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Identification and stocking density of elements phosphate indigo system for fish farming cages nets floating in freshwater district Laut Tawar, Aceh Province

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Abstract. Lake Laut Tawar is located in Aceh district of Aceh province. The lake were used by the community as a livelihood by making a Cages. One of the elements that influence the fish growth is an element Phosphate (PO_4) and other such as, pH, nitrate-nitrite, temperature and others. The lake has undergone changes caused by the use of commercial feed. The sampling locations based on the environmental setting by using method "purposive sampling" from January to May. The results was found of 0.1407 mg/L phosphate with fish expenditure amounting to 23728.61 ton / year using cages of net with number as 92, stocking density at 48,950 of fish and marine area 19.77 Ha. However the standard classes showed is under class II Regulation with No. 82 Year 2001 3400, solid lowest stocking cages tail on the size of 2.5 x 2.5 x 3m (spacious, 181m^3) with post-harvest fish expenditure amounted to 1,214 tons of fish/year, the highest 9,250 cages tail on the size e of 5 x 5 x 3m (spacious 123m^3) with fish expenditure by 2,800 tones of fish/year. While the results of feed conversion and Phosphate content is 12.70% with the Feed Conversion Ratio (FCR) was 1,635 and 1,491.

1. Introduction

Laut Tawar is a lake formed from volcanic processes with an area of 5742.10 ha, with a depth of 84.23 and a length of 15.7 km, width 4.5 km, vast littoral zone with potential are the process of photosynthesis by aquatic 14.28 %. Lautt Tawar also has one outlet that river Batang Peusangan (the name of village) and there are as many as 25 small streams of water catchment areas and has a water flow varies between II L/ sec - 2554L / sec [1] so appropriate to be the location of freshwater fish farming. Water level in Laut Tawar in November to January very fluctuating then decreased until March and rose in April as written by Hygiene and Cropping (2014) . suitable for location of freshwater fish farming.

Fish farming in the system Cages net in Lautt Tawar has long been done by the people of Central Aceh. The system of fish farming every year cage net was continue increase, it is because knowledge of the fish farming cages net system is very good compared to the maintenance of fish naturally. The increasing public freshwater fish in the Laut Tawar, reduce impact of phosphate elements and oxygen elements due to feeding or household waste, that the occurrence of water pollution [2]

Feeding used by the public is in the form of feed floating nature of the feed drifting of stream direction of the wind, because the feed is floating not some favored fish. The feed will accumulate corner of the net so that there is contamination, thus the element Phosphate present in the water will be disrupted, this caused resulting in fish rearing is not achieved in accordance with what is expected. Death of fish is very high due to the high levels of Phosphate, the population levels of algae will grow so that oxygen will be reduced [3.4]. To avoid the occurrence of a mass mortality of fish, due to the increased element of phosphates in the Laut Tawar. It is necessary governance good governance by examining how much impact the influence Phosphate on fish cultivation system cages floating net by using additional feed. Feed Conversion Ratio (FCR) is one way of determining the amount of feed given in determining catches converted with elements phosphate contained in feed consumed fish.

Feeding is not appropriate trigger pollution because the feed is not eaten by the fish. Remaining in the other form, such as nitrogen and phosphorus pollution that would make the fishing mortality rate will be higher. Phosphorus was instrumental in the process of eutrophication in a water ecosystem, so increasing phosphorus in the water, the algae will increase, causing oxygen deficit leaching in water that eventually kill fish en masse.

To determine the level of fishing mortality caused by high Phosphate elements in water, and Phosphate elements contained in fish feed as well as the amount of fishing that takes place every year.

2. Materials and Methods

2.1. Samples

Data collection was performed by means of purposive sampling, based on the point coordinates are generated. In this study was determined by 4 (four) observation station where the locations are considered in accordance with the purpose of research. Station 1, located in the village Kelitu, located at coordinates 4 ° 38 '12:45' 'N and 96 ° 54' 41.11 " BT. Water sampling is done at two points, with a distance of 50 and 100 meters from the shores of Lake. Station 2, the waters adjacent to agricultural activity and settlement. Station 3, is the only outlet Laut Tawar at coordinates 4 ° 37 '35.22' 'N and 96 ° 51' 32.45 " BT. Water sampling within the 100 and 150 meters from the shores of Lake. Station 3, is the only outlet Laut Tawar, located at coordinates 4 ° 37 '35.22' 'N and 96 ° 51' 32.45 " BT. Water sampling at a distance of 60-120 meters from the shore of Lake. At station four water sampling conducted on two groups of cages.

2.2 . Preserving Water Samples

Pickling question is if the sample to be analyzed is not done directly at the time of data collection but were housed in some old dependent than the type of meter to be examined as an example of preservation under in:

2.3. Measurement of Physical Chemistry Parameter Bodies as follows:

1. The water temperature using secci Disk, and thermometer
2. Brightness, using Disk secci and count the number of dots on a string that has been given the scale.
3. The degree of acidity (pH). By dipping into the sample pH meter
4. Analysis Dissolved Oxygen (DO)
5. BOD (Biochemical Oxygen Demand)
6. Analysis Nitrate
7. Analysis of total phosphate.

2.4. Calculation (Feed Conversion Ratio (FCR) was calculated as follows:

$$FCR = \frac{\text{Amount of feed given (tons)}}{\text{Weight of fish produced (tons)}}$$

2.5.Calculation of Morphology and Hydrology lake with the formula:

$$Z = V / A$$

$$p = Q0 / V$$

Where:

Z = The average depth of the lake (m)
V = Volume of lake water (million m3)
A = area of the lake waters (m2)
p = rate of flushing water lakes (1 / year)
Q0 = Number of water flow out of the lake (Million m3 / year)

Table 1. Preserving water samples

Type of Analysis	storage containers	Required Amount	Preservation	Limit of Storages
BOD	BOD Bottle	100	Refrigerant	48 hours
Total Phosphate	G (A)	100	Refrigerant	48 hours
Nitrate	P,G	100	H2SO4; pH≤ 2, Refrigerant	48 hours

Sources: [5]

2.6. Pollution Load Calculation of Total P (La) with the formula:

$$La = Likan \times A$$

$$Likan = \Delta [P] Z.P / (1 / year)$$

$$Rikan = x + [(1-x) R]$$

$$R = 1 / (1 = 0{,}747\ p0.507)$$

Where:

Likan = P-total waste of fish per unit large
A = area of the lake waters (Ha)
Z = The average depth of the lake (m)
p = rate of flushing water lake (1 year)
Δ [P] = value difference between the mean concentration Average phosphate in waters with a total maximum phosphate accepted farmed fish (mg / m3)
Rfish = The overall proportion of total phosphate lost to sediment
x = The proportion total phosphate missing permanently to precipitate in bottom waters was 0.45 to 0.55
R = Total phosphate dissolved stay together sediments

2.7. Calculated of Phosphorus in Fish Farming (PLP) by the formula:
PLP = FCR x Pfeed -Pfish
Where:
PPakan = levels of phosphate in the feed (Kg)

Where:
P (La) = total phosphorus load carrying capacity. Where: The detail calculation in point 2.8 as following

below

2.8. Calculation of Maximum Fish Production

$DD = \frac{P\ (La)}{PLP}$

DD = Carrying capacity of water (tons / year) (Kg / year)
PLP = Number of phosphate released from
fish cultivation.

3. Results and Discussions
To determine the average stocking density, the amount of feed given and cages net production can be seen in Table 2 where the number was 920 cages net with indigenous fish stocking at 48.950. While the production of fish in the cages is 1,214 tons / year with size cages net is181 m3, stocking densities 3,400 fish, total fish/cycle amounted to 0.607 tones, the total feed of 1,986 tons/year and FCR amounting to 1,635, with a stocking density slightly but FCR owned larger, it shows that taking fish feed every uneven compared to the number of stocking density of fish and 9,250 cages, FCR was 1,491, but not all cages net which increased FCR. Fish expenditure average of the number of cages net is 2,135 tons / year, this indicates that the waters of Lut Tawar contributes greatly to the production of fish public waters [6] and if by Trix index, Laut Tawar categorized mesotrofik waters.
P / tons of feed) by the formula:

Table 2. Average Number of Total Solids Tebar and Fish Production in 181m^3 Cages and Total Feed

Sizes of Cages net/m^3	Solid stocking (total of fishes) (tails)	Total of fishes/cycles (year/tones)	Production of fishes (KG) Total of fishes /year (tones)	Feed/ cycles (tones)	Total of /year (tones)	FCR
123	9,250	1,400	2,800	2,087	4,174	1.491
97	8,800	1,200	2,400	1,840	3,680	1.533
111	8,000	1,418	2,836	2,203	4,406	1.554
129	7,000	1,066	2,132	1,533	3,066	1.533
146	7,000	1,000	2,000	1,500	3,000	1.500
133	5,000	0,783	1,566	1,133	2,266	1.447
181	3,400	0,607	1,214	0,993	1,986	1.635
Mean		1,068	2,135	1,613	3,225	1.527

Total phosphate in Laut Tawar experience likely fluctuations on a monthly basis as in January the state of phosphate was obtained 0.100 and 0.280 in the station 1 and 3, in February occurred for station 3 is higher than stations 1 such as phosphate is at 0.132 and 0.180 as shown in Table 3. Meanwhile, in April and Mei station 1 is lower compared with the phosphate content of 3 stations that are in the 0.108 to 0.133, and 0.559 to 0.164. For station 4 only occurs in March is 0.112 to 0.180 for Station 1 and Station 4.

Abundance of phosphorus can lead to eutrophication, thereby encouraging the growth and development of algae rapidly resulting in lower dissolved oxygen content will cause the death of the organism [7], While the value of total raw phosphate based on Government Regulation No. 82 of 2001 grade II for freshwater fish farming is 0.2 mg/l.

Table 3. Average Total Phosphate in January, February, March, April and May in Laut Tawar at Stations 1, 2, 3 and 4

Number of Station	Month					
	January (mg/l)	February (mg/l)	March (mg/l)	April (mg/l)	Mei (mg/l)	FCR
Station 1	0.100	0.162	0.112	0.108	0.112	0.119
Station 2	0.154	0.143	0.144	0.115	0.137	0.139
Station 3	0.280	0.132	0.156	0.559	0.164	0.148
Station 4	0.163	0.152	0.180	0.142	0.151	0.157
Mean	0.136	0.147	0.148	0.131	0.141	0.140

The results of the analysis of chemical properties of physics in the waters of Laut Tawar at each station experiencing significant difference even though there is the same as the state of the lake water brightness average ranges above 5 m, there are only four stations has decreased with a brightness level ranging from 4,94 m viewable in(Table 4). the whole station DO increase ranged 5.74 to 6.98 mg / l is at station 4 and 3. the resulting BOD is no low levels averaging 2.18mg / l. Nitrate-N lower at Station 1 is located at 0.8mg / l, while the quality standard of Grade II said 10mg / l content of nitrate-N in Laut Tawar that it demonstrates Laut Tawar is still best used with the cultivation of floating net system cages , as claimed by [8] in which the nitrite content in excess of 1 mg /l can make fish mortality.

Table 4. Average Analysis Chemical Properties Physical Bodies Laut Tawar at each station.

Number Station	Parameter						
	Temperature (^{0}C)	Brightness (m)	DO (mg/l)	BOD (mg/l)	pH	Nitrate-N (mg/l)	Total Phospate
The quality standard Class 11 Deviation 3			≥ 4	3	6-9	10	0,2

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From the analysis parameters Chemical Physics Water Laut Tawar in every station 1,2,3 and 4 (Table 5), the average temperature levels ranging from 23.5 up to 24.25^{0}C, Brightness was there 4.96 m to 5. 32 m, DO is at 6.05 womb up to 6.54mg / l, BOD is at 1.8 up to 2.38mg / l, pH between 7.17 up to 8.17. Nitrate-N ranged from 1.04 up to 1,11mg / l, and Total phosphate is at 0.13 up to 0.15mg/l.

Table 5. Average Analysis Chemical Properties Physical Bodies Laut Tawar at each station.

Number Station	Parameter						
	Temperature (^{0}C)	Brightness (m)	DO (mg/l)	BOD (mg/l)	pH	Nitrate-N (mg/l)	Total Phospate
The quality standard Class 11			≥ 4	3	6-9	10	0.2
Deviation 3							
Station 1	23.80	5.41	6.54	2.25	7.9	0.8	0.12
Station 2	23.60	5.14	5.90	2.06	8.08	1.02	0.14
Station 3	24.40	5.06	6.98	2.26	8.20	1.31	0.15
Station 4	24.00	4.94	5.74	2.18	8.03	1.13	0.16

Table 6. Average analysis Physical and Chemical on January, February, March, April and May in\ Lake Laut Tawar at station1, 2, 3 and 4

Parameter	The quality standard Class 1	Month				
	Deviation 3	January	February	March	April	May
Temperature (^{0}C)		24.25	24.25	24	23.5	23.75
Brightness (m)		5.32	5.01	5.23	4.96	5.15
DO (mg/l)	4	6.22	6.54	6.31	6.32	6.05
BOD (mg/l)	3	2.38	2.28	1.8	2.05	2.32
pH	6-9	8.1	8.03	7.99	7.91	8.17
Nitrate-N (mg/l)	10	1.04	1.06	1.11	1.05	1.09
Total Phospate (mg/l)	0.2	0.14	0.15	0.15	0.13	0.14

Results of average total phosphate Ra of 0.1407mg / l with fish production amounted 23,728,615 tons of fish / year means Laut Tawar can accommodate the expected carrying capacity, where the productivity in cages in Laut Tawar average of 41,577kg / m3 /year. To reach the carrying capacity of the water volume of Laut Tawar that can be utilized is 570,714,935m3, if at Laut Tawar has a depth of 3 meters, the water area that can be utilized in accordance with its carrying capacity is 19.024 hectares or an area of 0.331% of the area of the lake , as shown in table 6.

Table 7. Carrying fluctuations of Laut Tawar, Aceh

Month	Phospate (mg/l)	Carrying Capacity (ton/year)
	0.136	24,748,967
February	0.147	22,360,908
March	0.148	22,143,812
April	0.131	25,834,448
May	0.141	23,662,846
Mean	0.1407	23,728,615

4. Conclusions

The research result have was found of 0.1407 mg/L phosphate with fish expenditure amounting to 23,728,61 ton / year using cages of net with number as 92, stocking density at 48,950 of fish and marine area 19.77 Ha, and standard classes showed is under class II Regulation with No. 82 Year 2001. While the

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