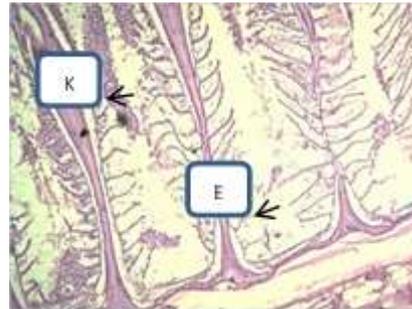


Figure 3. Histopathological Gills of Tamba fish at Station 2



Figure 4. Histopathological livers of Tamba fish at Station 2

Histopathological observations of gills and fish liver in the river stem of the girl showed a histological change found. Changes found were different at different observation stations. At station 1 there was a change in mmc in the gills of the fish and degeneration of fat in the fish liver. While at station 2 there was congestion, hyperplasia and edema of the gills and hemorrhage and necrosis were found in the fish liver.

The difference in changes found at different stations shows that water conditions are different in the two sampling areas. Station 1 is a river area far from the agricultural area while Station 2 is an area found in agriculture along the river bank. The results of Atifah et al [3] showed that at station two there were found pesticide residues from organophosphate groups namely diazinon, malation, and chlorpyrifos and from organochlorine groups namely aldrin, dieldrin and endosulfan. The highest organophosphate residues were found in the soil while the highest organochlorine residues were found in fish. Although the levels found are still at the threshold limit of the pesticide residues (BMR), but the chlorpyrifos

pesticide can last longer or is more persistent in nature than the other six pesticides, which is more than one year [12].

Organochlorine compounds are also very persistent, meaning that the active ingredients can survive in the long term either in soil, water, animal tissue, or plants. Not easily decomposed by microorganisms, enzymes, heat, or ultraviolet light. In terms of the function of pesticides, compounds with these properties are the best but not good in terms of the environment [13]. Fish that live in a pesticide-contaminated aquatic environment will absorb the active ingredients of the pesticide and are stored in the body, because fish is a good accumulator of various types of pesticides, especially those that are lipophilic (easily bound in fatty tissue). Under sublethal water conditions, the content of pesticide residues in the body of fish formed through the bioaccumulation process will be higher with increasing concentration and increasing exposure time until reaching steady state conditions. In addition, the continued influence of pesticide bioaccumulation at certain concentrations can significantly reduce the growth rate and impact on fish haematological conditions [4]. Endophytic bacteria that (5,7) isolated from

#### 4. CONCLUSION

Histological changes in gill and liver of Tamba fish from both locations are different. Those alterations varied from Melano macrophage center (MMC), DL, hyperplasia, edema and necrosis. Those alterations varied from the two sampling locations. The level of alteration more in fish taken at station 2 (Muara Mais).

#### REFERENCES

- [1] Haryono, and J. Subagja. 2008. Population and Habitat of Tamba fish, *Tor tambroides* (Bleeker, 1854) in Regional Waters Muller Mountains of Kalimantan The middle. *Journal of Biodiversity*. vol 9, No 4, pp. 306-309
- [2] Atifah, Y and Lubis, F.A. 2017. Diversity of fish species in Batang Gadis Mandailing River, North Sumatra. *Scripta Biologica* 4 (4): 215-219
- [3] Atifah, Y., Lubis, M., Lubis., L.S., Maulana, A. 2019. Pesticide Pollution in Batang Batang Mandailing River, North Sumatra. In the process publication on Bioeducience
- [4] Taufik, I. 2005. Further effects of bioaccumulation of endosulfan insecticides on growth and haematological conditions of carp (*Cyprinus carpio*). Thesis. Postgraduate School, Water Sciences Study Program, IPB, 83 p.
- [5] Suntoro, H. 1983. *Metode Pewarnaan*. Bhratara Karya Aksara. Jakarta
- [6] Tandjung, S. D. 1995. *Toksikologi Lingkungan*. Gadjah Mada University Press. Yogyakarta.
- [7] Ressang, A. A. 1984. *Patologi Khusus Veteriner*. Bali Press. Denpasar.
- [8] Sudiono. 2003. *Ilmu Patologi*. Penerbit Buku Kedokteran. Jakarta
- [9] Darmono. 1995. *Metals in the System Biology of Living Things*. Ui-press, Jakarta.
- [10] Agius and Robert .1981. Phylogenetic development of melano-macrophage centres in fish. *Journal of Zoology*
- [11] Ersa, I.M. 2008. Overview of Histopathology Gills, Intestines And Muscles In Fish Mujair (*Oreochromis mossambicu* In the Ciampea Area Bogor. Essay. Faculty of Veterinary Medicine Institut Bogor Agriculture. Bogor.
- [12] Gilan, S.T. 2011. Chlorpyrifos Degradation in Soil and Its Effect on Soil Microorganisms. *The Journal of Animal & Plant Sciences*.
- [13] Sastroutomo, S.S. 1992. Pesticides, the basics and the impact of their use. Gramedia, Jakarta, 184 p.