Impact of Environmental Riparia Change and Biodiversity Fish on Three Oxbow in The Nature Park Buluhcina, Kampar Riau Province

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Abstract. The research was conducted in three lakes in the area of the Park Buluhcina-Kampar on March to July 2019, aims to look at the impact of environmental riparia change and diversity of fish species. This survey research methods, through a purposive sampling technique as the activity of residents in the neighborhood riparia in Baru Lake, Pinang Luar Lake, and Pinang Dalam Lake. Research parameters are: Characteristic riparia environmental and ecological aspects. The collection of data through open interviews and attempts catch per unit effort tool to use nets fishing gear step and dustpan. Ecological aspects of data analysis include the fish species composition and physical-chemical factors. Results human activity is causing changes in the environmental riparia setting in the TWA and the impact on environmental degradation and decline in species composition. Changes in environmental quality in the lake found the highest riparia Pinang Luar Lake indicated by a decrease in the plant canopy, increasing water temperature, a decrease in oxygen content and pH of the water, as well as the lowest of fish species diversity, the spread of the fish tends to uneven compared to two other lakes.

1. Introduction

Kampar River is one of four major rivers in the province of Riau formed by the flow of creeks in Riau and West Sumatera, then empties into the Estuary of Meranti in Pelalawan, Riau Province. During this time, the Kampar River used by local people for daily activities such as bathing, washing, fishing and transportation facilities to bring the results of the plantation. Kampar River flow upstream is also used as Hydroelectric Power Plant (HEPP) in the Region XIII Koto Kampar. Kampar River also crosses a protected area that is the Nature Park (TWA) in the village of Buluhcina, Siak Hulu District, Kampar Regency. Along the river through this Buluhcina village, local people used to aquaculture floating cages.

Along the road to the Buluhcina village and along the banks of the River Kampar Buluhcina TWA forest ecosystem dominated lowland forest (approximately 10 meters) above sea level is located and swamp [17]. The existence of TWA Buluhcina vegetation in an area should be a concern because it is a conservation area located in Riau Province which is about 40 km from the center of Riau province (Pekanbaru). TWA has a particular biological diversity of ecosystem riparia types.
The existence riparia has an important function as a transition area to get to the mainland waters that it has affected the location and placement of the settlement [3], [6]; mentions that riparia has four (4) main function is to control the water quality, protect the habitat of the river, providing shade and organic litter, nature conservation and as a place of recreation. [13]; mentions that riparia have economic value either directly or indirectly, that is a source of timber, preventing floods, recharging aquifers, surface water resources and fisheries productivity. Riparia owned social value that is a place of recreation, research, education and aesthetics / beauty.

In the region there are 7 Oxbow Buluhcina TWA (dead rivers) or the so-called lake. The beauty, demographic condition and uniqueness of the seven lakes is an interesting tourist attraction for the tourists who will visit. The seventh lake is Tanjung Balam Lake, Bunte Lake, Tuok Tonga Lake, Tanjung Putus Lake, Baru Lake, Pinang Dalam Lake and Pinang Luar Lake [17]. In this area there are also some diversity of organisms that is characteristic of the region, namely the ecosystem riparia.

Demographics condition, population is one of the major capital base in the implementation of a country’s development, when optimizing the utilization can be implemented with the support of the quality of the total population. However, the quality of the population as well as environmental capacity are inadequate or are not balanced with the quality of the population.

Based on the initial survey researchers that occurred since the last 2 years riparia land clearing through deforestation and converted into oil palm plantations. It is suspected exploitation of natural resources will pose complex problems and lead to environmental degradation which impact on the diversity of biota, especially fish.

This research is limited to the three locations of the lake of seven lakes in TWA Buluhcina, namely: 1) Baru Lake, 2) Pinang Luar Lake and 3) Pinang Dalam Lake. The purpose of this research to assess changes in environmental riparia quality and their impact to diversity of fish species on three lakes in the region.

2. Research Methods

2.1 Location and Time Research

The research location is in the village Buluhcina, Kampar regency. When the study for 4 months from March to July 2019.

Map of location of study in the Nature Park Buluhcina, District Siak Hulu, Kampar, Riau Province, located at 00 20’ 30” - 00 23 ’00” north latitude and 101 30’ 00” - 101 33’ 00” east Nature Park Buluhcina has an area of 1,000 ha [4].

This research was conducted at three locations, determining the location of the research conducted by purposive sampling method, the use of this method is tailored to the need to take samples where access to the lake which was not isolated. Sampling sites as follows: Baru Lake (60 x 350 m), Pinang
Dalam Lake (74 x 4200 m) and Pinang Luar Lake (65 x 300 m). The identification process carried out in the Laboratory of Biology FKIP of Riau University. The tools used in this research is the scatter, net fishing, caliper, and a determination key. Materials needed is water and 10% formalin solution. Samples obtained from catch fish using nets scatter and net fishing. Samples were photographed and then preserved in 10% formalin and identified using determination keys by [13] and [26].

This survey research methods include: 1) observation, through focusing on an object by using the senses. 2) Focus Group or Focus Group Discussion (FGD) Type, Source Data, Techniques of data collection and data analysis are presented in Table 1 below:

**Table 1.** Research aspects, types, sources, data collection and data analysis

| No. | Aspects of research                                    | The type of data / data source | Methods and Techniques of Data Collection | Data analysis |
|-----|--------------------------------------------------------|--------------------------------|-------------------------------------------|---------------|
| 1   | Characteristics of Riparian environments Rona          | Qualitative / Secondary        | Survey / interview / documentation        | Descriptive   |
| 2   | Physical-chemical factors Lake                         | Quantitative / Primary         | Insitu sampling                           | Manual / Laboratory |
| 3   | The diversity of fish                                  | Quantitative/ Primary          | Effort per unit of fishing equipment per time | Fish species composition |

Data analysis and indicator according to [27],[28].

3. Result

3.1 Characteristics Riparia in Three Lakes Region Buluhcina TWA

Riparia environmental characteristics in terms of vegetation canopy quality indicators, the state of presence / absence of peat bogs, flood events on major rivers, an indication of the activity of the population, the data presented in Table 2 below.

**Table 2.** Environmental Characteristics Profile Riparia in the Three-Lakes Nature Park Buluhcina in 2019 compared to 2015.

| Indicators of Environmental Characteristics | Baru Lake | Pinang Luar lake | Pinang Dalam Lake |
|--------------------------------------------|-----------|-----------------|------------------|
| Year 2015 2019                             | Year 2015 2019 | Year 2015 2019 | Year 2015 2019 |
| Forest vegetation riparia                  | Dense and canopied | Dense and canopied | Dense and canopied | Changes to the oil palm plantation |
| Peat swamps or stagnant water in Riparia   | Peat swamps / Puddles along Riparia | Peat swamps / Puddles along Riparia | tends to dry | tends to dry |
| The incidence of flooding in the main river| 1 to 2 times per year last November 2014 | Last flooding in December 2018 | 1 to 2 times per year last November 2014 | Last flooding in December 2018 |
| Activities population                      | Yet had the mark of people’s activities | There is a path into the location | There were traces of forest rambaha | Yet had the mark of people’s activities | There were traces of forest rambahan |
Table 2 can be explained that the forest vegetation riparia at three locations that are changing most extensive shade canopy in Pinang Luar Lake, because the forest along the riparia has turned into oil palm plantations. The irrigation canals meeting along oil palm plantations leading to lake waters resulting in siltation of Lake Pinang Luar and draining land around riparia forests in Lake Pinang Luar.

Of the three lakes, only in Baru Lake peatlands found part of flooded though the dry season. This is because at this lake vegetation found shade canopy shade trees, and no logging activity, so that puddles of forest riparia in Baru Lake create a habitat that is diverse and heterogeneous as reflected in biodiversity.

3.2 Physical Factors Conditions - Water Chemistry in Three Lakes

Conditions physics factor consists lake waters from the depths of the lake, the water temperature and the lake water physical factors that include the degree of acidity and dissolved oxygen levels (presented in Table 3).

On Table 3 based on the depth so Pinang Luar Lake more shallow (less than 3m), the temperature of the lake water tends to be higher (30 to 34 °C), the lowest degree of acidity (4.5 to 5) and the dissolved oxygen content were lower at 3 to 5 mg/L. Condition of physical factors - chemicals tend to be extreme compared to two other lakes, it is caused by forest clearing riparia causing a decline in the shade and is in line with the rise in temperature of the concentration of dissolved oxygen in the water decreases. Clearing of land led to increased erosion on the cliffs of the lake and the flow of the drifting land. A slow flow increases turbidity ground so that the mud will stop and settle to the bottom of the lake, urging algae and other organisms, and cause silting of the lake [13].

| Environmental Indicators | Baru Lake | Pinang Luar Lake | Pinang Dalam Lake |
|--------------------------|-----------|------------------|------------------|
|                          | Year 2015 | 2019             | Year 2015        | 2019             |
| Depth (M)                | 1.9 to 2.5| 1.8 to 2.4       | nd               | 1.2 to 2.3       | 1.3 to 4.5       | 1.35 to 3.5       |
| Temperature (°C)         | 28.5 to 29| 26-29            | nd               | 30-34            | 29-29            | 29-30             |
| Acidity                  | 6.6-6.8   | 6.0 to 6.8       | nd               | 4.5 to 5.0       | 5.0-6.0          | 5.0-5.3           |
| Dissolved oxygen (Mg / L)| 6.3 to 6.8| 6.0 to 6.7       | nd               | 3.8-5.1          | 4.1 to 6.5       | 4.0 to 6.2        |

Description: nd = no data

3.3 Composition Species

Based on data analysis of fish species composition in 2019, results of identification species of fish in three lakes are: The Baru Lake acquired 18 species, which are classified into 14 genera, 6 families and 5 orders. In Pinang Luar Lake obtained 8 species, which is classified into 8 genera, 6 families and 5 orders, and in Pinang Dalam Lake obtained 15 species, which are classified into 12 genera, 7 families and 5 orders. This result can showed that decreased fish species diversitry compared with 2015 (in Baru Lake are found 37 species of fish, on Pinang Dalam Lake acquired as many as 30 species of fish, as well as some endemic species found only in that region [5].

4. Result and Discussion

Overall, the incidence of floods in major rivers in the three lakes took place in the same month each year for the previous three lakes fed by the same main river, the river Kampar. Furthermore, the activity of the highest population riparia sequentially exploit forests found in locations Pinang Luar Lake, Pinang Dalam Lake and Baru Lake. This causes environmental damage from the third highest lake in the Pinang Luar Lake. The high degradation of the riparia environment on the Pinang Luar
Lake due to the large amount of open land, easy access of the main road to Pekanbaru city and the large number of residential settlements.

Riparia ecosystems that are in the Kampar river bank is covered by a variety of plant species that have adapted to live in places that are often flooded river, especially when it rains [17]. Riparia usually describe biotic communities that inhabit the banks of rivers, ponds, lakes and wetlands other or region is along the edge of the river and directly affected by the tidal waters of the river [19].

[7]: mentioned that the relationship of community activities on riparian ecosystems have an impact on freshwater ecosystems, so component ecosystems that are in the area experienced some changes especially in biotic components that have a direct response to these changes. This is consistent with the results of research conducted by [11]: who stated that one of the effects of environmental degradation is characterized by shrinking levels of biodiversity in one of the environmental impact caused by antrophogenik. Antrophogenik is environmental damage caused by pollution result of human activities such as industry, combustion and so forth.

Global aquatic biodiversity continues to decline rapidly, although there are international efforts that provide a wide range of policies and legislation that identifies objectives for, and provide direction to protect the waters of the world's fauna and flora [23]. This decrease may occur as a result of a positive correlation between the quality of the waters with the diversity of fish in an area. [11]: results that do research in one of the oxbows in Central Russia are getting the results that there is no diversity of fish in oxbow although there are fluctuations in the water as long as no degradation of water quality.

Natural potential wealth in the form of fish fauna on the habitat of the river still has not been recorded properly. Therefore it takes a survey on fish diversity. In some species of fish that are sensitive to changes in the environment so that it can be used as bio-indicators of environmental changes that occur in freshwater or river [26]. Furthermore, the effects of environmental changes that occur result metabolic responses in animals that are in the waters of the fresh water in response to environmental changes both external factors and internal factors, so that the fish population in these ecosystems are experiencing a transition in the river environment has undergone changes in the environment [25].

Enviromental damage can have an impact on the stability of ecosystems and enviromental biodiversity. According [9]: states that the environmental damage caused by environmental changes affect the stability of the ecosystem that will reduce the environmental biodiversity. Environmental impacts that result from human activity occupies the first place the most influence on the environment. According [8]: there were 45 human activities that have environmental impacts including water environment both sea and freshwater. It is also a serious threat to fish and their habitat, as many species of fish dependent on material derived from animals or plants that fall into the water and vegetation overhanging the water, and largely dependent either directly or indirectly the leaves and other materials that float in the water. These materials form the detritus are a staple of the food chain for many invertebrates and fish [13].

Riparia vegetation function very viability of life terrestrial and aquatic organisms. Riparia vegetation are important habitat for fish, supporters of the food chain of wildlife habitat, maintain the temperature, the stabilization of the banks of the river, water quality protection, maintain and control the flooding of river morphology. Disruption to riparia the main cause of decline in the structure and function of the river [10].

According to [16]: to address the serious threat of the impact of reduced levels of biodiversity of fish and the river, the efforts that need to be done as follows: (1) Pollution of the river should be dismissed, (2) Pesticides, insecticides should be restricted, (3) Vegetation waters of excessive must be controlled, (4) the movement of ships and other water should be facilitated, (5) the use of nets dangerous illegal to be controlled, (6) of the Act must be made and applied strictly against illegal fishing (7) Awareness future must be built.

Deforestation riparia converted into oil palm plantations led to changes in environmental quality that is changing the environmental setting and change physical factors (temperature and depth of the lake) and chemical changes (dissolved oxygen content and pH) in the waters of the Pinang Luar Lake.
The lake is experiencing the toughest environmental degradation is a Pinang Luar Lake, then there are indications of potentially disruptive activity Riparia environmental quality in Pinang Dalam lake and Baru Lake.

The forest and peat land exploitation, construction of canals have contributed to draining swamp and creeks. The forest and peat land fire have caused the change of local climate (the rise of water and air temperature, and change of flood cycle), decreasing number of micro habitat variety which are the home for fish for foraging, nesting and spawning has led to reduction number of biodiversity of fish into River [28].

5. Conclusion

Riparia environmental changes in TWA Buluhcina impact on the environment characteristic changes in the quality and reduction of fish species composition. The composition of fish species in the lake three locations namely: The Baru Lake acquired 20 species, which are classified into 18 genera, 8 families and 4 orders. In Pinang Luar Lake obtained 8 species, which is classified into 8 genera, 4 families and 3 orders, and in Pinang Dalam Lake obtained 13 species, which are classified into 12 genera, 4 families and 3 orders. The rate of decline riparia environmental changes, in line with the decline in fish species diversity in all three lakes.

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