

PATS: THE FLOODPLAIN WETLAND RESOURCES OF MANIPUR

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Abstract

There are 153 floodplain wetlands in the Manipur state covering an area of 52,859 ha, which is 28.3% of the total valley area (1800 sq km). The innumerable wetlands that dot Manipur's landscape play an important role in the life of the valley's inhabitants. Loktak lake (24,672 ha) is the biggest among them and other important pats are Pumlun pat (8022 ha), Kharung pat (6520 ha) and Loushi pat (1864 ha) to name a few. These pats contribute significantly to the State's fish production, especially those of the local species, along with some economically important aquatic plants. There is a general lack of information on these lakes resulting in lesser appreciation of their economic value and importance. These pats are being threatened by numerous social problems and anthropogenic activities. Many of these pats are in a transient phase of their evolution into marshlands and some of them have already been converted to concrete land masses.

Introduction

Manipur, a small state located at far eastern corner of India bordering Myanmar, is included among biodiversity hotspot regions of the world. Situated between 23° 83' N and 25° 68' N latitude and between 93°02' E and 94° 98' E longitude at an altitude of 790 m above msl, the state has a distinct zoo-geographical identity. The total area of the state is 22,327 sq. km. of which hilly regions with coverage of about 92% encloses a central valley of about 1800 sq. km. The state has vast and varied water resources in the form of torrential fast flowing hill streams as well as over fifteen meandering and quite rivers flowing in the valley. Associated with the drainage systems there are a number of floodplain wetlands in the valley, which have been associated with lives of the people since historical periods. These wetlands are presently under threat of extinction owing to rampant urbanization and human encroachments. In this paper, an insight into the floodplain wetlands of the valley in order to highlight their importance in the socio-economic and cultural ethos of the inhabitants has been presented.

Floodplain Wetlands (Pat) of Manipur

Manipur valley is saturated with floodplain wetlands locally known as *pat* (pronounce as *paat*). The state had a record of 155 lakes in the past but there are now only 19 lakes as indicated by data provided by remote sensing satellite images (Garg *et al.*, 1998). The *pats* are either formed by inundation of low-lying areas from the rivers during rainy seasons or due to discontinuation of river course due to siltation or tectonic activities. Owing to poor and restricted drainage system, the low-lying areas retain water either throughout the year (perennial) or partly a year (seasonal) or completely dried up.

The innumerable *pats* that blotch the state's landscape definitely play an important role in the life of the valley inhabitants and are deeply entwined with the socio-economic and cultural ethos of the people. The main fishery resources of the state are the *pats*, which despite the accelerated deterioration, still forms the backbone of fisheries of the state. These *pats* contribute significantly to the State's revenue, especially by those of the local fish species, apart from producing economically important aquatic plants. For people living nearby the water bodies, *pats* are their lifeline. The accessibility to these water bodies is open so they directly collect materials from the *pats* either for daily consumption or for selling in the market. In spite of all its significance, there is a general lack of information on these lakes resulting in lesser appreciation of their economic value and importance.

There are four districts in the valley namely, Thoubal, Bishenpur/Bishnupur, Imphal East and Imphal West. Bishenpur has the minimum number (25 nos) of wetland with maximum wetland area (19905.50 ha). Maximum number of wetland (79 nos) is found in Imphal but with minimum area (13265.50 ha; Garg *et al.*, 1998). The size of the existing lakes have also been diminishing fast due to high demand of water and land area in the city, and almost half of the water areas of all lakes are covered by various type of aquatic vegetation. The condition becomes worst during winter and pre-monsoon seasons when weeds cover up to 3/4th of the water area. During monsoon seasons, most of the surrounding area of the *pats* is inundated with rainwater giving a look of a gigantic water body, whereas in other seasons the lake area shrinks into small size. Thus the State's existing water bodies cover an area of 23,246 ha during post- monsoon, while it is only about 10,661 ha during pre-monsoon

season (Garg *et al.*, 1998). However, the local people use the dried up areas of the *pats* for paddy and vegetables cultivation. The details of the wetlands are given in Fig. 1.

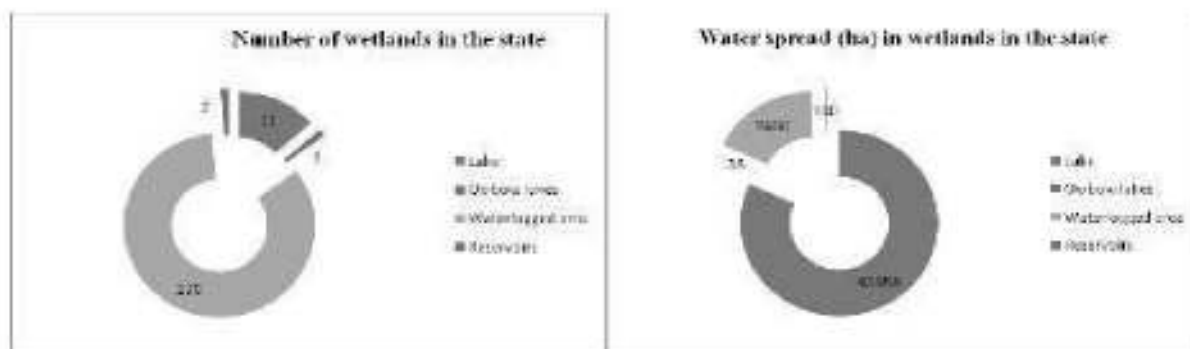


Fig. 1: Number and area (ha) of wetlands in the state

As the valley is surrounded by hills on all sides, the soil particle coming down from the surrounding hills silted up the *pats* so the depths of the *pats* have drastically reduced. Though siltation is a natural process, but the process is speeded up by anthropogenic activities like deforestation, Jhum cultivation and so on. During the last two/three decades, some *pats* have been occupied with human settlements and some are in the process of transformation. To name some such transformed *pats* in the middle of Imphal city are Keisam *pat*, Lamphel *pat* and Nitai *pat*. Also Porom *pat*, Yaral *pat*, Akam *pat* and Takyel *pat* are the name of some floodplains, which have been converted into solid terrain at the outskirts of the city. At present, there is not a single oligotrophic lake found in the valley. They are either in early or late eutrophic stage. Loktak lake (Ramsar site) is the only lake recognised officially by the National Lake Conservation Programme under Ministry of Environment, Forest and Climate change. But there are still important lakes which remain still rather intact are Pumlun (Khoidum), Ekop (Kharung), Loushi, Waithou (Punnem), Aongbeekhong, Ushoipokpi, Sana, Utra, Tankha, Kharam, Lamphel, Jailet and Jeimeng. However, there is a fear that if the present trend continues and sustainable measures are not brought out in time this would result in extinction of the remaining lake.

Loktak Lake and Fish Farming

Loktak Lake (area=24672 km²; ISRO, 1998), which is the biggest lake in northeastern region of the country is situated at Moirang, 48 kms from Imphal and lies in Bishenpur district (Manipur). Half of the state's fish demand is met by the lake and its associated wetlands. The lake is the source of sustenance for the people of the state economically, climatologically and physiologically. The lake is considered as divine by the locals. People worship the lake as mother deity that provides not only fish, prawns or edible molluscs, it also produces lots of consumable and economically important macrophytes. There is socio-economic and cultural ethos associated around the lake. The cultural and the traditional aspects of Manipuris will be incomplete if Loktak lake is not related.

The fishing community living near the lake and inside the lake in floating huts makes full use of their watery environment. These people depend on the lake and its resources for various products besides fisheries including food, fuel, fodder, thatching material, medicinal plant, raw materials for handicrafts etc. The most common fish-catching device in this lake is *Athapum* and gill nets. *Athapums* are the artificial circular *phumdis*, which were built by the villagers as enclosures for fish farming (Shyamjai, 2002). The *Phum/Phumdis* are a series of floating islands and a typical characteristic of Loktak Lake (Fig. 2-3). They cover a substantial part of the lake area and are heterogeneous masses of soil, vegetation and organic matter in various stages of decomposition. This floating mass of matted vegetation has a thickness that varies from a few centimeters to two meters. Only 20% of a *Phumdi's* thickness floats above the water surface; the other 80% remains submerged. Local fishermen improvise on these naturally formed floating islands by securing them with ropes, bamboos and nylon nets, and make them into dwelling units. The largest single mass of *Phum* is in the southeastern part of the lake, covering an area of 40 sq. km is the world's largest floating park, known as Keibul Lamjao National Park. This park is the last natural refuge of the endangered Manipur brow-antlered deer (*Cervus eldi eldi*), locally called the *Sangai*. The lake is internationally important and biologically-rich besides being a unique wintering ground of various migratory waterfowls.



Fig. 2: Loktak lake and *Phumdis*



Fig. 3: Macrophytes on the lake

Out of the total population of 50,400 fishermen depending on Loktak Lake, 8300 live in island villages, 40,500 in lakeshore villages and 1600 in floating huts, *Phum* (WISA and LDA, 2003). There are at least 733 families living permanently on small *Phumdis* on the Loktak. While the *Phum* dwellers are entirely engaged in fishing which is their sole source of income, the inhabitants around the lake areas are also dependent upon fisheries to varying degrees. It not only provide base for shelter, they are also a source of food, vegetable, sand, and fodder. There are many problems coming up associated with this lake because of burgeoning human population. *Athapums*, has caused proliferation of the *Phumdis* in the lake, coupled with severe infestation of the lake by water hyacinth, is the main cause of concern. The paddy fields which lie in the periphery of the lake become inundated with water after the construction of Ithai barrage while lots of area of the *pats* becomes converted into agricultural lands because of the *Phums*. Many fish farms are coming up around the lake, which becomes a menace for the lake. The people living on the floating *Phums* get themselves ashore and after some time the *Phum* area continues with the land mass.

Resources of the Pats

Despite the accelerated deterioration of the *pats* in the valley, these water bodies continue to give livelihood to many people living in the surrounding area (Fig. 4-9). They still form the repository of many rare plant and animal species and host a number of prized species. *Pats* play very significant role in fishery as a traditional source of inland capture fisheries. Fish forms a part of daily diet for the different ethnic groups in the state in all possible forms like fresh, fermented, smoked, roasted, salted, heated and steamed dishes. Though the rate of production of fish in particular from these *pats* is very low (100 kg/ha/year) but it is well compensated by economically important varieties of flora and fauna, which are available in plenty.



Fig. 4: *Alisma plantago-aquatica* & *Sagittaria* sps.



Fig. 5: Snails sps.



Fig. 6: Edible Macrophytes from the lakes



Fig. 7: Roots of *Nelumbo* sps.



Fig. 8: Water lily from the pats



Fig. 9: Fish from the pats

There are more than 300 plant species reported by earlier workers from the *pats* of Manipur. More than 50 species of plants are used as food, many of them are consumed with high preference and some are having good medicinal value. Plant like *Euryale ferox* (edible plant) and *Scirpus lacustris* (material for making decoration item) can be used for large scale production of mats and chairs as they have high economic value. Some plants have beautiful flowers, which are used in beautification and rituals. Other than this, some plants are used as fodder for animals, thatching materials, wrapping materials, in construction of house walls and mats, decoration items, bio-fertilizers, fire-woods, etc. (Table 1). Likewise, the lakes of the state harbor varieties of animal species. Apart from fish, several amphibian and insect species are found in plenty and are used by the people in one way or other. The local people consume many species of snail, some of these are known to have medicinal value. Economically important animal species found in the lakes of the state are listed in Table 2 and 3.

Table 1: Commercially important macrophytes available in the *pats* of Manipur.

Sl. No.	Scientific name	Local name	Family	Uses
1.	<i>Ageratum conyzoides</i>	Khongjai napi	Asteraceae	A
2.	<i>Acorus calamus</i>	Okhidak	Araceae	A
3.	<i>Alisma plantago-aqatica</i>	Kakthrum	Alismataceae	A
4.	<i>Alocasia indica</i>	Singjupan angangba	Aroideae	C
5.	<i>A. cucullata</i>	Singjupan angouba	Aroideae	C
6.	<i>Alpinia galangal</i>	Pullei	Zingiberaceae	C
7.	<i>A. nigra</i>	Pullei	Zingiberaceae	C
8.	<i>Alternanthera philoxeroides</i>	Kabo napi	Amaranthaceae	A, C, D
9.	<i>Alternanthera sessilis</i>	Phakchet	Amaranthaceae	A, C
10.	<i>Amaranthus spinosus</i>	Chengkruk tingkangpanba	Amaranthaceae	C
11.	<i>Amaranthus tricolor</i>	Chengkruk	Amaranthaceae	C
12.	<i>Argyrea nervosa</i>	Uri tujombi	Convolvulaceae	A
13.	<i>Artemisia mlagurica</i>	Laibakngou	Asteraceae	A
14.	<i>Arundo donax</i>	Luwang tou	Graminaceae	A, D
15.	<i>Azolla pinnata</i>	Kangmacha	Salviniaceae	D
16.	<i>Brvonopsis locmiosa</i>	Kwakthabi	Cucumbitaceae	A
17.	<i>Cama flaccida</i>	Laphurit hangamapal	Cannaceae	B
18.	<i>Cama indica</i>	Laphurit angouba	Cannaceae	B
19.	<i>Cassia bicapsularis</i>	Thounam	Caesalpinaceae	B
20.	<i>Carex indica</i>	Hundung	Cyperaceae	A, C
21.	<i>Cassia sophera</i>	Thounam	Cyperaceae	C
22.	<i>Celosta argentea</i>	Haorei	Amaranthaceae	B
23.	<i>Centella asiatica</i>	Peruk	Apiaceae	A, C
24.	<i>Ceratophyllum demersum</i>	Charang nakuppi	Ceratophyllaceae	D

25.	<i>Coix lachryma</i>	Yawa chaning	Poaceae	A
26.	<i>Colocasia esculanta</i>	Lampan	Atoideae	C
27.	<i>Crotolaria alata</i>	Lam hawai	Leguminoneae	A
28.	<i>Crotolaria juncea</i>	U-hawaimaton	Fabaceae	A, C
29.	<i>Cymbopogon nardus</i>	Haona charot	Gramineae	D
30.	<i>Cynodon dactylon</i>	Tingthou	Gramineae	A, D
31.	<i>Cyperus brevifolius</i>	Chumthang	Cyperaceae	A, D
32.	<i>Cyrtococcum accrescens</i>	Kangmapal	Poaceae	B
33.	<i>Dactyloctenium aegyptium</i>	Pungphai	Gramineae	B
34.	<i>Dichrocephala latifolia</i>	Lallukok	Asteraceae	A
35.	<i>Dioscorea bulbifera</i>	Haa	Dioscoreaceae	C
36.	<i>Drymaria cordata</i>	Tandanmathi	Caryophyllaceae	A
37.	<i>Echinochola stagina</i>	Hup	Gramineae	D
38.	<i>Eclipta prostrate</i>	Ushi shumbal	Astraceae	A
39.	<i>Eichhornia crassipes</i>	Kabokang	Potederiaceae	A, C
40.	<i>Enhydra fluctuans</i>	Komprek tujombi	Asteraceae	A, C
41.	<i>Equisetum debile</i>	Lai utong	Equisetaceae	D
42.	<i>Erianthus arundinaceus</i>	Sing-nut	Gramineae	D
43.	<i>E. procerus</i>	Singnang	Gramineae	D
44.	<i>Euphorbia hurta</i>	Pakhang leiton	Euphorbiaceae	A
45.	<i>E. thymifolia</i>	Tengnou	Euphorbiaceae	A
46.	<i>Euryale ferox</i>	Thangjing	Nymphaceae	A,C
47.	<i>Fuirena umbellata</i>	Lamthangjou	Nymphaceae	A
48.	<i>Gynura cusimbua</i>	Tera paibi	Asteraceae	A
49.	<i>Hedychium coronarium</i>	Loklei	Zingiberaceae	C
50.	<i>H. spicatum</i>	Takhelei	Zingiberaceae	A, B, C
51.	<i>Hebanthus annuus</i>	Numitlei	Asteracea	B, C
52.	<i>Hydrilla verticillata</i>	Charang	Hdrocharitaceae	D
53.	<i>Hydrocotyle javanica</i>	Lai peruk	Apiaceae	A
54.	<i>Imperata cylindrical</i>	Ee	Gramineae	D
55.	<i>Ipomoea aquatica</i>	Kolamni	Convolvulaceae	A, C
56.	<i>Isachne himalaica</i>	Huplaba	Gramineae	
57.	<i>Jussiaea repens</i>	Onagraceae	Ishing kundo	A, C
58.	<i>Lagenaria vulgaris</i>	Koubuyai	Cucurbitaceae	A
59.	<i>Leersia hexandra</i>	Choura	Poaceae	D
60.	<i>Lemna perpusila</i>	Kangmacha	Lemnaceae	D
61.	<i>L. trisula</i>	Kangmacha	Lemnaceae	D
62.	<i>Lemanea australis</i>	Nungsham	Cyperaceae	A, F
63.	<i>Marsilea minuta</i>	Ishing yenshang	Marsiliaceae	C
64.	<i>M. quadrifoliata</i>	Ishing yenshang	Marsiliaceae	C
65.	<i>Melothria purpusilla</i>	Lamthabi	Cucurbitaceae	A
66.	<i>Mikania micrantha</i>	Uri hingchabi	Asteraceae	A, D
67.	<i>Mimosa pudica</i>	Kangphal ikaithabi	Mimosaceae	A
68.	<i>Monochoria hastaefolia</i>	Kakla	Pontederiaceae	A
69.	<i>Murdannia nudiflora</i>	Tandan pambi	Cyperaceae	A
70.	<i>Narenga porphyrochoma</i>	Singut	Poaceae	D
71.	<i>Nelumbo nucifera</i>	Thambal angouba	Nymphaceae	A, B C, D
72.	<i>N. n. var. rubra</i>	Thambal anganba	Nymphaceae	A, B, C, D
73.	<i>Nymphaea micrantha</i>	Nilkamal	Nymphaceae	B, C
74.	<i>N. nouchali</i>	Thariktha angangba	Nymphaceae	A, B, C
75.	<i>N. pubescens</i>	Tharo	Nymphaceae	A, B, C, D
76.	<i>N. rubra</i>	Tharo anangba	Nymphaceae	A, B, C, D

77.	<i>N. stellata</i>	Thariktha	Nymphaceae	A, B, C, D
78.	<i>Neptunia prostrata</i>	Ishingikaithibi	Mimosaceae	A, C
79.	<i>Nymphoides cristata</i>	Tharo macha	Gentianaceae	B, C
80.	<i>N. hydrophyllum</i>	Tharo macha	Gentianaceae	B, C
81.	<i>Oenanthe javanica</i>	Komprek	Apiaceae	A, C
82.	<i>Oriza rufipogon</i>	Wainu chara	Graminaceae	D
83.	<i>O. sativa</i>	Phou	Graminaceae	C
84.	<i>O. sativa</i>	Taothabi	Graminaceae	C
85.	<i>Persicarsia perfoliata</i>	Lilhar	Polygonaceae	A, C
86.	<i>P. chinensis</i>	Yengkhuman	Polygonaceae	C
87.	<i>P. potsumba</i>	Ishing kengngoi	Polygonaceae	C
88.	<i>Pennisetum glaucum</i>	Wanamanbi	Poaceae	D
89.	<i>Phragmites karka</i>	Tou	Gramineae	A, D
90.	<i>Pistia stratiotes</i>	Kangjao	Araceae	C
91.	<i>Plantago erosa</i>	Yempat	Plantaginaceae	A
92.	<i>Polygonum barbatum</i>	Yellang	Polygonaceae	C
93.	<i>P. orientale</i>	Chaokhong	Polygonaceae	A
94.	<i>P. plebejum</i>	Phakchet	Polygonaceae	C
95.	<i>Riccia natans</i>	Kangmacha	Ricciaceae	D
96.	<i>Riccia natans corda</i>	Kangmacha	Ricciaceae	D
97.	<i>Ricciocarpus natans</i>	Kangmacha	Ricciaceae	D
98.	<i>Rubus ellipticus</i>	Heijampet	Rosaceae	A
99.	<i>Rumex maritimus</i>	Torong khongchak	Polygonaceae	C
100.	<i>R. nepalensis</i>	Torong khongchak	Polygonaceae	C
101.	<i>Saccharum spontaneum</i>	Mom	Gramineae	A, D
102.	<i>S. munja</i>	Khoimom	Gramineae	A, D
103.	<i>Sacciolepis myosuroides</i>	Hup	Gramineae	D
104.	<i>Sagittaria guayanensis</i>	Koukha	Alismataceae	C
105.	<i>S. sagittifolia</i>	Koukha	Alismataceae	C
106.	<i>Salvinia cucullata</i>	Samukang/ Kangborobi	Salviniaceae	D
107.	<i>Seirpus lacustris</i>	Kouna	Gramineae	A, D
108.	<i>Sesbania sesban</i>	Chuchurangmei	Leguminosae	C
109.	<i>Setaria pallidifusca</i>	Hup	Gramineae	D
110.	<i>Solanum khasianum</i>	Singkhanga	Solanaceae	A
111.	<i>S. nigrum</i>	Leipungkhanga	Solanaceae	A
112.	<i>S. myriacanthum</i>	Lamkhamen	Solanaceae	A
113.	<i>Stellaria media</i>	Yerum keirum	Caryophyllaceae	C
114.	<i>Trapa natans</i>	Heikak	Trapaceae	A, C
115.	<i>Utricularia flexuosa</i>	Charang kokphabi	Lentibulariaceae	D
116.	<i>Xanthium strumarium</i>	Hameng shampakpi	Asteraceae	A
117.	<i>Zizania latifolia</i>	Ishing kambong	Gramineae	A, C, D

A. medicinal ; B: use in rituals; C: use as food; D: other economically useful plants

Table 2: Commercially important animal species found in the lakes of Manipur

Sl. No	Scientific name	Local name	Phylum	Uses
1.	<i>Pheritima posthuma</i>	Tinthrok	Annelida	Soil rejuvenator
2.	<i>Haemadipsa zeylamica</i>	Kakphei	Annelida	Medicinal
3.	<i>Hirudinaria granulosa</i>	Timpha	Annelida	Medicinal
4.	<i>Acridium melanocorne</i>	Kaojeng	Arthropoda	Food
5.	<i>Acisoma panorpoides</i>	Charang	Arthropoda	Food
6.	<i>Belostoma indicum</i>	Naoshek	Arthropoda	Food
7.	<i>Berosus indicus</i>	Tharaikokpi macha	Arthropoda	Food
8.	<i>Cybister confusus</i>	Tengbi	Arthropoda	Food
9.	<i>C. convexus</i>	-	Arthropoda	Food
10.	<i>C. posticus</i>	-	Arthropoda	Food
11.	<i>C. tripunctatus asiaticus</i>	-	Arthropoda	Food
12.	<i>Laccophilus anticatus</i>	-	Arthropoda	Food
13.	<i>Acheta domesticus</i>	Harou	Arthropoda	Food
14.	<i>Grylotalpa africana</i>	Wahei	Arthropoda	Food
15.	<i>Hydrophilus olivaceus</i>	Tharaikokpi	Arthropoda	Food
16.	<i>H. spindicus</i>	Tharaikokpi	Arthropoda	Food
17.	<i>Neap rubra</i>	Haonaoshek	Arthropoda	Food
18.	<i>Notoneeta glauca</i>	Long khajing	Arthropoda	Food
19.	<i>Tettigonia viridissima</i>	Kaojeng ahangba	Arthropoda	Food
20.	<i>Macrobrachium hendersoni</i>	Khajing macha	Arthropoda	Food
21.	<i>M. lamarroides</i>	Khajing	Arthropoda	Food
22.	<i>Palaemon styliferus</i>	Khajing waikhu makhong panba	Arthropoda	Food
23.	<i>Bellamya crassa</i>	Labuktharoi macha	Mollusca	Food
24.	<i>Cipangopaludina lecythis</i>	Labuktharoi achouba	Mollusca	Food
25.	<i>Pila globosa</i>	Pungtharoi	Mollusca	Food
26.	<i>Angulyagra oxytropis</i>	Tharoi ningkhabi	Mollusca	Food & medicinal
27.	<i>Thiara luberculata</i>	Lai tharoi	Mollusca	Food
28.	<i>Brotia costula</i>	Lai tharoi	Mollusca	Food
29.	<i>Rana tigrina</i>	Moreh hangoi	Amphibia	Food

Table 3: Ichthyofaunastic resources of the *pats* of Manipur

Sl no.	Scientific name	Sl no.	Scientific name
1.	<i>Notopterus notopterus</i> (Pallas)	15.	<i>L. bata</i> (Hamilton-Buchanan)
2.	<i>Amblypharyngodon mola</i> (Ham-Buch)	16.	<i>L. gonius</i> (Hamilton-Buchanan)
3.	<i>Barilius barila</i> (Ham-Buch)	17.	<i>L. calbasu</i> (Ham-Buch)
4.	<i>B. barna</i> (Ham-Buch)	18.	<i>Bangana dero</i> (Hamilton-Buchanan)
5.	<i>B. bendelisis</i> (Ham-Buch)	19.	<i>Catla catla</i> (Hamilton-Buchanan)
6.	<i>B. dogarsinghi</i> Hora	20.	<i>Hypophthalmichthys molitrix</i> (Val)
7.	<i>B. ngawa</i> Vish. & Manoj	21.	<i>Ostreobrama cotio</i> (Ham-Buch)
8.	<i>Esomus danricus</i> (Ham-Buch)	22.	<i>O. cunma</i> (Day)
9.	<i>Cyprinus carpio communis</i> Linnaeus	23.	<i>Puntius chola</i> (Ham-Buch)
10.	<i>Cyprinus carpio nudus</i> Linnaeus	24.	<i>P. conchoniis</i> (Ham-Buch)
11.	<i>Cyprinus carpio specularis</i> Linnaeus	25.	<i>P. jayarami</i> Vish. & Tombi
12.	<i>Ctenopharyngodon idella</i> (Val)	26.	<i>P. manipurensis</i> Menon, Rema & Vish
13.	<i>Cirrhinus mrigala</i> (Ham-Buch)	27.	<i>P. sarana orphoides</i> (Valenciennes)
14.	<i>Labeo rohita</i> (Hamilton-Buchanan)	28.	<i>P. sarana sarana</i> (Ham-Buch)

29	<i>P. sophore</i> (Ham-Buch)
30	<i>P. ticto</i> (Ham-Buch)
31	<i>Crossocheilus latius</i> Hamilton
32	<i>Acantophthalmus pangia</i> (Ham-Buch)
33	<i>A. longipinnis</i> (Menon)
34	<i>Wallago attu</i> (Schneider)
35	<i>Ompok bimaculatus</i> (Bloch)
36	<i>Mystus bleekeri</i> (Day)
37	<i>Botia berdmorei</i> (Blyth)
38	<i>Mastacembelus armatus</i> (Lecepede)
39	<i>Lepidocephalus berdmorei</i> (Blyth)
40	<i>L. irrorata</i> (Hora)
41	<i>Clarias batrachus</i> (Linnaeus)
42	<i>Heteropneustes fossilis</i> (Bloch)

43	<i>Aplocheilus panchax</i> (Ham-Buch)
44	<i>Monopterus albus</i> (Zuiew)
45	<i>M. cuchia</i> (Ham-Buch)
46	<i>Chanda nama</i> Hamilton-Buchanan
47	<i>C. baculis</i> (Ham-Buch)
48	<i>Parambassis ranga</i> (Ham-Buch)
49	<i>Oreochromis mossambicus</i> (Peters)
50	<i>Glossogobius giuris</i> (Ham-Buch)
51	<i>Anabas testudineus</i> (Bloch)
52	<i>Colisa fasciatus</i> (Schneider)
53	<i>Oreochromis mossambicus</i> (Peters)
54	<i>Channa. sota</i> (Ham-Buch)
55	<i>C. orientalis</i> Bloch & Schneider
56	<i>C. punctatus</i> (Bloch)
57	<i>C. striatus</i> (Bloch)

Pats vis-à-vis Socio Economic Scenario

In the state like Manipur, where the majority of the population lives in rural areas, the basic needs are fulfilled from surrounding environment and lakes, which is scattered all over the valley area is one of the major sources of livelihood to many people. Since time immemorial life of the peoples of the valley is closely associated with these pats. Besides fisheries, the local people depend on the *pats* and its resources for various products. Over a period of time the availability of the natural resources has declined causing immense hardship to the communities that depend on these water resources for sustenance. As the waters of these *pats* are generally shallow, it is very convenient for women to catch fish or collect vegetables for household consumption or for commercial purpose. During rainy season, women catching fish with Chinese dip net is a common sight in all water bodies of Manipur. Women efficiently operate fishing crafts like casting Chinese dip net by sailing a dugout canoe. Selling of commodities, including fish are done solely by women. *Ema keithel* (Mother market) in the middle of Imphal city is the only market of its kind run exclusively by women.

Scope for Development

Despite its small size, Manipur has rich water resources spreading over 52,000 ha in various forms. On account of diverse physiography of the region, scope for the development of the resources is also diverse. The state has the potential for developing self-sustained fisheries of the lakes. These *pats* offer a good potential for capture fisheries as they are auto stocked with fish seeds from the rivers and also provide scope for culture fisheries. The lakes also have plenty of colourful fishes, which have potential in international ornamental fish market. Yet, no attempt has been made to study the feasibility of marketing them abroad. The ornamental value of the fish is still unknown to the local people. The plant and animal resources which are found naturally can be exploited for large scale production. Some potential species are *Euryale ferox*, *Scirpus lacustris*, *Rana tigrina*, many species of snails and insects, which are sold in market by collecting from wilderness, can be commercialized by adopting scientific cultural methods.

Challenges Faced by the Water Bodies

Man has been degrading the pristine environment from the time immemorial. Biotic environment is being altered by human needs leading to extinction of many plant and animal species. Other results include change of the environment and climate making human being to compromise with the environmental condition. The *pats* of Manipur are not exception to the global changes; they are threatened by anthropogenic activities and numerous social problems. At the same time, the local people are still depending on the *pats* for their livelihood, wild collection of plant and animal species are still very much prevalent. Under present circumstances, the *pats* of Manipur need urgent attention. Since ownership of the *pats* of the state are not clearly defined, open access to the *pats* is a serious threats to the *pats* ecosystem. The production of fish in Loktak lake has declined at an annual rate of 2.72 per cent during 1991- 2001 (1,790 MT in 1991 to 1,358 MT in 2001) (WISA and LDA, 2003). To meet the high demand of the burgeoning human population the local people collect more of the resources, sometime indiscriminately resulting into unwanted exploitation. This is also one of the major reasons of disappearance of some plant and animal species from this region. The greatest concern is the loss and modification of habitat and heavy extortion of the plant and animal

species. Still the pats of Manipur are home to many rare plant and fish species but unmanaged utilization of the resources threaten the existence of the *pats*. Some species found in these water bodies have already included in the IUCN red data book. A systematic research is required for production and managerial techniques of the resources of the pats which at present is fragmentary. This will lead to the development and enhancement of potential untapped aquatic resources. Apart from enforcement of existing laws, there is an urgent need to create mass awareness about ecological restoration of *pats*, by both government and non-government organizations. This will lead to the development of a viable and sustainable trade and will support not only the local people but also will help in conserving plant and animal species.

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