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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 6 (1): 65-69, 2003
ISSN 1028-8880

Some Ecological Aspects, Water Properties and Natural Fish Species of the Phrom River in Northeast Thailand

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Abstract: The present study was carried out to investigate some ecological aspects and available fish species of the Phrom River, Chaiyaphume Province, Thailand. The work consisted of ecological survey of the topography of the Phrom basin, some water properties and also the existing fish species of the Phrom River. The results showed that the Phrom basin consisted of different valleys of the mountains with different first and second streams where they flew down to the Phrom River. The Phrom River has its spiral shape where some numbers of islets have been formed along with some small ponds of stagnant water. The results on water properties of the Phrom River revealed that water pH, conductivity (μScm^{-1}), temperature (°C), total alkalinity (mg $CaCO_3$), total hardness mg ($CaCO_3L^{-1}$), and the dissolved oxygen (DO mg L^{-1}) values were ranging from 7.02 - 7.54, 62.37-74.17, 29.62-30.27, 25.78-30.35, 30.85-31.51, and 6.87-7.41, respectively. There were 13 fish families with 37 species. The *Cyprinidae* family has two subfamilies with the majority of 17 species. The Phrom River has 12 important economic fish species.

Key words: Fish species, Phrom River, water properties

Introduction

Northeast Thailand, one of the four regions of the country has one third of both the population and the land area. It is located on a high land at approximately 200 meters above sea level for most plain areas but up to 800-1,300 meters for the mesa mountain of the Phukradueng. The important rivers in Northeast consisted of the Mun River, and the Chi River where a large amount of water from the Chern second stream flows to the Phrom River and then down to the Chi River and eventually to the Mun River before reaching the Kong River at Ubonratchathani Province. The Phrom basin has many first and second streams before coming down to the Phrom River (Suksri, 1999). The work had focused on some ecological habitation of the various kinds of fish and some of the existing fish species of the Phrom River where some urgent needs to conserve and protect these natural resources must not be overlooked by scientists and the Thai people.

It has been advocated that one important protein diet comes from fish both fresh and saline water sources and about 57 % of the total fish production in Asia come from fresh water (De Silva, 1987). Nevertheless, the amount of any single fish species in some rivers or reservoirs may be varied with time thus Wongratana (1989) reported that environmental condition could have some tremendous effects on the population and the survival of the fish species particularly with respect to the changes in both the season and the ecological habitation. Sipzay and Pawapootanon (1972) reported that they have found five families of ten species of fish at the Chulaporn Dam of the Phrom basin. A number of workers have investigated the effect due to the changing of the environments from rivers to dams in the southern part of Thailand, e.g. Duangsawasdi and Krajangdara (1994) and Krajangdara (1994). They showed that at Ratchaprabha Dam of Surat Thani province of the southern region of Thailand during the initial year after the dam was constructed. There were 52 fish species available but for the second year only 41 species were recorded whilst Anonymous (1995) reported some available fish species at the Kaeng Sue Ten area of the Yom River where the proposed dam construction was established. They found that there were 92 species, 54 genera of 21 families of fish being available in the Yom River. However, they stated that some species of fish may be available during the initial year of the construction of the dam and later some additional fish species may be found due to the reservoir stability and the longer period of settlement after the construction of the dam was completed. Brittan (1995) reported that a few years after the construction of the dam was completed, some additional fish species in the reservoir were vividly found. There had been some investigations for more information on fish species in Thailand by a number of workers such as Smith (1945), Kottelat (1989), Roberts (1991), Wootton (1992), Giller *et al.* (1994), Matthews (1998) and Lawton (1990). Nevertheless, their investigated results did not include information on fish species at the Phrom Basin.

Therefore, it is of imperative value to search for more information concerning the environment and the availability of fish species at the Phrom basin in Northeast Thailand.

Materials and Methods

For this investigation, the work was divided in to three parts, i.e. (a) some details on ecological survey with respect to topography of the Phrom River, (b) some water properties of the Phrom River, and © a record on the existing species of fish of the Phrom River. For water properties, the experiment was carried out in a randomized complete block design with four replications. The treatments being used were: Treatment 1 = Location 1, Treatment 2 = Location 2, and Treatment 3 = Location 3. The three locations were marked along the river's bank at approximately 2 kilometers away from each other. One liter of water for each replication was taken from each location for the determinations on pH, conductivity (μScm^{-1}), total alkalinity (mg $CaCO_3$), total hardness (mg $CaCO_3$), temperature (°C) and the dissolved oxygen [DO (mg L^{-1})]. The determinations on water pH, conductivity and temperature were measured with the use of the Solomat 520 C meter whilst the total alkalinity, total hardness and the DO level were carried out with the use of the titritatic method (APHA, 1989). The water temperature determinations, pH, conductivity and dissolved oxygen were carried out by actual measurements at each location where appropriate. The attained data were statistically analysed using a SAS computer programme (SAS, 1986). However, the data on the different species of fish were not subjected to statistical calculations. The gathered information of the existing fish species was carried out through the batches of fish being caught by fishermen of the different villages along the Phrom River's bank within the period of the three months from October to December 2000.

Results

For ecological survey information on topography of the Phrom River, the results showed that this river had originated from the different valleys of the mountains with a number of a small streams run down to form the Phrom River. The river is having a spiral shape due to the different elevations of the valleys. The soil particles at the underneath of the river consisted of gravels and sandy particles. There are a number of islets and some of them are at the lengthy depth and many are shallow. There are some units of small ponds with stagnant water. At the bank of the river there are some small and large rocks along with the sandy particles and the further upward of the river's bank densely covers with the evergreen vegetation of the various types of plants of different sizes. With the three sampling periods on water quality during October, November, and December 2000 of the Phrom River, the results showed that the mean values for their respective months of water pH were 7.02, 7.54, and 7.13, water conductivity (μScm^{-1}) were 72.60, 62.37, and 74.17, temperature (°C) were 30.05, 30.27, and 29.62. The mean values of the total alkalinity (mg $CaCO_3$ l^{-1}) were

Table 1: The recorded data on pH, conductivity, and temperature of the water of the three locations of the Phrom River being measured in Oct., Nov. and Dec. 2000

	Water quality parameters								
	pH (unit)			Conductivity (µS cm^{-1})			Temp. (°C)		
Sampling location	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.
1	6.83	7.52	6.72	71.53	64.53	68.34	30.23	30.4	29.43
2	7.22	7.63	7.31	68.09	66.73	77.98	29.33	30.33	30.00
3	7.01	7.46	7.37	78.17	78.85	76.20	30.60	30.07	29.43
Average	7.02	7.54	7.13	72.60	62.37	74.17	30.05	30.27	29.62
F-test	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%	2.26	0.81	0.79	0.12	0.13	0.13	0.25	0.25	0.25

Remarks: NS = Non significance

Table 2: Total alkalinity, total hardness, and dissolved oxygen (DO) of the water of the Phrom River, Northeast Thailand

	Water quality parameters								
	Total Alk. (Mg $CaCO_3$)			Total Hd. (Mg $CaCO_3$)			DO (mg l^{-1})		
Sampling location	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.	Oct.	Nov.	Dec.
1	25.50	30.15	29.29	31.67	30.67	31.41	6.48	6.95	7.19
2	28.60	28.69	30.98	30.46	31.24	31.57	7.29	7.24	7.39
3	23.24	29.96	30.77	32.39	30.65	31.41	6.85	7.03	7.64
Average	25.78	29.60	30.35	31.51	30.85	31.46	6.87	6.91	7.41
F-test	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%	0.22	0.19	0.15	0.21	0.19	0.10	0.47	0.96	1.90

Remarks: DO = Dissolved Oxygen, Hd = Hardness, Alk = Alkalinity, NS = Non significance

Table 3: Family name and scientific name of the fish being found at the Phrom River, Northeast Thailand during October to December 2000

Family and Scientific name	English common name
Family: Anabantidae	
Anabas testudineus	Gouramy
Trichopsis vittatus	Climbing perch
Family: Bagridae	
Mystus albolineatus	White banded catfish
Mystus singaringan	Long fatty fined catfish
Family: Channidae	
Channa gachua	Red-tail snakehead
Channa striata	snackhead fish
Family: Cichlidae	
Orechromis niloticus	Nile tilapia
Family: Clariidae	
Clarias batrachus	Walking catfish
Family: Cobitidae	
Acanthophthalmus javanicus	Loach
Acanthopsis choirorhynchos	Loach
Acanthopsoides gracilentus	Loach
Pangio anguillaris	Loach
Family: Cyprinidae (Subfamily: Rasoborinae)	
Esomus metallicus	Minnow, Barb
Rasbora myersi	Minnow
Rasbora paviei	Minnow
(Subfamily: Cyprininae)	
Barbodes gonionotus	Thai silver barb
Cyclocheilichthys armatus	River barb
Cyclocheilichthys repasson	River barb
Hampala dispar	Eye-spot barb
Labiobarbus spilopleura	Barb
Osteochilus waandersi	Hard-lipped barb
Poropuntius deauratus	Waander's bony lipped barb
Puntioplites proctozysron	Smith's barb
Puntius brevis	Golden little barb, barb
Systomus binotatus	Long-snouted barb
Systomus orphoides	Red-cheek barb, barb
Tor soro	Barb
(Subfamily: Garrinae)	
Garra taeniata	Stone lapping fish
Family: Gyrinocheilidae	
Gyrinocheilus aymonieri	Siammese Gyrinocheilid
Family: Hemirhamphidae	
Dermogenys pusilla	Half-beak
Family: Mastacembelidae	
Macrognathus siamensis	Spiny eel
Mastacembelus armatus	Spiny eel
Mastacembelus favus	Spiny eel
Family: Notopteridae	
Notopterus notopterus	Featherback
Family: Pristolepidae	
Pristolepis fasciata	Stripped tiger nandid
Family: Symbranchidae	
Fluta alba	Swamp eel

25.78, 29.60, and 30.35, mean values of total hardness (mg $CaCO_3$ l^{-1}) were 31.51, 30.85, and 31.46 and eventually the mean values of the dissolved oxygen (DO, mg l^{-1}) were 6.87, 6.91, and 7.41 for the months of Oct., Nov., and Dec., respectively (Tables 1 and 2). There were no statistical differences found at each tested item of the water quality. The results showed that there were 13 families of fish being found, i.e. Anabantidae, Bagridae, Channidae, Cichlidae, Clariidae, Cobitidae, Cyprinidae, Gyrinocheilidae, Hemirhamphidae, Mastacembelidae, Notopteridae, Pristolepidae, and Symbranchidae (Table 3). Within these 13 families, there were 37 species of fish where the Cyprinidae family has two subfamilies with the majority of the species of 17, i.e. *Esomus metallicus, Rasbora myersi, Rasbora paviei, Barbodes gonionotus, Cyclocheilichthys armatus, Cyclocheilichthys repasson, Hampala dispar, Labiobarbus spilopleura, Osteochilus waandersi, Poropuntius deauratus, Puntioplites proctozysron, Puntius brevis, Systomus binotatus, Systomus orphoides, Tor soro, and Garra taeniata.* The Cobitidae family and the Mastacembelidae family ranked the second and third places with respect to the number of fish species, respectively. The *Acanthophthalmus javanicus, Acanthopsis choirorhynchos, Acanthopsoides gracilentus, Pangio anguillaris* belong to the Cobitidae family and the *Macrognathus siamensis, Mastacembelus armatus, Mastacembelus favus* belong to the Mastacembelidae family. Each of the other listed families has one or two species and they were all together up to 13 fish species.

Discussion

In terms of ecological features, the Phrom basin possesses the watershed area of some diversifications of different topographical conditions such as a dense forest and a mountainous feature where rainwater flew down from the different valleys to make some eroded streams and eventually down to the Chern, the second order stream and the Phrom River, respectively. This could possibly be the pattern of watershed of the many rivers in Thailand particularly those in the northern region of the country where many first and second streams had originated before coming down to form the larger sizes of the rivers such as the Ping, Wang, Yom and the Nan River. This could possibly be considered as an advocatory case for the Chi River and the Mun River in the northeastern region of Thailand where the Phrom River is connected. These features of the topography have made many fish species fairly adapted themselves to

their habitants. For the results on water quality of the Phrom River, the results showed that water pH, conductivity, temperature, total alkalinity, total hardness and the dissolved oxygen values in all the tested locations were at presumably the normal values for the habitation of the fish species. Water quality has some significant effects on the survival of *Pangasius sutchi* as stated by Banu and Aktar (2002). As a result of the high current of the water of some lengthy portions of the Phrom River, some fish species those normally found in other high current of water with other rivers were also found at the Phrom River such as *Poropuntius deauratus, Garra taeniata,* and *Gyrinocheilus aymonieri* species. Nevertheless, some kinds of fish species those adapted to some moderate water current also found in the Phrom River such as *Notopterus notopterus, Osteochilus spp., Puntioplites proctozysron, Puntius* spp., *Systomus* spp., and *Barbodes* spp. Furthermore, some kinds of fish species those thrive well in the slow water current were also found in the Phrom River, e.g. *Gyrinocheilus aymonieri* and *Notopterus notopterus*. These fish species could possibly adapt themselves well to their environment. It was also found that *Channa striata* species, the fish of the stagnant water or the extremely slow water current could thrive on well in the Phrom River. The results indicated that all fish species being recorded at the Phrom River could be able to adapt themselves well to their environments. This may be attributable to the various water currents where the elevation has its influences on the movement of the water, i.e. some portions of the river may possess low, medium and high water current hence the fish species could be able to choose where they could possibly thrive on. That is why the Phrom basin has its diversification on both ecological feature and fish species. The numbers of the available fish species found at the Phrom River were not as much as reported by Anonymous (1995). Nevertheless, the Phrom River has some important economic fish species, e.g. *Channa striata, Oreochromis niloticus; Cyclocheilichthys armatus, C. repasson, Hampala dispar, Osteochilus hasselti, Puntioplites proctozysron, Barbodes gonionotus, Mastacembelus armatus, M. favus, Nototerus notopterus* and *Fluta alba*. The number of fish species found at the Phrom River was lesser than that of the report of Anonymous (1995). This may be attributable to the lesser length of the river since this river is located at the watershed area of the origin of the larger rivers, i.e. the Chi River and the Mun River. Some further investigations with respect to long term availability of fish species may be of important information for fish habitation and production.

Acknowledgements

The author wishes to thanks Khon Kaen University for financial assistance, Mr. Sanong Teapsri of the Department of Fisheries, Faculty of Agriculture, Khon Kaen University for his assistance in taking fish samples and the surveying of the experimental site.

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