



## Fish diversity of Pumlun Lake in Manipur with a Note on Traditional Fish Catching Devices

### KEYWORDS

Pumlun Lake, Manipur, Mega-biodiversity, Cypriniformes, Fishing Gears

### Ngasepam Romen Singh

Department of Life Science and Bioinformatics, Assam (Central) University, Silchar-788011, Assam.

### Biplab Kumar Das

Department of Life Science and Bioinformatics, Assam (Central) University, Silchar-788011, Assam.

### M. Shomorendra

Fish Disease Research Laboratory, Department of Zoology, Thambal Marik College, Oinam 795134, Manipur.

### Devashish Kar

Department of Life Science and Bioinformatics, Assam (Central) University, Silchar-788011, Assam.

**ABSTRACT** Fish is an excellent source of food. Fish constitutes almost half of the total number of vertebrates in the world. Our country occupies 9th position in terms of fresh water mega biodiversity. The surveyed on fish diversity of Pumlun Lake in Manipur were carried out during January to December, 2012. A total of 40 species of fishes belonging to 27 genera, under 14 families and 7 orders were reported during my study period. Order Cypriniformes with maximum number of 22 fish species followed by Perciformes with 7 fish species and order Beloniformes with only 2 fish species. Of these, the most abundant is *Channa punctata* (6.39%), *Tilapia mossambica* (6.12%) followed by *Amblypharyngodon mola* (5.84%) and *Glossogobius giuris* was least abundant (0.33%).

### Introduction

Fishes are one of the important elements in the health and economy of many countries as they have been a staple item of diet of many people in the world. They constitute slightly more than half of the total number approximately 54,711 recognized living vertebrate species; there are descriptions of estimated 27,977 valid species of fishes<sup>14</sup>.

The fishes are one of the main exploitable resources of the aquatic ecosystems that provide a cheap source of protein. Fishes are one of the important elements in the economy of many nations as they have been a staple item in the diet of many people. Pumlun Lake locally known as Pumlun pat (Pat – a lake in Manipur) is the second largest freshwater wetland located in the southern part of the Manipur valley. The lake is situated in Thoubal District at an appropriate distance of about 50 km from Imphal city towards the southern lowlands of the valley, on the left side of the Imphal river at the geographical ordinates between 93°50'E to 94°0'E and 24°20'N to 24°35'N and at elevation of 767 meters above mean sea level (a.s.l.). Fishing is a very important part of the economic activities in the surrounding area and is a vital source of protein for the local diet. It is a shallow weed- infested lake with 2/3 of its water surface covered with heterogeneous vegetation locally known as Phoom or Phumdi. A drastic change in the ecosystem of Pumlun Lake from its earlier state is said to have occurred since the commissioning of Loktak Hydel Project which uses the Lake Pumlun as a secondary reservoir<sup>10</sup>.

The traditional fishing methods in the different water bodies of Northeast India have been described by various authors<sup>7</sup>. Fishermen all over the world use some kind of traditional knowledge or other to attract and aggregate the fish to facilitate its easy harvest. The artisanal fishermen of the state use wide fish catching techniques and methods. The fishermen of Manipur use wide varieties of fishing gears. Realizing the importance of traditional fishing gear in sustainable fish farming systems of Manipur, the present study was undertaken with the specific objectives to survey the fish biodiversity to give recent data on the available fishes in Pumlun lake and to document different fishing gears being used by the fishermen to lure the fish and to know the rationale behind their use.

### Material and Methods

Topographically, Manipur is constituted by two distinct geographic features, i.e. an elevated central plain forming a valley and rows of mountains on all sides. While the valley is very rich in lakes, ponds and wetlands, the mountainous regions are drained by three river systems, viz. the Barak river system, the Manipur river system and the Yu river system. Because of different geographical entity, the aquatic resources in the state exhibit diverse characteristics with immense Ichthyofaunal diversity. This hilly state situated at the North-Eastern border of India has considerable aquatic resources situated for fisheries. In the evolution of the fish catching methods, the development of fishing gear is an important concern. Fishing gear refers to all those implements and devices that are used for quite diverse methods of fishing around the world, which employ gears ranging from simple hook and line to modern fish pumps. For commercial fisheries it became desirable to change from catching single fish to bulk. The knowledge of fish behaviour in relation to fishing gear has become one of the most important tools of modern gear development. The fishing technology is an integral part of fishery science. Thus studies in fishing gears and methods provide the essential background for proper exploitation of fishery.

Thus a great variety of gears are used in fishing differing very much in size, construction material, method of operation area and type of fish to be caught. The gears include gill net, cast net, dip net, dragged net, surrounding net, lift net, traps, hook and lines, wounding gears etc. are some of the fishing gears and fishing methods used by the fishermen in Manipur.

1. Gill net: These are single walled nets with a mesh opening of such a size that the required fish can gill themselves in the netting. The nets are used singly or in series. This is the most widely used fishing gear. Floats and sinkers are attached and plastic ropes are used as head ropes and foot ropes. Gill nets of various mesh size are available for catching different fishes viz.

- Muka-nga lang (Net No. 20): This gill net is most commonly used for catching small size fish such as *Esomus dandricus*, *Amblypharyngodon mola*, etc.
- Phabou lang (Net No. 25): *Puntius* spp., *Notopterus* no-

topterus, glossogobius giuris, etc.

- Ukabi lang (Net No. 35): *Anabas testudineus*, *Notopterus notopterus*, *Mystus spp.*, *Cirius batrachus*, *Channa spp.*, etc.
- Khabak lang (Net No. 50-60): *Labeo dero*, *L. angra* etc,
- Porong lang (Net No. 70-90): *Channa spp.*, *Accrossocheilus hexagonolepis* etc.
- Langjao (Net No. 100-120): *Wallago attu*, *Crossocheilus burmanicus*, *Bagarius bagarius*, *Anguilla bengalensis*, *Cyprinus carpio*, *Catla catla*, *Labeo rohita*, *Hypothalme-trix molitrix*, etc.

### Taijep

This trap is rectangular in shape and all the six sides of the structure are surrounded by bamboo netting. An entrance is provided at the middle of one side of the longitudinal portion where fish enter the trap. But brevet escape by fixing a comb like bamboo strips which are fitted with a flexible rubber string commonly known as funnel. The main species caught by this gear include *Notopterus notopterus*, *Channa spp.*, *A. testudineus*, *C. batrachus*, Common carp etc.

### Long

This implement locally known as "long" is of wide used. It has 7-9 prongs made out of splitting of bamboo provided with iron points at the tips of around 2 inches in length. These prongs are tight to a bamboo pole of 8-10 ft. long.

### Longthrai

This gear is operated either from shore or from a canoe. It consists of an elliptical bamboo ring, which is fixed to a bamboo pole. The circumference of the ring is around 17 ft. the netting is fixed to this elliptical bamboo ring. The shape of the netting is cone shaped tapering at the bottom. The gear is mostly used throughout the year at different depth and different water bodies. The catch is a mixed species e.g. *Puntius chola*, *Channa spp.*, *N. notopterus*, etc.

### Long-Oop

It is bell-shaped basket made of seasoned bamboo strips having a height of about 50-55 cm with foot diameter of about 40-50 cm and top opening diameter of about 13-15 cm. it is operated during the dry season, when the water reduces to its minimum level. The gear is operated by one man. Species caught are Indian major carps, exotic carps, *Notopterus sp.*, *Channa striatus* etc.

### Iljao

In this the rectangular net is made by joining 9 pieces of the net. There is bamboo structures fitted at four corners in which the net is tightened. The lowering and setting of the net is done by lowering the rope provided at one side, the lifting of net is done by pulling the two ropes at one end. This gear is operated in lakes only. The catches are of mixed species. It is operated throughout the year. General survey of fish diversity was done using standard procedure<sup>9</sup>. Also NBFGR Manual<sup>13</sup> was consulted for studying the habitat parameters.

Fish were collected experimental fishing gears like gill nets (Vertical height 2.0m) cast nets (diameter 3.7m,3.1m, and 1.0m),triangular scoop nets (Vertical height 1.0m-1.5m; length 100m-150m) and variety of traps. Camouflaging technique was also used to catch the fishes. Fish have been preserved at first in the concentrated formaldehyde in the field itself and then 40% formalin. They are brought to the laboratory in plastic container. In the laboratory, the fishes were identified with the help of standard taxonomic literature<sup>11, 12, 15, 16</sup>.

### Result and Discussion

Fish being one the main items of food for most of the people in Manipur, the demand for fish is very high in this area. About c 90% of the people in the state are fish eaters. Pumlén Lake has rich diversity of 40 fish species belonging to 27 genera, 14 families and 7 orders. Table no: 1 shows the list

of fish species available in Pumlén Lake The most abundant is *Channa punctata* (6.39%), *Tilapia mossambica* (6.12%) followed by *Amblypharyngodon mola* (5.84%) and *Glossogobius giuris* was least abundant with 0.33%.and Table: 2 shows physico-chemical properties of water. The temperature of Pumlén Lake were recorded 12°C to 29°C as minimum and maximum, pH value ranges from 6.1 to 7, dissolved oxygen (mg/L) varies from 2.26 to 4.9, free carbon-di-oxide (mg/L) varies from 7.26 to 16.7 and total alkalinity (mg/L) ranges from 33 to 76 were recorded during my study period.

Sl. No.	Name Of The Fish	Order	Family	Abundance %
1	<i>Amblypharyngodon Mola</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	5.84%
2	<i>Barilius Gangensis</i> (Valenciennes)	Cypriniformes	Cyprinidae	4.14%
3	<i>Catla Catla</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.33%
4	<i>Cirrhinius Mrigla</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	1.96%
5	<i>Ctenopharyngodon Idella</i> (Valenciennes)	Cypriniformes	Cyprinidae	2.33%
6	<i>Cyprinus Carpio</i> (Linnaeus)	Cypriniformes	Cyprinidae	2.67%
7	<i>Esomus Dandricus</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	3.76%
8	<i>Labeo Angra</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.71%
9	<i>Labeo Bata</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	4.82%
10	<i>Labeo Calbasu</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.37%
11	<i>Labeo Dero</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.41%
12	<i>Labeo Gonius</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	3.16%
13	<i>Labeo Rohita</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	3.27%
14	<i>Puntius Chola</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.78%
15	<i>Puntius Sarana</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	2.45%
16	<i>Puntius Ticto</i> (Hamilton-Buchanam)	Cypriniformes	Cyprinidae	1.88%
17	<i>Puntius Meingangbi</i> (Arunkumar & Tombi Singh)	Cypriniformes	Cyprinidae	3.61%
18	<i>Anabas Testudineus</i> (Bloch)	Anabantoidei	Anabantidae	0.41%
19	<i>Botia Berdmorei</i> (Bleeker)	Cypriniformes	Cobitidae	1.24%
20	<i>Lepidocephalichthys Guntea</i> (Hamilton-Buchanam)	Cypriniformes	Cobitidae	1.09%
21	<i>Lepidocephalichthys lorrorata</i> (Hamilton-Buchanam)	Cypriniformes	Cobitidae	0.86%
22	<i>Noemacheilus Sikmaiensis</i> (Day)	Cypriniformes	Cobitidae	2.75%
23	<i>Chanda Nama</i> (Hamilton-Buchanam)	Perciformes	Channidae	1.28%
24	<i>Channa Ranga</i> (Hamilton-Buchanam)	Perciformes	Channidae	1.96%
25	<i>Channa Orientalis</i> (Schneider)	Perciformes	Channidae	3.73%

26	<i>Channa Striata</i> (Bloch)	Perciformes	Channidae	1.09%
27	<i>Channa Puntata</i> (Bloch)	Perciformes	Channidae	6.39%
28	<i>Clarias Batrachus</i> (Linnaeus)	Siluriformes	Clariidae	1.77%
29	<i>Trichogaster Fasciatus</i> (Schneider)	Beloniformes	Belontiidae	2.71%
30	<i>Trichogaster Labiosa</i> Day	Beloniformes	Belontiidae	2.94%
31	<i>Glossogobius Giuris</i> (Hamilton)	Perciformes	Gobiidae	0.33%
32	<i>Heteropneustes Fossilis</i> (Bloch)	Siluriformes	Heteropneustidae	2.60%
33	<i>Mastacembelus Armantus</i> (Lacepede)	Synbranchioidei	Mastacembelidae	2.18
34	<i>Monopterus Albus</i> (Zuiew)	Synbranchioidei	Synbranchiidae	0.86%
35	<i>Mystus Bleekeri</i> (Day)	Siluriformes	Bagradae	2.37%
36	<i>Notopterus Notopterus</i> (Pallas)	Osteglossiformes	Notopteriidae	2.29%
37	<i>Ompok Bimaculatus</i> (Bloch)	Siluriformes	Siluridae	1.84%
38	<i>Wallago Attu</i> (Schneider)	Siluriformes	Siluridae	1.22%
39	<i>Pangio Pangia</i> (Hamilton)	Cypriniformes	Botinidae	0.99%
40	<i>Tilapia Mossambica</i> (Peters)	Perciformes	Cichlidae	6.12%

**Table 1: Fish species diversity of Pumlun Lake during January-December 2012**

Months	Water Temperature	pH	DO (mg/l)	FCO (mg/l)	TA (mg/l)
January	25	6.1	4.1	13.26	43
February	27	6.2	4.33	9.9	43
March	26	6.6	4.66	7.7	48.5
April	28	6.4	2.26	12.32	76
May	29	7	3.27	7.26	65
June	25	6.23	3.1	16.7	59
July	24	6.33	5.5	7.26	48
August	20	6.44	3	7.29	37.5
September	14	6.7	3.9	8.58	24.5
October	14	6.8	4.3	10.34	34
November	13	6.1	4.8	11.12	33
December	12	6.7	4.9	12.1	35

**Table no: 2 Physico-chemical Parameter Pumlun Lake during January-December 2012**

#### Acknowledgement

The authors are thankful to Assam University, Silchar and Principal, Thambal Marik College, Oinam for giving laboratory facilities and to the UGC, New Delhi for granting UGC-fellowship to the First and Second author.

#### REFERENCE

1. Economic Survey of Manipur, Directorate of Economics and Statistics, Government of Manipur, Imphal, 2007-08, 278.
2. Gurumayum S D and Choudhary M, Fishing methods in the rivers of Northeast India, Indian J Tradit Knowle, 8(2) (2009) 237-241.
3. Dutta R and Bhattacharjya B K, An indigenous community fishing practice of Tirap district, Arunachal Pradesh, Indian J Tradit Knowle, 7 (4) (2008) 624-626.
4. Tynsong H and Tiwari B K, Traditional knowledge associated with fish harvesting practices of War Khasi community of Meghalaya, Indian J Tradit Knowle, 7(4) (2008) 618-623.
5. Dutta R and Bhattacharjya B K, A traditional fishing method of Assam for catfishes using duck meat as an attractant, Indian J Tradit Knowle, 8(2) (2009) 234-236.
6. Kalita B, Dutta A, Bhagabati S K and Sharma A, Indigenous technical knowledge for fish harvesting in Karbi-anlong district of Assam, Indian J. Tradit Knowle, 9 (2) (2010) 252-255.
7. Gurumayum S D, Arun G and Nandeesha M C, Women participation in fisheries activities in Manipur valley in India with traditional fish based beliefs and customs, In: Global symposium on Gender and Fisheries, edited by P S Choo, S J Hall and M J W illiams, (World Fish Center, Penang), 2006, 149-158.
8. Bira Singh O, Fishing technique used for Air-Breathing fishes with special reference to Phoomdi (floating mass) of Loktak lake of Manipur, (M FSc Dissertaion, CIFE, Mumbai), 1999.
9. Armontrout N. B. (1990). Aquatic Inventory. Bureau of Land Management, Eugene District (USA), 32 pp.
10. Joychandra Singh M, Limnological studies of Pumlun Lake- A major freshwater wetland of Manipur Ph.D. thesis Manipur university (1998), 177.
11. Jayram K C, The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka. Zoological Survey of India, Calcutta (1981).
12. Jayaram K C, The fresh water fishes of the Indian region. Narendra Publ. House, Delhi, India. 1999, 551pp.
13. NBFGR, Manual on Habitat Inventory. National Bureau of Fish Genetic Resources (ICAR) (Lucknow), 2000, 27pp.
14. Shinde S E, Pathan T S, Bhandare R Y and Sonawane D L, Ichthyofaunal Diversity of Harsool Savangi Dam, District Aurangabad, (M.S.) India. World J. Fish and Marine Sci., 1(3): (229), 141-143.
15. Talwar P K and Jhingran A G, Inland Fishes of India and Adjacent countries, Vol. I and II Oxford and IBH Co. Pvt. Ltd. (New Delhi), (1991), pp. xix + 1158.
16. Menon A G K, A Checklist of the Fishes of the Himalayan and the Indo-gangetic Plains, Inland Fish. Soc. India (Barrackpore), 1974, pp. viii + 136.