FISH COMMUNITY OF TWO RURAL LAKES AND SOCIO-ECONOMIC ASSESSMENT IN BUMBUNG LIMA, KEPALA BATAS

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A preliminary study on the fish community in two rural lakes in Bumbung Lima, Kepala Batas was conducted from May 2003 to November 2003. Species abundance and composition were affected by various factors such as water quality, encroaching of aquatic vegetation and human activities at the study sites. A total of 28 fish species from 10 families were recorded during the study period. Cyprinidae was the dominant family while *Puntius schwanenfeldii* and *P. gonionotus* were the most widespread species identified. Socio-economic studies which include human activities in Bumbung Lima area were reviewed. Field survey using questionnaires have been carried out in an attempt to obtain information on socio-demographic status of the study sites. Results showed that over one-third of the heads of households in Bumbung Lima depended on agriculture for their living which was 36.25% followed by 27.5% were government servants. In terms of education, majority of respondents received their level of education only until secondary school, which was accounted for 50% of overall education. Regarding monthly income, about one-third of the respondent earned below than RM 400 per month (33.75%). Only 18.75% of the respondents obtained a salary above RM 1000 per month, which was comparatively small and thus form only a minor portion of total respondents.

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Abstract

A preliminary study on the fish community in two rural lakes in Bumbung Lima, Kepala Batas was conducted from May 2003 to November 2003. Species abundance and composition were affected by various factors such as water quality, encroaching of aquatic vegetation and human activities at the study sites. A total of 28 fish species from 10 families were recorded during the study period. Cyprinidae was the dominant family while *Puntius schwanenfeldii* and *P. gonionotus* were the most widespread species identified. Socio-economic study which include human activities in Bumbung Lima area were reviewed. Field survey using questionnaires have been carried out in an attempt to obtain information on socio-demographic status of the study sites. Results showed that over one-third of the heads of households in Bumbung Lima depended on agriculture for their living which was 36.25% followed by 27.5% were government servants. In terms of education, majority of respondents received their level of education only until secondary school, which was accounted for 50% of overall education. Regarding monthly income, about one-third of the respondent earned below than RM 400 per month (33.75%). Only 18.75% of the respondents obtained a salary above RM 1000 per month, which was comparatively small and thus form only a minor portion of total respondents.

Introduction

Freshwater fishes of Peninsular Malaysia are relatively diverse. Of the 1000 species estimated to be present in the South-East Asian tropics, more than 200 species are found in Peninsular Malaysia (Zakaria-Ismail, 1994). Studies on the distribution of freshwater fishes have been carried out on many specialized habitats such as in Tasik Bera (Mizuno & Furtado, 1982), Kanching River and its tributaries in Selangor (Zakaria-Ismail & Sabariah, 1994) and Temenggor Lake (Zakaria-Ismail & Lim, 1995). Other works include the distributional patterns of freshwater fish in Chenderoh Reservoir (Ali, 1996) and Wang Kelian area of the Perlis State Park (Ahmad et al., 2001).

Freshwater fish communities are useful indicator of the healthy status of the water bodies they inhabit. Fish also have the greatest economic, recreational and perhaps spiritual value of all freshwater species. In fact, the fish are essential part of the food chain and also important for human consumption as well. Undeniable, fish is a vital source of food and the most important source of animal protein in the diet of human population in the world and according to Ali (1990), fish is the major source of protein for the people in Asia. Coche (1967) mentioned that fish provided about 15% to 20 % of protein to the human while Wan & Adinan (1992) found that fish constitutes about 60% of the Malaysian total protein intake.

Materials and Methods

Two localities were chosen for each lake where each station represented different habitat. The first locality (Station 1) located close to the north bank of the Lake A and characterized by muddy substrate bottom covered extensively by dense stands of *Polygonum barbatum* and *Phragmites communis* (Figure 1). The second locality (Station 2), characterized by gravelly-sandy bottom, which is situated on the south of Lake A and free from vegetation. For the Lake B, Station 3 is characterized by dense community of *Polygonum barbatum* while Station 4 is located on the north of Lake 2 without any aquatic plant (Figure 1). Study sites were visited monthly, which included the wet seasons and dry seasons. The average water depth measured during the study was 4.5 m with a range of 4.2 m to 6.0 m depending on the season. The terms 'rare', 'intermediate', 'common' and 'abundant' were used to indicate the relative abundance of the fish species at the study sites as well as its suitability as source of food and aquarium fish. Specimens were collected using gill nets with the helps of local people on the area. The gill nets have been set at 1900 hours, were left in the lake for the duration of 12 hours. At 0700 hours on the next morning, the nets were pulled up and specimens caught were recorded and identified on site. The fishes were taxonomically confirmed using the key based on Mohsin & Ambak (1991) and Inger & Chin (1965). Additional information on the fish population was also obtained through creel survey and interviews with local people.

The survey method was used in conducting the socio-economic study to determine the living standard of the people living on the surrounding areas of these lakes. A random survey of the houses around the lakes was carried out using a standard questionnaires format designed for this purpose. Totally six villages were selected in this regard, namely Kampung Permatang Damar, Pantai Kamloon, Permatang Tinggi 'C', Permatang Tinggi Bakar Bata, Tanjung Rambai and Bumbung Lima. The data were collected based on observational method, informal interview and questionnaires. The socio-economic assessment was focused on demographic issues such as ethnic composition, household income, level of education, family size and source of employment. The questionnaires were designed to be delivered to the head of the household and on his absence, to the most senior adult member available.

Description of the study area

The study site was an area of disused man-made lakes, which is situated in Kg. Pantai Kamloon, Bumbung Lima, Kepala Batas, Penang. About 20 years ago, it was an area of sand-mining activities. Abandoned over long periods of time, these pools have changed into lakes, which provide natural habitats for freshwater fishes and other aquatic organisms. Lake A and Lake B are located on N 5°33.895' E 100°27.138 and N 5°33.710' E 100°27.201 respectively (Figure 1). In fact, Bumbung Lima covering an area of 255 hectares and consists of six villages. A warm and sunny equatorial climate with considerable rainfall throughout the year with average rainfall in 2003 was 258.7 mm. The highest rainfall reading was recorded in October while air temperature range from 26.4°C to 28.8°C. Monthly surface wind speeds ranged from 1.84 m/s to 2.61 m/s. According to 2000 data from Statistical Department of Penang, the population of Bumbung Lima comprising of 2829 residents. This population was divided into three main ethnic groups and Malay made up the bulk of the population, which were accounted for 92.6% (2619 individuals). About 7% (199 individuals) were Chinese while another 0.4% (11 individuals) was Indian. Generally, Bumbung Lima was located within 5 kilometers from the town of Kepala Batas and all the villagers were provided with roads and transportation systems.

Figure 1 Aerial photo showing the location of
study sites in Bumbung Lima (Lake A and Lake B)

Results and Discussion

A total of twenty eight species out of ten families were recorded as major freshwater fishes within the study areas (Table 1). Cyprinidae dominate the fish communities and make up 35.71% of total number of species. High diversity of Cyprinidae is also expected in the study areas since the cyprinids are the most common and abundant family of freshwater fishes in South East Asia (Rainboth, 1991). According to Zakaria-Ismail (1991), cyprinid fishes might contribute more than 50% of the total fish diversity especially in undisturbed areas. The remainders belong to Anabantidae (17.86%), Channidae (10.71%), Bagridae, Clariidae and Ciclidae (7.14% each); Synbranchidae, Mastacembelidae, Tetraodontidae and Notopteridae contributed 3.57% of the fish population (Figure 2). The most abundant species were *Puntius schwanenfeldii* and *Puntius gonionotus* while species commonly found were *Hampala macrolepidota*, *Osteochilus hasselti*, *Anabas testudineus*, *Trichogaster pectoralis* and *Channa striatus*. Figure 3 showed the most common fish caught in Pond A and Pond B by local people based on creel survey and interviews.

Table 1 Freshwater fish fauna in Bumbung Lima lakes exploited by local fishers based on creel survey and interview with local people

[++++ - Abundant (76% - 100%), +++ - Common (51% - 75%), ++ - Moderate (26% - 50%), + - Rare (1% - 25%); FO-Food fish, AQ-Aquarium fish].

Family and species	Frequency	Potential use
Cyprinidae		
Rasbora sumatrana (Bleeker)	++	AQ
Rasbora heteromorpha (Duncker)	++	AQ
Puntius bulu (Bleeker)	+	AQ
Puntius schwanenfeldii (Bleeker)	++++	FO
Puntius binotatus (Cuvier and Valencienness)	+	AQ
Puntius gonionotus (Bleeker)	++++	FO
Hampala macrolepidota van Hasselt	+++	FO
Osteochilus hasselti (Cuvier and Valencienness)	+++	FO
Labiobarbus sp.	++	FO
Cyclocheilichthys apogon (Cuvier and Valencienness)	+	FO
Anabantidae		
Anabas testudineus (Bloch)	+++	FO
Trichogaster pectoralis (Regan)	+++	FO
Trichogaster trichopterus (Pallas)	+	FO
Osphronemus goramy Lacepede	+	AQ, FO
Helostoma temmincki (Cuvier and Valencienness)	+	FO
Channidae		
Channa striatus Bloch	+++	FO
Channa lucius (Cuvier and Valencienness)	+	AQ
Channa micropeltes (Cuvier and Valencienness)	++	FO
Bagridae		
Mystus nemurus (Cuvier and Valencienness)	++	FO
Mystus negriceps (Cuvier and Valencienness)	+	FO
Clariidae		
Clarias macrocephalus Gunther	+	FO
Clarias batrachus (Linnaues)	+	FO
Cichlidae		
Oreochromis niloticus (Trewavas)	++	FO
Oreochromis mossambicus (Trewavas)	++	FO
Synbranchidae		
Monopterus albus (Zuiew)	+	FO
Mastacembelidae		
Mastacembelus sp.	+	AQ
Tetraodontidae		
Tetraodon sp.	+	AQ
Notopteridae		
Notopterus notopterus (Pallas)	++	FO
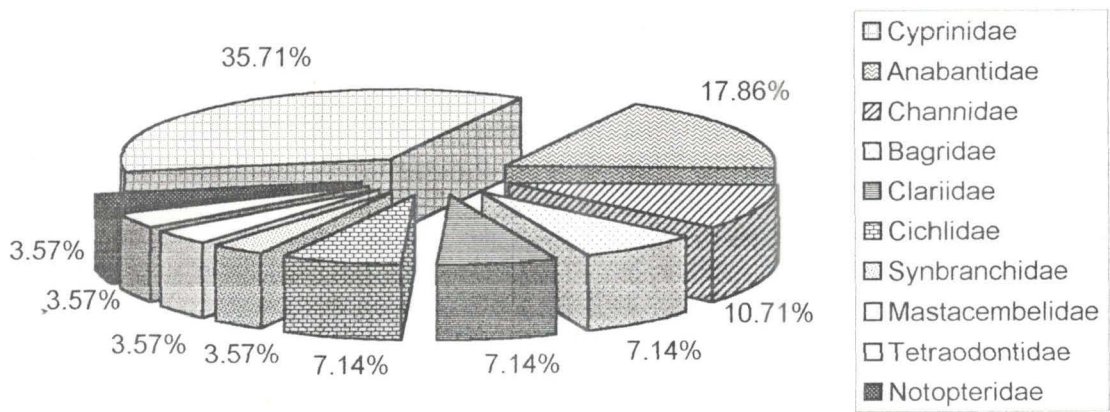
Figure 2 The percentage of fish distribution by family
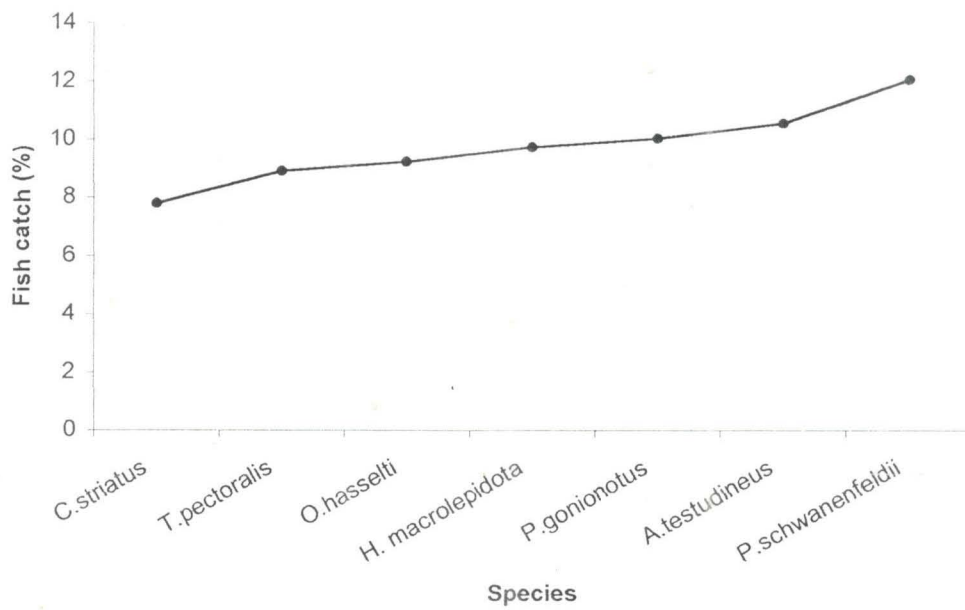
Figure 3 Average of most common fish caught in Pond A and Pond B by local people

Some of the species such as *Puntius schwanenfeldii, P. gonionotus* and *Rasbora sumatrana* that are common in river ecosystem were also collected in the lakes. This phenomenon probably due to the proximity of the study area and Muda River, which is only fourty meters. Besides, there are hydrological interchanges and exchanges of water, nutrients as well as flora and fauna between these two ecosystems. The significance of this linkage was more pronounced during rainy season as water level increased to as high as 0.7 m above the day season level. Thus, turning both the lakes and the riverine area into inundated aquatic habitat.

Although the pre-impoundment data was not available, interviews with elder fishermen indicated that there was a drop in fish catches on the lakes. From the interviews, it was concluded that overfishing could be the reason for the poor recruitment of the fish. According to Pomeroy (1993), the intense fishing pressure due to unlimited access has resulted in the declining population of the valuable fish species. As catches continued to decrease, most of the local people agreed of the implementation of floating cage aquaculture at the disused man-made lakes. The baseline ecological survey and interviews with the local people on fish population have provided sufficient information about the status of the lakes and its suitability for any aquaculture project. Among twenty-eight species collected, at least ten species already or have a very great potential to be utilized as aquaculture fishes.

Fish species diversity was relatively higher compared to Ahning Reservoir, which was only twelve species (Shah & Ali, 2002). Many species such as *Puntius schwanenfeldii, Puntius gonionotus, Hampala macrolepidota* and *Osteochilus hasselti* (Table 1) are important food fishes for people living around the surrounding area of the lakes. The catches were also sold to nearby markets thus generating income for the local communities. Table 2 showed the average fish market price at market of Kepala Batas during the study period.

Table 2 Average fish market price at market of Kepala Batas

Fish species	Common name	Local name	Price (RM/kg)
Puntius schwanenfeldii	Schwanenfeld's tinfoil barb	Lampam sungai	8.00
Puntius gonionotus	Javanese carp	Lampam jawa	8.00
Hampala macrolepidota	Hampala barb	Sebarau	8.00
Osteochilus hasselti	Hard-lipped barb	Terbui	3.00 – 4.00
Anabas testudineus	Climbing perch	Puyu	12.00
Trichogaster pectoralis	Snakeskin gouramy	Sepat siam	10.00
Osphronemus goramy	Giant gouramy	Kalui	5.00 – 6.00
Helostoma temmincki	Kissing gouramy	Temakang	8.00
Channa striatus	Striped snakehead	Haruan	10.00 – 15.00
Mystus nemurus	Nemurus catfish	Baung	12.00
Clarias macrocephalus	Walking catfish	Keli bunga	9.00 – 10.00
Clarias batrachus	Walking catfish	Keli kayu	4.00 – 5.00
Oreochromis niloticus	Nile tilapia	Tilapia	6.00 – 8.00
Monopterus albus	Freshwater eel	Belut	12.00 – 13.00
Mastacembelus sp.	Spinny eel	Tilan	140.00
Notopterus notopterus	Grey feather back	Belida	2.00 – 3.00

Some species are of great potential for tropical aquarium industry such as *Rasbora sumatrana, R. heteromorpha, Puntius binotatus, Osphronemus goramy, Channa lucius* and *Mastacembelus sp.* This industry also supports the economic needs of the rural communities. In fact, some

species such as *Clarias macrocephalus, C. batrachus, Channa striatus, Anabas testudineus, Trichogaster pectoralis, T. trichopterus and Notopterus notopterus* are not only important as human food but also play an important role in controlling the presence and infestation of harmful insects and weeds. Figure 4 shows the potential use of common fish species in Pond A and Pond B based on the survey.
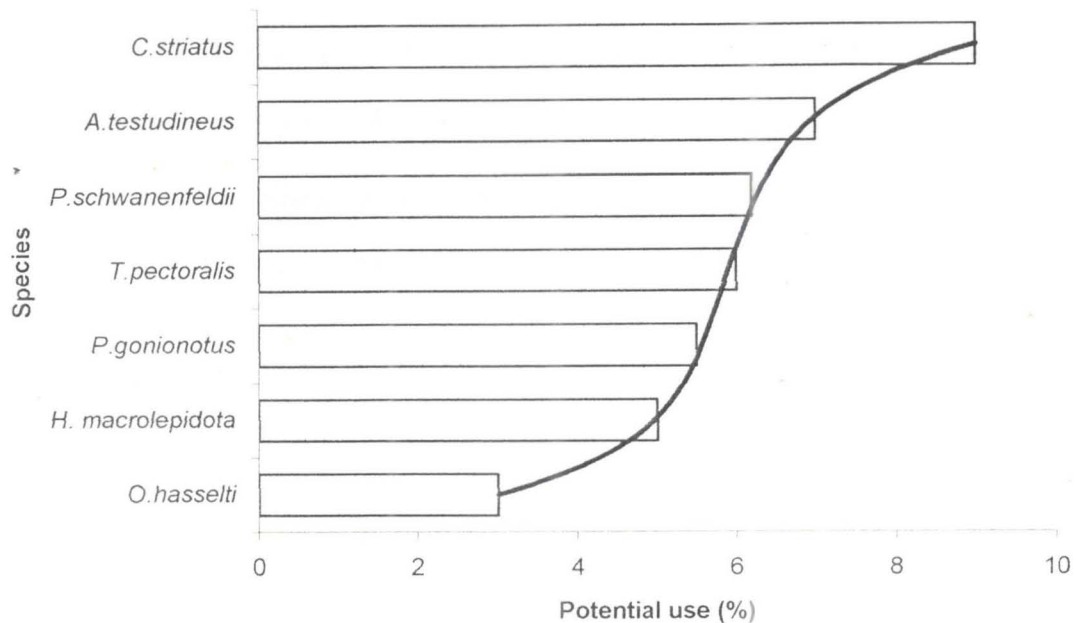

Figure 4 Potential use of common fish species in Pond A and Pond B

based on survey among local communities

In terms of socio-economic study, the occupational status of male household members was clearly determined by farming as the main economic activities. More than one-thirds (36.25%) of the male household members involved in farming. About 27.5% were involved as government servants, 23.75% were in private sector, while 7.5 % were involved in retail business. On the other hand, pensioner accounted for 3.75% while another 1.25% was house builder (Figure 5). The average household consists of six people in two or three generations which constituting twenty percent of total respondents. However, some households contain more than ten people in three generations (2.5%). The survey also showed that each couple has on average four to five children, with some couple having up to ten children. In terms of education, majority of respondents received their level of education only until secondary school, which was accounted for fifty percent of overall education. Twenty five percent of the respondents received their education until secondary school while 17.5% of the respondents stop schooling or did not attend school at all. The other 7.5% get the education in religious schools including 'pondok' schools. Regarding monthly income, about one-third of the respondent earned below than RM 400 per month (33.75%). Thirty percent earned between RM 400 to RM 599 per month while ten percent received monthly income between RM 600 to RM 799. Only 18.75% of the respondents obtained a salary above RM 1000 per month, which was comparatively small and thus form only a minor portion of total respondents (Figure 6).
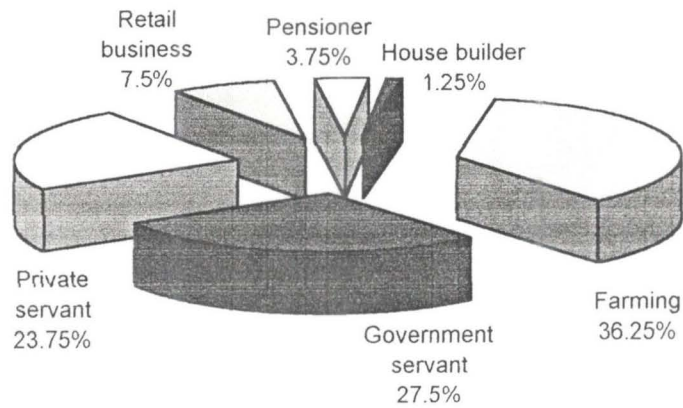
Figure 5 Occupational status of male household members in Bumbung Lima
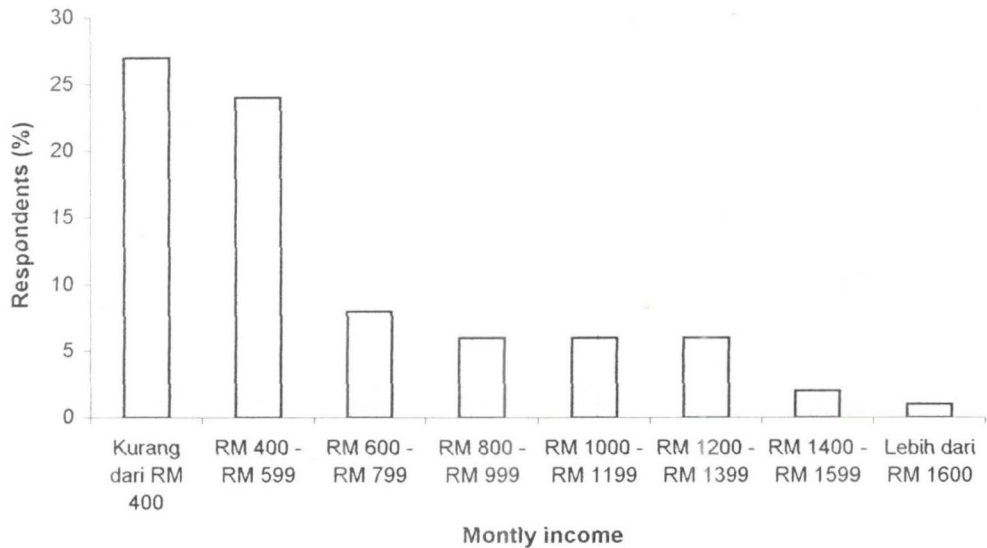
Figure 6 Monthly income gained by head of household in Bumbung Lima

Conclusions

The findings of the study shows that local people were not much dependent of water bodies to meet their day requirement as the number of fish species has been reduced considerably. Agricultural development and overfishing have caused severe declines in the freshwater fish populations on the study sites. The decline in freshwater fish diversity becomes a valuable indicator of improper development or use of our natural resources. Nevertheless, Bumbung Lima lakes (Lake A and Lake B) have very important natural function as flood control, water purification and wildlife habitat as well as providing income to the local people through its fish resources. Undeniable, local communities traditionally benefited from the natural resources and functions of this wetland. Thus, proper management of the lakes is needed to maximize their function such as to increase niche diversity, provide shelter, spawning grounds and food for fish, amphibians and birds as well as for aesthetic values.

Acknowledgements

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ABSTRACTS

- ○ **Restoring and Sustaining Capture Fisheries**
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- ○ **Understanding Aquatic Resources**
- ○ **Global Symposium on Gender and Fisheries**
- ○ **SS Fisheries Co-Management**
- ○ **SS Inland Fisheries**
- ○ **SS Managing Fishing Impacts on Sharks and Rays**
- ○ **SS Restocking and Stock Enchancement of Coastal Fisheries:** *Potential, Problems and Progress*