American Journal of Agricultural and Biological Sciences 8 (2): 142-148, 2013
ISSN: 1557-4989
©2013 Science Publication
doi:10.3844/ajabssp.2013.142.148 Published Online 8 (2) 2013 (http://www.thescipub.com/ajabs.toc)

Analysis of *Leptobarbus hoevenii* in Control Environment at Natural Lakes

[1]Mohd Khairul Amri Kamarudin, [2]Mushrifah Idris and [1]Mohd Ekhwan Toriman

[1]School of Social, Development and Environmental Studies, Faculty of Social Sciences and Humanities,
[2]School of Natural and Environmental Sciences, Faculty of Science and Technology,
National University of Malaysia, 43600, Bangi Selangor, Malaysia

Received 2013-01-30, Revised 2013-03-27; Accepted 2013-06-24

ABSTRACT

Leptobarbus hoevenii or its common name Ikan Jelawat is a high-value fish from family *Cyprinidae*, genus *Leptobarbus* are omnivorous fish that can grow up to 60 cm long. Due to human activities and the time change, this species has been depleted in Lake Chini. As an initiative from the Malaysian government, a conservation project for this species has been carried out. This article discussed the results on growth-up monitoring of *L. hoevenii* on the food and environment factor in conservation cage at Lake Chini. Monitoring of the grown-up, food and water quality of chemical composition was carried out for four months of this study. The results of statistical analysis showed, *L. hoevenii* growth is a positive rate with the Body Weight (BW) and Total Length (TL) on R^2 0.986 and R^2 0.988 respectively, by using floating type '*grower pellet*', with 32% of protein. However, the Jemberau River basin is experiencing changes due logging and mining activities and that have affected to the chemical composition of the water quality and environmental. The iron content in the first week is ±0.0 mg L^{-1} change to ±5.0 mg L^{-1} and ±0.0 mg L^{-1} to ±2.0 mg L^{-1} for ammonia content in 10 weeks. The high content of the iron and ammonia on the water quality in the cage areas, effected for livestock to be stressed and also to the diet and growth-up of fish. 2500 of batch 1 *L. hoevenii* that has been released in Lake Chini showed they can be adapted to the local environment at the Laut Jemberau Lake, but take a time. Therefore, the closure of the Laut Jemberau Lake as fish conservation area is proposed to ensure that conservation objectives are achieved.

Keywords: *Leptobarbus Hoevenii*, Fish Growth, Jelawat Fish, Fish Food

1. INTRODUCTION

Fish are aquatic organisms that became the main source of protein for human; this is because each organ of fish has a high ability to concentrate different metals even in the same species. Fish also known as vertebrate that belongs to the cold-blooded group as their body temperature that varies with environment (Ahmad *et al*., 2009a; 2009b). Fish is the biggest of the nekton community of the group of animals have the ability to swim and to determine the position and spread without the influence of water currents or waves (Inerny and Gerard, 1989).

Fish growth is highly sensitive and depends on several factors such as diet, water quality, good health and the environment. All these factors are interrelated, which makes it a complex system.

Lake Chini is the second largest natural lake in peninsular Malaysia has a unique geomorphological structure (Othman *et al*., 2010a). This lake has a rich heritage with a variety of freshwater fish species and famous as one of the first anglers at a time. It is because, the reservoir of Lake Chini has a complex genetic of fish effects from the mixing of water from creeks that flow into the Lake Chini and flow out to Pahang river go to see via Chini river. In the raining season, water from

Corresponding Author: Mohd Khairul Amri Kamarudin, School of Social, Development and Environmental Studies, Faculty of Social Sciences and Humanities, National University of Malaysia, 43600, Bangi Selangor, Malaysia

Pahang river back flow into Lake Chini via Chini River, from these phenomena many species from the Pahang River go in to Chini Lake (Kamarudin *et al*., 2009; Othman *et al*., 2010b). Thus, not surprisingly, Lake Chini has been reported to support approximately 84 freshwater fish species in a while ago (Ahmad *et al*., 2009a). Unsustainable development of the tourism industry and increasing human activities such as farming, mining and logging has been affected the natural ecosystem of the Lake Chini. This can be seen with increasing density of cats aquatic plant (*Cabomba furcata*), deterioration of water quality, reduction of the lotus plant, reducing the number of fish and an increase of *coliform bacteria* and *Eschericia coli* (Othman *et al*., 2005; Idris and Kutty, 2005). Decrease of the diversity and composition of fish in Lake China was also a result of the construction of dams or water locks on the River Chini in 1995 to control the water level of lakes and river Chini. Deforestation, fertilizers and pesticides using for farming and mass exploitation of fish as a source of additional income by local or indigenous people is also likely the cause of threat composition of fish in this lake (Toriman *et al*., 2009).

July 2009, Lake Chini declared as a Biosphere Reserve (BR) area, which ultimately provide to new impetus and opportunity to this area to support sustainable development and tourism at Lake Chini. Biosphere Reserve is an area that was commissioned by United Nations Educational, Scientific and Cultural Organization (UNESCO) and Biosphere Program through (MAB) to achieve between human harmony and environment balance (Ahmad *et al*., 2012). Biosphere Reserves also should ensure the cultural landscape and man-made development to bring maximum benefits and opportunities for local communities to integrate with nature and to create nature balance, harmony and benefits to all aspects (Schultz *et al*., 2011; Batisse, 1982).

The sequence from global declarations to Lake Chini, Malaysian government under the provisions of the East Coast Economic Region Development Council (ECER) allocated about RM 4.2 million to a special conservation program entitled "The Proposed Construction and Completion of the following Works for the Rehabilitation and Conservation Works at Chini Lake State Park, Pahang" was carried out. There are three main factors in this project. First is Chini River bank erosion control, second is reforestation of open areas around Lake Chini catchment and third is conservation of fish in Chini Lake which aims to conserve and restore the environment of Lake Chini as an ecological system and focus on sustainable tourism. Therefore, this article presents a study of growth monitoring of *hoevenii Leptobarbus* (or its common name is Jelawat fish) in cage environment conservation at Lake Chini have been performed.

2. MATERIALS AND METHODS

In the original proposal, Jemberau River, which flows into the Laut Jemberau at the Chini Lake has been selected as a conservation of fish nursery areas, but for some reason the area was transferred to the Laut Jemberau which is ±600 m front the Jemberau River. Laut Jemberau been selected as a conservation of fish nursery areas because the content of water quality in this lake is very good from Class I level accordance with the Indexes Water Quality Standard (IWQS) in Malaysia (Othman *et al*., 2009). Jemberau also has a stream that flows throughout every year in which a discharge between 1.5-2.3 $m^3 sec^{-1}$ and is the largest tributary basin from the Chini Lake. **Figuer 1**, sufficient swampy areas to store and supply water in the Laut Jemberau) Laut Jemberau also has an easy access and research center sites (UKM-PPTC) that will facilitate any research and conservation activities carried out.

Leptobarbus hoevenii (Jelawat) and *Hemibagrus nemurus* (Baung) spesis being selected as the first catalyst for this conservation project. There are 10 nursery tanks with a capacity of 2100 L for the growth of seedlings and 10 cage capacities of 5×5×2m for preservation before discharging into the Lake Chini. A total of reared is 500 fish per cage, five cages reared with *H. nemurus* fish and other five cages with *L. hoevenii* fish. The total number is 5000 pieces for both animal species at a time. However, only *L. hoevenii* fish are being focused in this article.

L. hoevenii also known as Sultan fish in the old community because the fish was a royal meal at this time. According Tan (1980) *L. hoevenii* detected in the large rivers, lakes and mines is the vicinity of Malaysia, Indonesia and Thailand. *L. hoevenii* usually swim in the middle of the water surface elevation to the bottom of rivers or lakes and usually breed during the rainy season. Effects of changes in landforms of human activity not only have affected the ecosystem of Chini Lake basin, but has absolutely disappeared *L. hoevenii* in this lake (Erincho, 1993). Now in Malaysia, population of wild fish of *L. hoevenii* is also reduced (Ashhar, 1998). Thus, *L. hoevenii* seeks to preserve back in select high-value species and indirectly help the livelihood of local people, particularly indigenous people and to aspects of tourism in the Chini Lake.

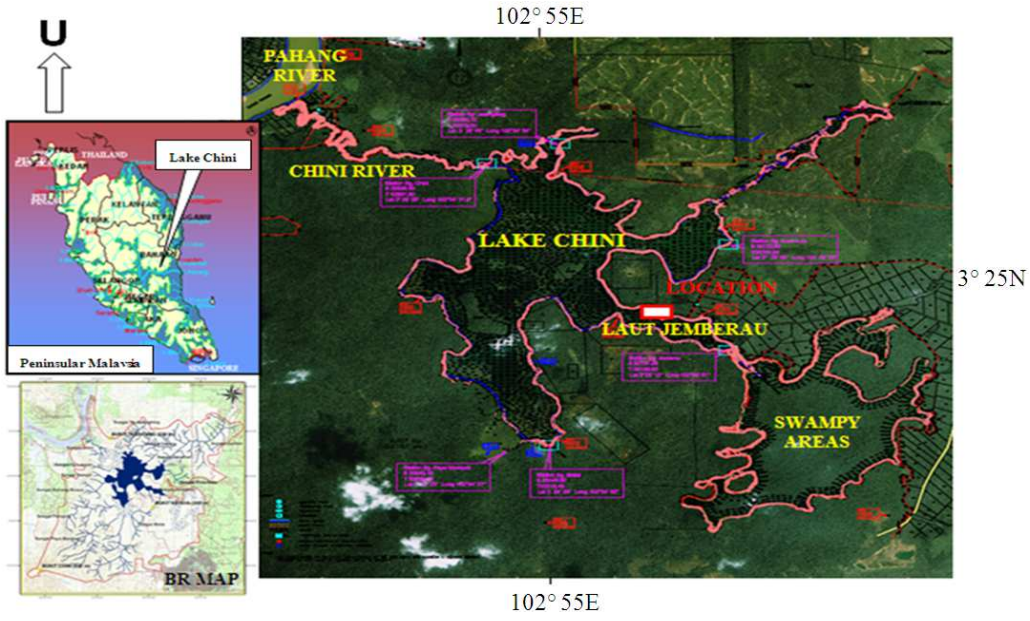

Fig. 1. Location of the conservation of fish nursery and cage areas at lake chini, Pahang, Malaysia

Monitoring of fish growth usually carried out using the method of measurement of total length, fork length and body weight (Pathmasothy, 1985). For this study, the monitoring of fish growth method using a Total Length (TL) measurement, Body Weight (BW) measurement, death of fish and the total daily diet of fish used. 30 of *L. hoevenii* fish has been use of sampling with a random survey of 500 fish in each cage to representation of monitoring fish growth data. For water quality, chemical of water quality data also been taken to see the effect on fish growth. The observed parameter is ammonia, phosphate, iron and alkalinity. For this purpose, a Hanna test kit instrument for fresh water has been used. Model HI 3824 Ammonia Test Kit to measure ammonia content, HI 3833 Phosphate Test Kit for phosphate, HI 3834 Iron Test Kit for the content of iron in the water and HI 3811Alkalinity Test Kit to find out alkalinity of the water content. Three replicate samples are taken and analyzed on a weekly basis and the results are shown as the average replication.

3. RESULTS AND DISCUSSION

This study showed a correlation between growths of *L. hoevenii* and day in this monitoring. **Figure 2** shows a significant relationship of $R^2 = 0.986$ for average Weight (BW) and $R^2 = 0.988$ for the Total Length (TL) between day of monitoring for 4 months of breeding. Indicating that increase in average weight (BW) would cause an increase in Total Length (TL) value, thus causing an increase in growth-up of *L. hoevenii*. While, the mortality rates showed no significant relationship with the day, it rated is $R^2 = 0.251$ where only 12 tails of *L. hoevenii* deaths recorded from 2500 birds bred for 4 months, this indicates showed a very low mortality rate in cage on conservation of fish nursery project at Chini Lake (**Table 1**).

In theory, feeding for fish nursery commonly according from the percentage of Body Weight formula used by the Department of Fisheries Malaysia. The average weight (g) x number of fish (tail) x proposed of the feed rate (%) = amount of food (daily). According from this formula, namely the rate of recommended to eating 5g-15g weight of fish with a rate 6% (Ashhar, 1998; Hyslop, 1980). Therefore, the daily feeding is 4.2g×2500 tail ×0.06 = 630g day^{-1}. However, the feeding method is dependent on the rate of actual eating fish in the cage or site areas (which after 5-20 min of shared food and fish have stopped eating). It is to avoid wastage in the amount of fish food and can give other impact on water quality at this area (Elliott and Persson, 1978). In this program, the first feeding to *L. hoevenii* is 630g day^{-1}, but too much wastage happened. Dietary fish also stopped for a moment when there is an activity that would cause the fish to be stressed, for example the movement of fish and rains.

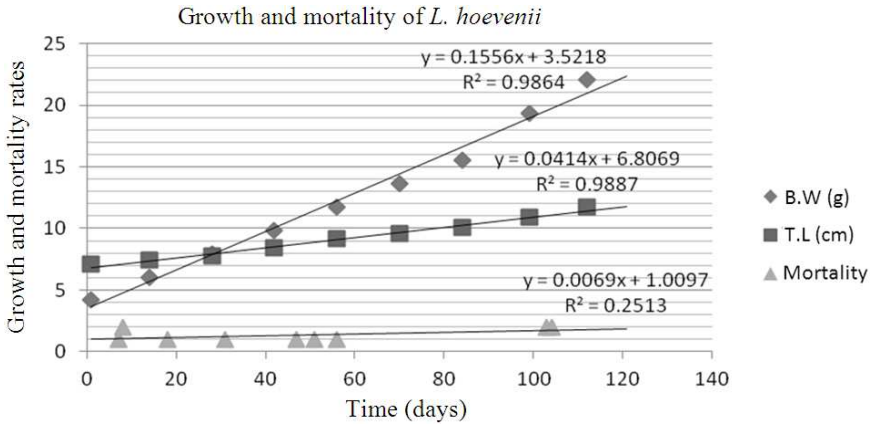

Fig. 2. Rates of growth and death of *L. hoevenii* for 4 months of monitoring

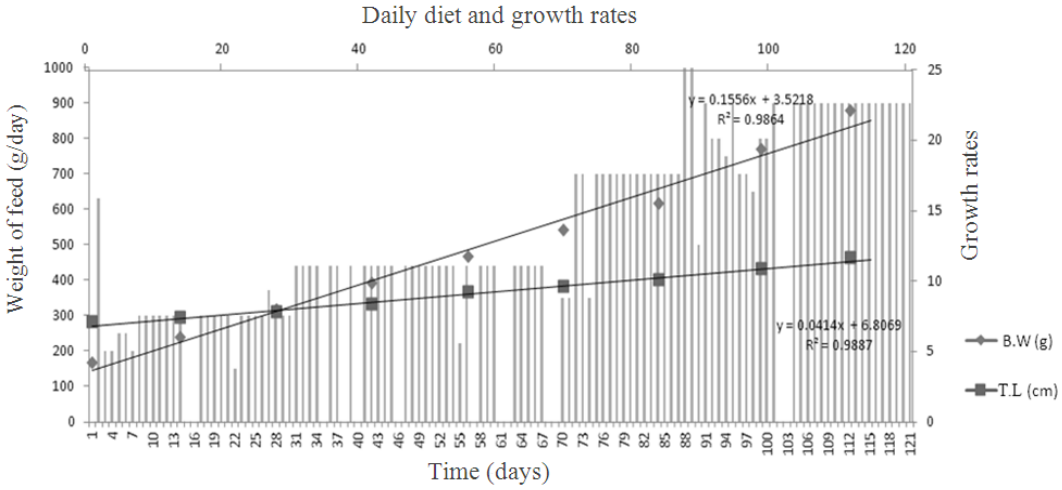

Fig. 3. Number of actual daily diet for *L. hoevenii* and growth rates of *L. Hoevenii*

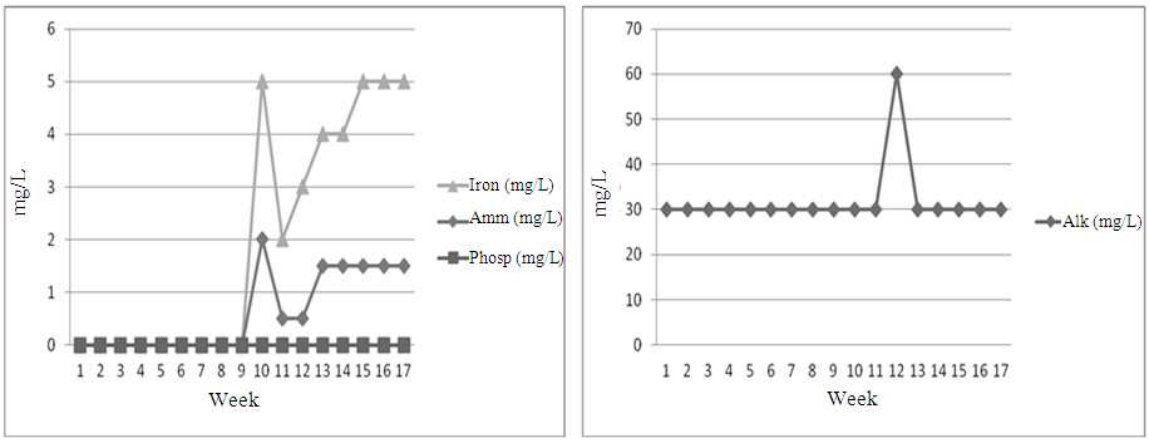

Fig. 4. Status of the chemical content of water quality in cage conservation at Lake Chini

Table 1. Summary of overall growth data *L. hoevenii* in cages conservation at Chini Lake

		Food management				Sampling of fish Body Weight (B.W) and Total Length (T.L) (Average)		Water quality management Chemical parameters (average)				
		TIME(g)/cage										
AGE (day)	Date (2011)	AM	PM	Daily (g)	Note dietary (32% Protein)	B.W (g)	T.L(cm)	Ammonia (mg/L)	Phosphate (mg/L)	Iron (mg/L)	Alkalinity (ppm)	Total death (Tail)
1	9-Jul				Introduction	4.20	7.1	0.0	0	0	30	0
7	15-Jul	100 g	100 g	200 g	of fish			0.0	0	0	30	1
14	22-Jul	150 g	150 g	300 g		6.04	7.4	0.0	0	0	30	2
21	29-Jul	150g	150 g	300 g				0.0	0	0	30	1
28	5-Aug	150 g	150 g	300 g		7.94	7.8	0.0	0	0	30	0
35	12-Aug	220 g	-	220 g	Rain (pm)			0.0	0	0	30	1
42	19-Aug	220 g	220 g	440 g		9.87	8.4	0.0	0	0	30	0
49	26-Aug	220 g	220 g	440 g				0.0	0	0	30	1
56	2-Sep	220 g	220 g	440 g		11.76	9.2	0.0	0	0	30	2
63	9-Sep	220 g	220 g	440 g				2.0	0	5	30	0
70	16-Sep	350 g	-	350 g	Rain (pm)	13.65	9.6	0.5	0	2	30	0
77	23-Sep	350 g	350 g	700 g				0.5	0	3	60	0
84	30-Sep	350 g	350 g	700 g		15.51	10.1	1.5	0	4	30	0
91	7-Oct	400 g	500 g	900 g				1.5	0	4	30	0
99	15-Oct	400 g	400 g	800 g		19.36	10.9	1.5	0	5	30	0
105	21-Oct	400 g	500 g	900 g				1.5	0	5	30	4
112	28-Oct	400 g	500 g	900 g		22.10	11.7	1.5	0	5	30	0
Total												12

*(Summary of monitoring growth data studies *L. hoevenii* 2011)

Therefore, the actual amount of food fed is as shown in **Fig. 3**. While **Table 1** showed a summary of the real total diet in this program.

According Pathmasothy (1985), differences of significant ($p<0.05$) was found in the standard length of *L. hoevenii* fish fed protein content from 32% to 40% protein. In terms of total weight, the fish were fed with 32% protein diet was higher. Determination of fish protein levels was influenced by age, size and types of livestock this species. Broodstock for each fish require a higher protein for weight gain and for the formation of good gonad. But for fish has reached an optimum growth (as determined by their genetic composition) may be required too lowly of protein. Therefore, the food has been used in this project are pellets from type *'grower'*, floating and has a 32% protein according to the size and species as recommended.

From the figure, the total actual daily diet and growth rate of *L. hoevenii* (**Fig. 3**), the growth of livestock is positively proportional to the rate of the daily diet, which the more feeding shared for fish with an actual rate at the site, the higher of fish growth rates that occurred. It shows the *L. hoevenii* on this conservation program in the cage at Lake Chini is completely dependent on pellets given. When there are a lot of other supplement foods in the cage such as small fish and other aquatic microorganisms. Body size, minor age and habit of *L. hoevenii* are a contributing factor to this fish for depends entirely on pellets given. Therefore, only *L. hoevenii* mature enough as an adult is recommend to be released into the lake to achieve the conservation program.

The content of water quality monitoring is one of the main factors to concern in any fish farming activities. Drastic change in any parameters on water quality will give a pressure on the livestock, thus have a substantial impact on growth of fish and mortality rates. **Figure 4** showed the status of the chemical content on water quality in breeding sites, water quality data show a significant distinction for the content of iron and ammonia in the 10th week in livestock, where each of the first week is ±0.0 mg L^{-1} increased to ±5.0 mg L^{-1} for iron and ±2.0 mg L^{-1} for ammonia. For phosphate parameter, the content has stayed ±0.0 mg L^{-1} until end of the observations. Increasing the value of iron content is detected effect from opening new mines (iron mines) that open in early January 2011 and began operations in early August 2011 in the Jemberau River catchment. According Boyd (1998), recommended iron content in the rearing ponds is between 0.05mg L^{-1} to 0.5 mg L^{-1} and <0.1 mg L^{-1} for ammonia (NH3). The high total iron and ammonia content causes the fish to be stressful and affect the diet and growth rate of livestock in the cage. However, at the site this change did not give more affect for a mortality rate on livestock, it is because the conservation cages in the flows water lake.

Alkalinity refers to the amount of carbonate and bicarbonate in water, while the water hardness refers to the concentration of calcium and magnesium in the water. For bonds with calcium and magnesium carbonate and bicarbonate, water hardness and alkalinity of water is closely related to each other and produce content and reading level of the same data. Boyd (1998) has classified the degree of water hardness as follows: 0-75

mg L^{-1} is soft, 75-150 mg L^{-1} is medium to hard, 150-300 mg L^{-1} is hard and more than 300 mg L^{-1} is very hard. He also recommends the level of alkalinity and water hardness to maintain around 50-300 mg L^{-1} to provide the best zone (stabilizing) effect to pH swings that occur in the livestock cages due to breathing aquatic flora and fauna. Observation findings in this study indicate alkalinity and total hardness of water quality in the conservation cage, at last a soft and has increased to the recommended level of 60 mg L^{-1} (**Fig. 4**). Therefore, the content of the alkalinity and water hardness parameter in water at the conservation cage has not posed problems with the growth of *L. Hoevenii*.

4. CONCLUSION

Overall, the growth of *L. hoevenii* is proportional to or positively with the number of feeding 'grower types' (has a 32% of protein content). This study also showed livestock or *L. hoevenii* is depending entirely on pellets given. Therefore, only *L. hoevenii* that mature enough, as an adult, they will be independent and find their own food had recommended being release into the lake to achieve the conservation program.

Water quality content changes at Laut Jemberau effects of logging and mining activities has been a little impact on the growth of this species. Where *L. hoevenii* is very sensitive to sudden changes in water quality, high iron content in water at conservation cage increased beyond the recommendations of a breeding pond has caused livestock to be stressed and the decline of the daily diet. Therefore, an appropriate action should take to control water quality in Laut Jemberau not only in the interest of conservation of the cage program, but for all aspects of the environment and ecosystem of the Lake Chini catchment.

However, 2500 of *L. hoevenii* from the first batch that were released into Lake Chini and from observation, this *L. hoevenii* can be able to adapt the local environment in the lake even take some time. Therefore, this study proposed to closure the Laut Jemberau as the breeding ground for fish conservation program. Where the Laut Jemberau closed from any type of fishing activity until the fish population on the lake to recover and conservation objectives are achieved.

5. ACKNOWLEDGEMENT

This study was conducted through Rehabilitation and Conservation Project State Park, Tasik Chini, Pahang (ECERDC-PO10/0453 and funding support under grant CUKMTOPDOWN-ST-08-FRG30003-2010). Like in attachment 3 the writer expressed his profound thanks to the ECERDC, KLCCP, UKM Pakarunding, Bee Eye Engineering, Department of Fisheries Malaysia, National University of Malaysia and Tasik Chini Research Centre (UKM-PPTC) in their contributions.

6. REFERENCES

Ahmad, A.K., S. Othman and M.M. Ali, 2009a. A temporal study of selected metals concentration in fishes of lake chini, peninsular Malaysia. Malaysian J. Analytical Sci., 13: 100-106.

Ahmad, A.K., S. Othman, M.B. Ghasim and S. Dugat, 2009b. Fish diversity at lake Chini, Pahang, Malaysia. Sains Malaysiana. 35: 625-630.

Ahmad, H., M. Idris, J. Hamzah, M.E. Toriman and A. Kurnia, 2012. Tourism packaging lake chini as biosphere reserve. J. e-Bangi, 7: 119-132.

Ashhar, A.O., 1998. Breeding and production of carp fry (*leptobarbus hoevenii*) bleeker. Freshwater Fisheries Research Center, PPPAT, Batu Berendam, Melaka, Malaysia.

Batisse, M., 1982. The biosphere reserve: A tool for environmental conservation and management. Environ. Conservat., 9: 101-111. DOI: 10.1017/S0376892900019937

Boyd, C.E., 1998. Water quality for pond aquaculture. research and development. Proceedings of the Series 43rd International Center for Aquaculture and Aquatic Environments, Alabama Agricultural Experiment Station, (AAES' 98), Auburn University, Alabama.

Elliott, J.M. and L. Persson, 1978. The estimation of daily rates of food consumption for fish. J. Anim. Ecol., 47: 977-991.

Erincho, S.B., 1993. Lake Chini-Eco-Tourism development study. Environmental Impact Assessment, Malaysia.

Hyslop, E.J., 1980. Stomach contents analysis-a review of methods and their application. J. Fish Biol., 17: 411-429. DOI: 10.1111/j.1095-8649.1980.tb02775.x

Idris, M. and A.A. Kutty, 2005. Tren of Physico-chemical Water Quality. In: Sumber Asli Tasik Chini, Mushrifah, I., K. Hussin and A. Latiff, (Eds.), Penerbit Universiti Kebangsaan Malaysia, Bangi, ISBN-10: 9679427439, pp: 20-29.

Inerny, D.M. and G. Gerard, 1989. All about Tropical Fish. 4th Edn., Random House Australia, Sydney, ISBN-10: 0091693705, pp: 480.

Kamarudin, M.K.A., M.E. Toriman, S. Mastura, S.A.M. Idris and N.R. Jamil *et al*., 2009. Temporal variability on lowland river sediment properties and yield. Am. J. Environ. Sci., 5: 657-663. DOI: 10.3844/ajessp.2009.657.663

Othman, J., M.E. Toriman, M. Idris, S. Mastura and S.A. Hafizan *et al*., 2010a. Study of water level-discharge relationship using Artificial Neural Network (ANN) in sungai gumum, tasik chini, pahang, Malaysia. Res. J. Applied Sci., 5: 20-26. DOI: 10.3923/rjasci.2010.20.26.

Othman, J., M.E. Toriman, M. Idris, S. Mastura and S.A.M.B. Gazim *et al*., 2010b. Modeling the impacts of ringlet reservoir on downstream hydraulic capacity of bertam river using XPSWMM in cameron highlands, Malaysia. Res. J. Applied Sci., 5: 47-53. DOI: 10.3923/rjasci.2010.47.53

Othman, S.M., L.E. Chong and M.B. Gasim, 2009. Status of Water Quality On Chini Lake And River. In: Natural Resources of Lake Chini, Idris, M., S. Othman, M. Sahibin, A. Rahim. Hussin and N.A. Abas *et al*., (Eds.), National University of Malaysia, Bangi, pp: 33-42.

Othman, S.M., L.E. Chong, M. Idris and S. Idrus, 2005. Water quality and heavy metals at chini lake, pahang. EAR.

Pathmasothy, S., 1985. The Effect of Three Diets with Variable Protein Levels on Ovary Development and Fecundity in *Leptobarbus hoevenii*. In: Finfish Nutrition in Asia: Methodological Approaches to Research and Development, Cho, C.Y., C.B. Cowey and T. Watanabe, (Eds.), International Development Research Centre, ISBN-10: 088936429X, pp: 23-26.

Schultz, L., A. Duit and C. Folke, 2011. Participation, adaptive co-management and management performance in the world network of biosphere reserves. World Dev., 39: 662-671. DOI: 10.1016/j.worlddev.2010.09.014

Tan, E.S.P., 1980. Some aspects of the biology of Malaysian riverine cyprinids. Aquaculture, 20: 281-290. DOI: 10.1016/0044-8486(80)90119-2

Toriman, M.E., M.K.A Kamarudin, N.A.A. Azlina and M.B. Gasim *et al*., 2009. Modeling hydrological hydraulic analysis of water flow inverse river sediment particle size, chini river, pahang. J. E-Bangi, 4: 56-69.