LIMNOLOGICAL CONDITION AND ESTIMATION OF POTENTIAL FISH PRODUCTION OF KERINCI LAKE JAMBI, SUMATRA

Samuel[1], Ni Komang Suryati[1] and Vipen Adiansyah[1]
[1]Research Institute for Inland Fisheries, Palembang
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e-mail: sam_asr@yahoo.co.id

ABSTRACT

Kerinci Lake is a type of tectonic lakes located in a protected forest area of National Park of Kerinci Sebelat and a source of various fish species important for local people for their daily food comsumption and income. However, few information is available on its limnological condition and fish resources. Field research observing the limnological condition and estimating the potential fish production was conducted four times in April, June, August and October 2013. The research is aimed to describe the condition of limnology to estimate the potential fish production of the lake. Limnological aspect included the physico-chemical and biological parameters, namely: temperature, water transparency, depth, substrate, conductivity, pH, dissolved oxygen, alkalinity, ammonia, nitrate, phosphate, total phosphorus, chlorophyll-a and trophic state. Potential fish production was calculated by using the biological parameter levels of chlorophyll-a. The results show that the euphotic layer of the lake waters was still feasible for fish life. Water condition of the bottom layer was less supportable for fish life due to low dissolved oxygen content. Trophic state index (TSI) values, either measured by temporal or spatial ways, had TSI with an average of 61.75. From these indeces, the lake is classified as a lake at the high productivity level (eutrophic). Annual fish production was an average of 307 kg/ha/year. By taking account the average of fish production and the total area of lake of around 4,200 ha, the potential fish production of Kerinci Lake is estimated about ± 1,287 tons/year.

KEYWORDS: Water quality, trophic state, potential fish production, Kerinci Lake of Jambi, Sumatra

INTRODUCTION

Kerinci Lake located in Kerinci Regency of Jambi Province at the altitude of ± 783 meters above sea level (Ministry of Environment, 2013) is one type of tectonic lakes in Indonesia. The lake has an area of ± 4,200 hectares with a maximum depth of ±110 meters. The famous fish of the lake is mahseer (*Tor duoronensis*) and some economically important fish. The numbers of fish such as: climbing perch (*Anabas testudineus*), snakedheads (*Channa striata*), giant gouramis (*Osphronemus gouramy*) and marble goby (*Oxyeleotris marmorata*) decline as a result of damage on the catchment area of the lake (Gazam, 2013). Besides that there are also various species of freshwater fish such as: bonylip barb (*Osteochilus waandersii*), hampala barb (*Hampala macrolepidota*), common carp (*Cyprinus carpio*), nile tilapia (*Oreochromis niloticus*), silver rasbora (*Rasbora argyrotaenia*), the fire eel (*Mastacembelus erythrotaenia*), snakeskin gourami (*Trichogaster pectoralis*) and asian swamp eel (*Monopterus albus*).

Prior to 1995, the condition of the waters of lake was covered by a blooming aquatic hyacinth plant (*Eichornia crassipes*) to almost of the lake surface. In 1995, a number of 2,000 fingerling of grass carp (*Ctenopharynggodon idella*) were imported from China by the local Fisheries Department to be introduced to the lake for cleaning the waters of the lake from the hyancinth plant. Then after more than 10 years later, the waters of the lake had been returned clean 100% of the water hyacinth (Sriwijaya Post "Water Hyacinth in Lake Kerinci all gone edible fish Koan ", May 19, 2011).

After the lake water condition cleaned from aquatic hyacinth plants, some native fish species of lake (mahseer, snakeskin gourami, climbing perch, silver rasbora and others) had been rarely caught. The fact was too difficult to find the native fish in the market. The declining of some native fish species in the lake was also complained by local people inhabiting in around Kerinci Lake, especially the in habitants who work as fishermen. This scarcity of native fish caused the reducing of income of the fishermen (Kementerian Lingkungan Hidup, 2013). Declining of fish production and reducing the catches indicated the absence of external factors that negatively influence upon fishery conditions in Lake Kerinci.

Water quality condition of the lake is still good enough to support the life of some fish species. This is reflected by the fact that many fishermen do their fishing activity in the lake. However, it is needed to do an assessment of the water quality to evaluate the

Corresponding author:
Research of Research Institute for Inland Fisheries
Jl. Beringin, No. 08, Mariana Palembang

extent of the water condition in supporting the fish life and how much water capacity to produce the fish. The purpose of research in Kerinci Lake to evaluate the aspects of limnology and to estimate the potential fish production as essential information for the fish resources management in Kerinci Lake.

MATERIALS AND METHODS

Field surveys to collect data were conducted four times: in April, June, August and October 2013. Six stations for sampling and measurement of water quality were determined by considering the land use around the lake such as the existence of residential areas, agricultural areas and plantation, protected forest areas, littoral areas, the position of the inlet and outlet, as well as in the middle of the lake (Figure 1).

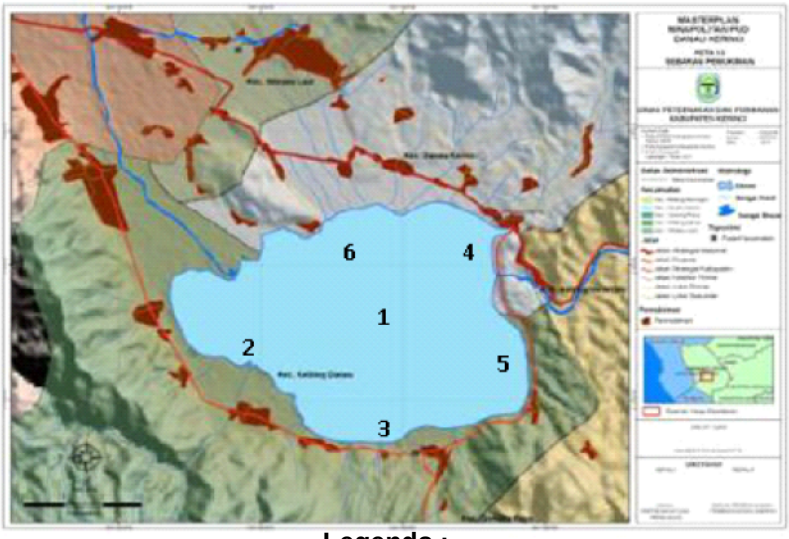
Measurement and water sampling were conducted with vertical stratification. The stratification was based on the results of measurements on the boundary of water transparency and depth of the lake which further stratified into several layers of water. Physico-chemical and biological parameters of lake waters were measured by using some materials, various tools and methods as outlined in Table 1. The parameters are: temperature, transparency, depth, substrate, conductivity, pH, dissolved oxygen, alkalinity, ammonia, nitrate, phosphate, total phosphorus and chlorophyll-a. Measurement and analysis of water quality parameters are referred to APHA (1981).

The fertility rate (trophic state) of waters was analyzed by calculating the value of the trophic state index (TSI) according to Carlson (1977) as quoted in the guidebook published by Kementerian Lingkungan Hidup (2008), with a series of formula as follow:

TSI = (TSI-SD + + TSI TSI-TP-Chl) / 3, ... (1)
where:

TSI = Carlson's Trophic State Index
TSI-SD = Trophic State Index for Secchi Disk Depth
TSI-TP = Trophic State Index for Total Phosphorus
TSI-Chl = Trophic State Index for chlorophyll-a
TSI-SD = 60 -14.41 * Ln [SD], where SD = Secchi Disk in meters
TSI-TP = 4.15 + 14.42 * Ln [TP], where TP = total phosphorus in µg/liter
TSI-Chl = 30.6 + 9.81 * Ln [Chl], where Chl = chlorophyll-a concentration in µg/liter

The conditions of aquatic trophic state index of Carlson are classified into four categories namely: very low, low, medium and high (Table 2).



Legends :

Number and name of stations	Geographical Position System (GPS)	
1= Middle of the lake	S= 02.08.937	E= 101.29.858
2= Inlet	S= 02.08.073	E= 101.27.714
3= Rice field areas	S= 02.09.911	E= 101.28.308
4= Outlet	S= 02.07.490	E= 101.31.398
5= Protected forest areas	S= 02.10.167	E= 101.31.593
6= Residential areas	S= 02.07.057	E= 101.30.457

Figure 1. Research stations in Kerinci Lake of Jambi, Sumatra.

Table 1. Physico-chemical and biologycal parameters measured as well as the agent, tools and methods used.

No	Parameters	Materials and Tools	Methods
A	**Physical Parameters**		
1	Temperature	Hg-Thermometer	In situ
2	Bottom Substrate	Ekman grab	In situ
3	Water transparancy	Sechi disk	In situ
4	Water Depth	Depth Sounder	In situ
5	Conductivity	SCT-meter	In situ
B	**Chemical Parameters**		
6	pH	pH indicator	In situ
7	Dissolved Oxygen	DO Meter	In situ
8	Alkalinity	Titrimetic tools	Titrimetri
9	Ammonia	Spectrophotometer	Phanate
10	Nitrate	Spectrophotometer	Nesler's
11	Phosphate	Spectrophotometer	Vanadate Molybdat
12	Total Phosphorus	Spectrophotometer	Vanada te Molybdat
C	**Biologycal Parameters**		
13	Chlorophyll-a	Spectrophotometer	Calorimetric

Table 2. Trophic state categories based on the Trophic State Index' Carlsons

Score	Trophic State	Descriptions
< 30	Ultraoligotrophic	The water is crystal clear, high dissolved oxygen concentrations throughout the year and reached the hypolimnion zone
30 - 40	Oligotrophic	The water is crystal clear, there may be a restriction on the anoxic hypolimnetic zone periodically
40 - 50	Mesotrophic	Water transparency is medium, increasing the changing of anoxic nature in hypolimnetic zone.
50 - 60	Light (low) eutrophic	The decline in water clarity, hypolimnetic zone is anoxic, there is a problem of water plants, only fish that are able to live in warm water.
60 - 70	Medium (moderate) eutrophic	Dominated by blue-green algae, occur clotting, water plant probler has been extensively
70 - 80	Heavy (high) eutrophic	Heavy algae blooming occurs, water plants form a layer bed like th hypereutrophic conditions
> 80	Hypereutrophic	Clumps of algae, dead fish, water plants slightly dominated by algae

Calculating the potential fish production dertermined in kg/ha/year used the formula from Moreau & De Silva (1991), namely:

$$Y = 28.2 + 10.5 \times (\text{Chl-a}), \quad \text{..... 2)}$$

where Y = potential fish production (kg/ha/year) and (Chl-a) = chlorophyll-a concentration in unit of µg/liter.

RESULTS AND DISCUSSION

Results

From the results of soil sampling at the bottom, it turned out that the bottom substrate of Kerinci Lake in six research stations was dominated by sandy mud substrate. Based on the temporal distribution of water quality values (Table 3), the water transparency of the

months from April to October ranged from 1.1 to 1.3 meters (average value of 1.2 meters), the temperature ranged from 22.6-26.7ºC (average of 25.5ºC), conductivity was between 88-93 ìS/cm (average of 91 ìS/cm), the pH ranged from 7.1 to 8.2 (average of 7.5). Dissolved oxygen content ranged from 6.34 to 7.78 mg/L (average of 6.82 mg/L), the alkalinity of 33-64 mg/L (average of 54 mg/L), ammonia levels from 0.06 to 0.23 mg/L (average of 0.11 mg/L), nitrate 25-122 µg/L (average of 81 µg/L), phosphate 54-58 µg/L (an average of 56 µg/L), total phosphorus ranged from 66-78 µg/L (average of 72 µg/L) and chlorophyll-a ranged from 18-35 µg/L (average of 27 µg/L).

Table 3. Mean Water quality values of Lake Kerinci based on the temporal distribution

Parameters	Units	April	June	August	October	Mean	Std
Transparency	meter	1.1	1.3	1.2	1.2	1.2	0.1
Temperature	ºC	26.7	26.2	22.6	26.3	25.5	1.9
Conductivity	µS/cm	90	92	93	88	91	2
PH	unit	8.2	7.1	7.3	7.3	7.5	0.5
Oxygen	mg/L	7.78	6.42	6.34	6.72	6.82	0.66
Alkalinity	mg/L	64	33	62	55	54	14
Ammonia	mg/L	0.06	0.23	0.08	0.09	0.11	0.08
Nitrate	µg/L	25	104	122	74	81	42
Phosphate	µg/L	54	55	58	56	56	2
Total-P	µg/L	68	66	78	74	72	6
Chlorophyll-a	µg/L	35	31	22	18	27	8

Based on the spatial distribution (Table 4), the water transparency from station 1 to 6, ranged from 1.1 to 1.3 meters (average value of 1.2 meters), the temperature ranged from 25.6-27.0ºC (average of 26.2ºC), conductivity was between 87-90 ìS/cm (average of 88 ìS/cm), the pH ranged from 7.6 to 7.7 (average of 7.6). Dissolved oxygen content ranged from 7.66 to 8.29 mg/L (average of 7.89 mg/L), the alkalinity of 53-55 mg/L (average of 54 mg/L), ammonia levels from 0.07 to 0.12 mg/L (average of 0.11 mg/L), nitrate 41-133 µg/L (average of 65 µg/L), phosphate 46-66 µg/L (an average of 55 µg/L), total phosphorus ranged from 62-79 µg/L (average of 70 µg/L) and chlorophyll-a ranged from 22-33 µg/L (average of 26 µg/L).

Table 4. Mean water quality values of Lake Kerinci based on the spatial distribution

Parameters	Units	St-1	St-2	St-3	St-4	St-5	St-6	Mean
Transparency	meter	1.2	1.1	1.3	1.2	1.3	1.2	1.2
Temperature	ºC	25.7	25.8	27.0	25.7	26.2	26.5	26.2
Conductivity	µS/cm	87	90	88	88	89	88	88
PH	unit	7.6	7.6	7.6	7.6	7.7	7.6	7.6
Oxygen	mg/L	7.66	8.29	7.76	7.88	8.12	7.67	7.89
Alkalinity	mg/L	54	55	53	55	53	54	54
Ammonia	mg/L	0.10	0.12	0.12	0.12	0.12	0.07	0.11
Nitrate	µg/L	52	133	72	52	42	41	65
Phosphate	µg/L	59	66	51	59	46	47	55
Total-P	µg/L	75	79	65	73	62	65	70
Chlorophyll-a	µg/L	33	30	23	22	28	22	26

Remark: St = Station ; Std = Standard Deviation

In the deepest part between 0-70 meters (station 1), water temperature ranged between 23.1-25.5 ºC and average 23.8ºC, conductivity of 87-110 ìS/cm with an average of 98 ìS/cm, pH waters of 6.86-7.64 with an average of 7.24 and dissolved oxygen levels ranging from 1.39 to 7.66 mg/L with an average of 4.01 mg/L. The vertical profile of the four parameters can be seen in Figure 2.

Trophic state index values of the lake waters based on the temporal and spatial distributions were listed in Table 5 and 6, while the potential of fish production were listed in Table 7 and 8.

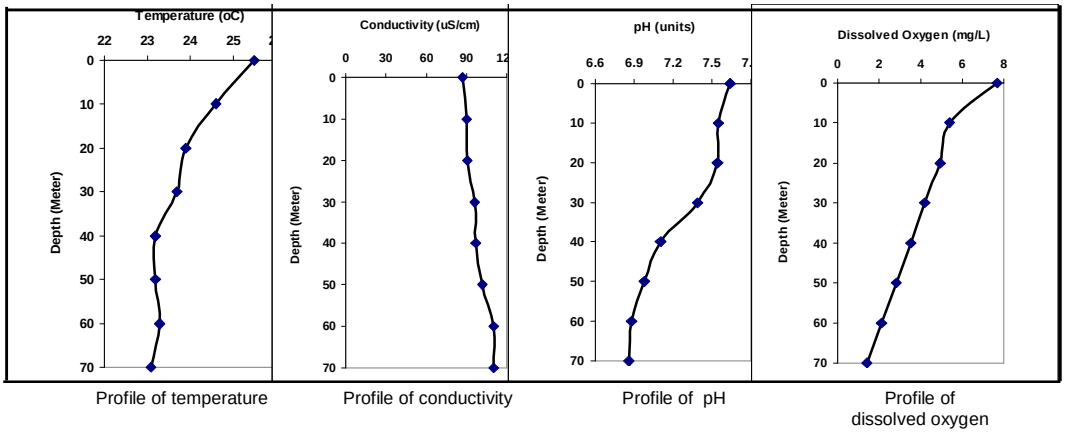


Figure 2. Vertical profiles of temperature, conductivity, pH and oxygen in Lake Kerinci.

Table 5. Trophic state index (TSI) of Kerinci Lake based on the temporal distribution

No	Months of Research	Score of TSI	Trophic State
1	April	62.86	Moderate eutrophic
2	June	61.59	Moderate eutrophic
3	August	61.73	Moderate eutrophic
4	October	60.81	Moderate eutrophic
	Average	61.75	Moderate eutrophic

Table 6. Trophic state index (TSI) of Kerinci Lake based on the spatial distribution

No	Stations of Research	Score of TSI	Trophic State
1	Station-1	62.72	Moderate eutrophic
2	Station-2	63.01	Moderate eutrophic
3	Station-3	61.13	Moderate eutrophic
4	Station-4	61.96	Moderate eutrophic
5	Station-5	60.81	Moderate eutrophic
6	Station-6	60.86	Moderate eutrophic
	Average	61.75	Moderate eutrophic

Table 7. Potential of fish production in the Lake Kerinci based on the temporal distribution

Months of Research	Potential fish production	
	(kg/ha/year)	(ton/year)
April	392	1,647
June	356	1,493
August	259	1,089
October	219	920
Average	307	1,287

Table 8. Potential of fish production in the Lake Kerinci based on the spatial distribution

Stations of Research	Potential fish production	
	(kg/ha/year)	(ton/year)
Station-1	367	1,541
Station-2	341	1,430
Station-3	288	1,210
Station-4	286	1,199
Station-5	305	1,282
Station-6	253	1,061
Average	307	1,287

Discussion

Limnological Condition

The water condition of Lake Kerinci, based on the value of each parameter did not seen to much vary, either measured by the time of sampling/ temporal ways (April to October) or measured by sampling stations/ spatial ways (station 1 to 6). Jorgensen (1980) stated the water condition of the lake with a variation value of water quality parameters does not differ significantly based on the time and place, is alleged that the limnological condition of the lake waters was relatively stable.

Aquatic trophic conditions in terms of water transparency parameters either measured by the temporal or spatial ways ranged from 1.1-1.3 meters with an average of 1.2 meters indicate the lake waters are included in the meso-eutrophic (Golman & Horne, 1983; Jorgensen, 1980; Cooke *et al*., 2005). Water transparency was related to the level of turbidity of river water pouring into the waters of the lake. In addition, the presence of land use activities around the lake (rice fields and settlements) allows the inclusion of organic colloidal particles into the waters of the lake which caused high turbidity levels, this occurred when the wet season had come (Davis & Cornwell, 1991).

In the deepest part, the water temperature shows a decreasing value with increasing water depth but decreasing of the value was very little. The small difference between surface and bottom water temperatures indicates that Lake Kerinci is classified as an oligomictic lake. This kind of lake in the tropical region has rarely perfect water circulation (Whitten *et al.,* 1987). The type of the lake mentioned above usually do not have a stratification layer of epilimnion, metalimnion and hypolimnion. Pescod (1973) stated that the water temperature changed suddenly and reached of 2.8ºC could destroy fish. Ahmad (1992) stated that the optimal water temperature for fish life occurs from 28 to 30ºC, under a temperature of 25ºC to 18ºC, certain fish species still survive but his appetite begin to decline. Based on the references, the water temperature of Lake Kerinci seems be ideal to support fish life.

The profile of pH and dissolved oxygen content tends to decrease with increasing the depth, while the value of the conductivity rose with increasing the depth that described the number of colloidal particles containing ions in the bottom waters (Wetzel, 1975; Boyd, 1979). The level of oxygen in the bottom waters of 1.39 mg/L is not suitable for fish life (Kartamihardja *et al.,* 1987). The pH of water decreasing from 7.64 at the surface to 6.86 at the bottom may influence the organic matter in the bottom waters (Boyd, 1979). Organic materials stacked in the bottom of the lake are decomposed by anaerobic bacteria and potentially decrease the dissolved oxygen content in the water so that oxygen levels become low. Due to low dissolved oxygen content in the bottom waters of Kerinci Lake, the bottom organism's life is limited. This is seen from the few bottom fish caught by fishermen (Samuel *et al*., 2013).

According to Pescod (1973), dissolved oxygen in the water at least 2 mg/L is sufficient to support fish life normally, but there are no toxic substances (toxic) in the waters. Based on the Indonesian Government Regulation No. 82/2001, the water quality standards which intend to sustain the life of aquatic organisms with reference to the dissolved oxygen levels are as follows: oxygen levels above 6 mg/L is very good (grade I), between 4-6 mg/L belonging to grade II. Dissolved oxygen content of Kerinci Lake waters is clustered in criteria of grade I and II, while below the layer the oxygen levels are started to decline. However, when viewed from the levels of dissolved oxygen, the waters

of Kerinci Lake are still worth to supporting fish life, especially the kinds of pelagic fish. Based on the water quality criteria proposed by Jeffries & Mills (1996), the levels of dissolved oxygen in the water ranged from 4.5 to 6.4 mg/L, so that the water quality status of Kerinci Lake would be lightly polluted waters. A part of them, the oxygen level values are still below 4 mg/L, this concludes that the waters of Kerinci Lake could be classified into mild-moderate polluted waters.

The pH of the waters during sampling (April to October) ranging from 7.1 to 8.2 with an average of 7.5 and based on the location of research, it was ranging from 7.6 to 7.7 with an average of 7.6 characterized the waters of Kerinci Lake as alkaline. Pescod (1973) mentionned the tolerance limit of aquatic organisms on the pH is various and influenced by many factors such as temperature, dissolved oxygen and alkalinity. In order to support fish life reasonably it is needed the waters with a pH ranging from 5.0 to 9.0 (Novotny & Olem, 1994). Tebbut (1992) stated that the ideal waters condition for supporting fish life is at pH of 7.0 to 8.5. From that information it could be mentionned the waters of Lake Kerinci could be classified as ideal waters to support fish life.

The value of water alkalinity could indicate the buffer capacity of the waters and could be used to estimate trophic state of waters (Swingle, 1968). Temporal and spatial measurements, alkalinity values of waters ranged from 33-64 mg/L $CaCO_3$ eq. with an average of 54 mg/L $CaCO_3$ eq and 53-55 mg/L $CaCO_3$ eq. with an average of 54 mg/L $CaCO_3$ eq. Relationship between the alkalinity and the water quality for fishery purposes, the waters of Kerinci Lake is classified as waters with meso-eutrophic because its value is below the range of values between 100-250 mg/liter $CaCO_3$ eq. (Canter & Hill, 1979).

Conductivity value provided an overview about the amounts of dissolved salt content or ionized in a body of water. Both APHA (1981) and Boyd (1979) mentionned that the tolerance limits of the conductivity value of fish are affected by the water hardness. For a proper life, the fish could tolerate conductivity ranging in value of 150-500 µmhos/cm (Sylvester, 1978). The results of measuring the conductivity in the waters of Lake Kerinci, conductivity average value was 91 ìS/cm (temporal measurement), 88 ìS/cm (spatial measurement), and the vertical measurement, the value was an average of 98 ìS/cm. The average conductivity value shows a relatively good value for the fish life (Kartamihardja *et al.*, 1987). When the conductivity value is compared with that of Batur Lake of Bali where the conductivity value of above 2,500 ìmhos/cm (Samuel *et al.*, 2011), it indicates that the waters of Kerinci Lake have low mineral salts content.

Phosphate content ranged between 54-58 µg/L with an average of 56 µg/L and total phosphorus between 68-78 µg/L with an average of 72 µg/L. The measurement based on the locations of research station (Spatial distribution), mean value of phosphate and total phosphorus were 55 µg/L and 70 µg/L respectively, classified the Kerinci Lake into criteria as fertile waters/ eutrophic level (Liaw, 1969). The concentration of phosphate in natural waters rarely exceeds to 100 µg/L, except for waters that receive domestic wastes, industrial waste and runoff from agricultural areas/estates that charge with phosphate fertilization (Wardoyo, 1979). Jorgensen (1980) and Alabaster & Llyoid (1981) also mentioned that The level of total phosphorus (TP) ranging between 66-78 µg/L (temporal distribution) and 62-79 µg/L (spatial distribution), is classified as moderate to high fertility rates characterizing the eutrophic waters.

Ammonia content of waters ranged from 0.06 to 0.23 mg/L with an average of 0.11 mg/L. The ammonia content values measured by temporal was not significant difference with spatial that ranged from 0.07-0.12 mg/L (average of 0.11 mg/L). Pescod (1973) stated that the capacity of ammonia toxicity increased with increasing the pH and decreased when the pH dropped. Further said for the waters in the tropical regions, ammonia in waters was not more than 1.0 mg/L. According to Redner (1978) as cited in Arthana & Restu (2009), the fish, *Tilapia aurea,* is relatively sensitive to ammonia in which the ammonia concentration of 0.12 mg/L, its growth has been affected and if referring to Government Regulation No. 82, 2001 on the control of water pollution, free ammonia levels in the water were advised not to be more than 0.02 mg/L. From these criteria, the condition of the Kerinci Lake is categoried as a high ammonia level. It is estimated by the decomposition process of organic material in the bottom part of the lake where is among excreted ammonia into the water system. Besides that, domestic and agricultural wastes (remnants of fertilizer into the waters widely available on the lake are also potential to produce the compounds of ammonia, nitrate and nitrite through chemical reactions in the process of nitrification.

Nitrate levels temporally ranged from 25 to 122 µg/L with an average of 81 µg/L. Spatially, it ranged from 41-133 µg/L with an average of 65 µg/L. Referring to the criteria of the water fertility proposed by Wetzel (1975), based on those values the waters condition of Kerinci Lake is classified as moderate fertility (meso-

eutrophic). The mean levels of chlorophyll-a in Lake Kerinci waters was 27 µg/L (temporal distribution) and 26 µg/L (spatial distribution), classified the waters as eutrophic level (Jorgensen, 1980).

The average trophic state index of waters temporally ranged from 60.81 to 62.86 and spatially ranged from 60.81 to 63.01. Both temporal and spatial ways have the same average value of 61.75 with moderate eutrophic state. The eutrophic state characterized Kerinci Lake as a high fertility rate. The high fertility of the lake waters is suspected due to the high concentration of phosphorus. The process of the high water fertility in Lake Kerinci can be explained as follows: 1) the nutrients derived from agricultural activities/plantation around the catchment area of the lake that its waste entering through the inlets to the lake waters; 2) materials coming from residential areas and human activities around the lake which stimulante the waters fertility of the lake; and 3) materials derived from feed waste released into the waters of the floating net cage activity which were found around the lake.

Potential Fish Production

The potential fish production in Lake Kerinci temporally ranged between 219-392 kg/ha/year with an average of 307 kg/ha/year. Based on spatial distribution, the potential fish production ranged from 253-367 kg/ha/year with an average of 307 kg/ha/year. With this average, the lake was classified as the waters having a high potential fish production (Kartamihardja, 1987). The high potential fish production in Kerinci Lake is probably due to closely relationship to the trophic state of waters that is also in a high fertility rate.

Taking account of the water area wide of Kerinci Lake that is around of 4,200 ha, so the potential fish production was calculated at average value of 1,287 tons/year. Jusuf (2009) summaried that the number of potential fish production for all lakes in Indonesia amounted to ± 158,162 tons/year. Based on this reference, it is found that the number of potential fish production of Kerinci Lake exceeded ± 0.82%. From the fishery statistical data of Kerinci District in 2012, the production of fish caught in Lake Kerinci was reported about 957.81 tons (Gazam, 2013). This indicates that the fishing in the lake would be still below the number of estimated potential production (average of 1,287 tons/year). Referring to the sustainable utilization of fish resources, it suggests that the activities of fisheries in Lake Kerinci would be maintained with a production target to be not exceeded the value of the potential fish production of Kerinci Lake.

CONCLUSION

The aquatic trophic state index (TSI) value calculated from the values of water quality parameters (water transparency, total phosphorus and chlorophyll-a) either measured by temporal or spatial ways has TSI with an average of 61.75, indicating the classification of the waters of Lake Kerinci is in eutrophic level. Based on the analysis of some parameter values (conductivity, the concentration of phosphate (PO_4-P), nitrate (NO_3-N), and alkalinity), temporally and spatially, the lake waters are generally categorized as productive waters that might support the life of aquatic organisms. This condition estimate the potential fish production of 307 kg/ha/year. Taking into account the broad waters of the lake, potential of fish production was an average of 1,287 tons/year. This potential fish production value was relatively higher than that repoted in 2012 production which amounted to 957.81 tons. In order to maintain the sustainability of fish resources in Lake Kerinci, it suggests that fish production should not exceed the value of the potency of production as obtained in this study.

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