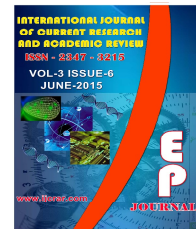




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### Investigation of the Life-form characteristics and biological spectrum of the aquatic macrophytes in Potsangbam River, Manipur, India

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#### KEYWORDS

Life –form,  
Biological Spectrum,  
Macrophytes,  
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River

#### A B S T R A C T

Water is one of the most precious natural resources. It plays an important role for the lives occurring both in aquatic and terrestrial habitats. The present investigation has been carried out in Potsangbam river which is one of the feeder streams of “Loktak Lake”, a Ramsar site. Life –form of the macrophytic vegetation were determine based on the height, form, habit and nature of the position and degree of protection of the perennating buds together with occurrence of each species which were studied in the field. In the present study Life-form classification of the different macrophytic species were recorded. The different macrophytic species have been catagorized into five major life forms viz; Chamaephytes, Hemicryptophytes, Geophytes, Therophytes and Errant Vascular Hydrophytes. Among the life form reported form the study area Therophytes and Hemicryptophytes dominated over the other life forms classes. Therefore the present river may be designated as Thero-Hemicryptophytes type of phytoclimate.

### Introduction

Rivers are included under the fresh water catagories. The fresh water are the most convenient and cheapest sources of water for the domestic and industrial needs and plays an important roles in the hydrological cycle. The fresh water bodies (both lotic and lentic) provide humanity with many valuable services like asthetic enjoyment,

recreation, fish transportation, water for irrigation, bathing, drinking and dilution of pollutants etc. The open dumping of the solid wastes by the inhabitant at and around the river is a major cause for pollution of water of this river. Manipur is endowed with many rivers and streams of which many are feeding the important lake of the state.

Overall 34 streams drain into the lake from the western hillside of the state. Many authors have studied the phytoclimate of the various lakes of Manipur mentioned may be made of the works of Singh K.K and Sharma (2013) in Kharungpat Lake, Devi and Sharma (2002) in Loktak lake, Devi (2001) in Sanapat lake, Devi (2002) in Ikop lake and Usha (2002) in Poiroupat lake. But there is little work regarding the phytoclimate of the rivers. Thus the present investigation has been undertaken to assess the life -form characteristics and biological spectrum of the macrophytic plant species in the Potsangbam Rivers, Bishnupur district, Manipur.

### **Description of study site**

The Potsangbam river originates from MayuronThenjang hills, Senapati districts and finally falls into Loktak Lake near the Upokpi Khunou, Bishnupur District (Fig. 1). It is about 30 km away from Imphal. The river is naturally ageing and is under the heavy environmental stress. It is due to human activities like disposal of untreated domestic sewage, disposal of solid waste, leaching of chemical fertilizers from the surrounding fields etc. For detailed study and investigation, the river has been divided into three sampling/study sites which are represented as site I, Site II and site III. Site I is located at the upstream area of the river, site III is located at the downstream area of the river.

### **Materials and Methods**

Potsangbam River located in Bishnupur district, Manipur. The survey and analysis of the river was carried out at monthly intervals for a period of one year from January 2012 to December 2012. Collection of macrophytic plants samples were done on monthly intervals from the three study sites.

The determination of life –form of the macrophytic vegetation was done based on the height, form, habit and nature of the position and degree of protection of the perennating buds together with occurrence of each species which were studied in the field. Besides the structures and seasonality of crown foliage, the shoot systems have also been taken into consideration. The vegetation of the various plant species were classified after Raunkiaer's Life-forms classification as modified by Ellenberg and Mueller-Dombois and Mueller –Dombois and Ellenberg. Comparisons between biological spectrum of the study area and normal spectrum of the world (Raunkiaer) were also made.

### **Result and Discussion**

The Life-form classification provides important information on the response of a community to particular environmental factors on the utilization of space and the probable comparative relations within the community. Puri *et al.* (1990) has identified Ten (10) types of phytoclimates in India based on Raunkiaer's Life-form classes.

The Vascular plant is categories into five different life-forms viz., Chamaephytes, Hemicryptophytes, Geophytes, Therophytes and Phanerophytes based on the position and degree of protection of the perennating buds during adverse seasons. Raunkiaer's classification emphasized only the higher plants (vascular plants). Ellenberg and Mueller- Dombois and Mueller- Dombois and Ellenberg through an intensive survey modified Raunkiaer's classification. In this modified classification various criteria like the structure and seasonality of the crown foliages and shoot system have been emphasized besides the structure and nature of perennating bodies.

In the present study life-form classification of the different macrophytic species has been followed as per Raunkiaer's system modified by Ellenberg and Mueller-Dombois and Mueller-Dombois and Ellenberg. Accordingly the different macrophytic species have been categorized into five major life-forms viz. 1. Chamaephytes, 2. Hemicryptophytes, 3. Geophytes, 4. Therophytes and 5. Errant Vascular Hydrophytes. The life-form classification of the present studied has been presented in Table I. The life-form classification in the present study rebuilds the presence of maximum number of species i.e. fifteen (15) in Therophytes. The species included in therophytes are *Alternanthera philoeroides*, *Alternanthera sessilis*, *Brachiaria mutica*, *Cassipourea*, *Echinochloa stagnina*, *Kyllinga tenuifolia*, *Leersia hexandra*, *Oenanthe javanica*, *Oryza officinalis*, *Oryza rufipogon*, *Paspalum schrobiculatum*, *Polygonum glabrum*, *Polygonum hydropiper*, *Ranunculus scleratus*, *Sacciolepis myosuroides*. This was successively followed by hemicryptophytes with nine (9) numbers of species viz. *Commelina bengalensis*, *Enhydra fluctuans*, *Hydrilla verticillata*, *Hygroryza aristata*, *Ipomoea aquatica*, *Ipomoea fistulosa*, *Ludwigia adscendens*, *Pseudorasbora parviflora*, *Pseudorasbora spinescens*. Errant vascular hydrophytes included six (6) species viz. *Eichhornia crassipes*, *Lemna minor*, *Marsilea quadrifida*, *Pistia stratiotes*, *Salvinia cucullata*, *Salvinia natans*. Chamaephytes include four (4) species viz. *Argyria nervosa* (Burm.f) Boj., *Knoxia mollis* R.Br., *Mimosapudica* Linn, *Phragmites Karka* (Retz) Trin. Ex stued. And geophytes also included four (4) species viz. *Colocasia esculenta* (Linn), *Cynodon dactylon* (Linn) Pers., *Cyperus rotundus*, *Zizania latifolia*.

Raunkiaer has put forward the idea of life-forms and biological spectrum in the different regions of the world. The biological spectrum is referred to as the ratio of life-forms of the different species in terms of percentage in any floristic community. The biological spectrum of Patsangbam River has been presented in Table II. The species have the capacity to grow in adverse climatic condition of the regions. From the present study it was found that phytoclimate of the lake is quite differ from the phytoclimate of the river. The Errant Vascular hydrophyte are mostly dominant in many of the lakes as studied by various author viz. Singh K.K. (2013) in Kharungpat, Usha (2002) in Poiroupat, Devi (2002) in Loktak, Devi (2001) in Sanapat etc. Regarding the present finding, it was found that the dominant macrophyte is therophyte and Hemicryptophytes.

Notes: CH- Chamaephytes; H- Hemicryptophytes; G- Geophytes; TH- Therophytes;

PH- Phanerophytes; EVH- Errant Vascular Hydrophytes.

## Conclusion

The percentage composition of the different life-form has been calculated (Fig. 2). Therophytes and Hemicryptophytes were found to contribute the highest percentage composition with 39.47% and 23.68% respectively. Errant Vascular Hydrophytes have got 15.78%. Chamaephytes and Geophytes have got the lowest percentage each of 10.52%. Since therophytes and hemicryptophytes dominated over the other life-form classes, the present status of the river can be regarded as thero-hemicryptophytes type of phytoclimate.

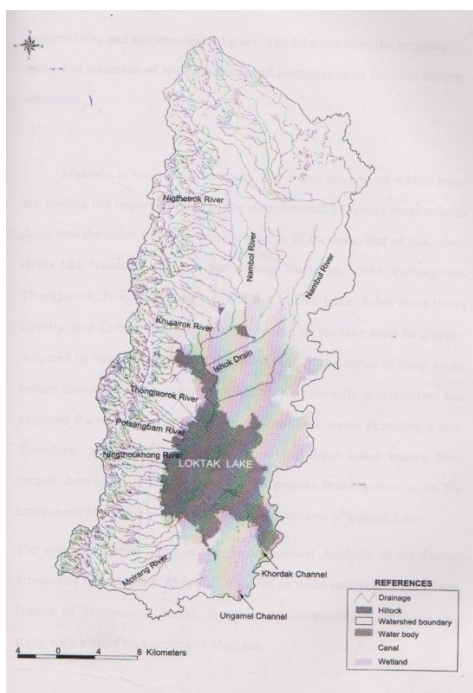
**Table.1** Life-form classification of the macrophytic species of Potsangbam River, Manipur

Sl. No.	Life-form groups	Name of species	No. of species	Compositions (%)
1.	CHAMAEPHYTES	<i>Argyria nervosa</i> (Burm.f) Boj. <i>Knoxiamollis</i> R.Br. <i>Mimosa pudica</i> Linn <i>Phragmite</i> Karka (Retz) Trin. Ex stued	4	10.52
2.	HEMICRYPTOPHYTES	<i>Commelinabengalensis</i> <i>Enhydrafluctuans</i> <i>Hydrillaverticillata</i> <i>Hygroryzaaristata</i> <i>Ipomoea aquatica</i> <i>Ipomoea fistulosa</i> <i>Ludwigiaadscendens</i> <i>Pseudoraphisminuta</i> <i>Pseudoraphis spinescens</i>	9	23.68
3.	GEOPHYTES	<i>Colocasiaesculenta</i> (Linn) <i>Cynodondactylon</i> (Linn) Pers. <i>Cyperusrotundus</i> <i>Zizyanialatifolia</i>	4	10.52
4.	THEROPHYTES	<i>Alternantheraphiloseroides</i> <i>Alternantherasessiles</i> <i>Brachiariamutica</i> <i>Cassia tora</i> <i>Echinochloastagnina</i> <i>Kyllingatenuifolia</i> <i>Leersiahexandra</i> <i>Oenanthejavanica</i> <i>Oryzaofficinalis</i> <i>Oryzarufipogon</i> <i>Paspalum schrobiculatum</i> <i>Polygonumglabrum</i> <i>Polygonumhydropiper</i> <i>Ranunculusscleratus</i> <i>Sacciolepsismyosuroides</i>	15	39.47
5.	ERRANT VASCULAR HYDROPHYTES	<i>Eichhorniacrassipes</i> <i>Lemna minor</i> <i>Marsileaquadrifoliata</i> <i>Pistiastratiotes</i> <i>Salviniacucullata</i> <i>Salvianianatans</i>	6	15.78

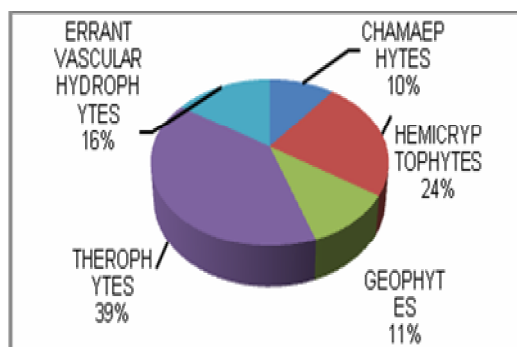
**Table.2** Biological spectrum of the flora of Potsangbam River, Manipur

Parameters	Life –form category						Total
	CH	H	G	TH	PH	EVH	
Total number of species	4	9	4	15	-	6	38
Life-form percentage (%)	10.52	23.68	10.52	39.47	-	15.78	100
Raunkiaer's Normal spectrum and composition (%)	9.00	26.00	6.00	13.00	46.00	-	100

**Fig.1** Map showing different feeders streams including Potsangbam rivers



**Fig.2** Percentage Composition of Different Life-Forms



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## **References**

- Devi, Ch. Bebika. 2001. Variation in species distribution and primary production of the macrophytes in Sanapat lake, Manipur, Ph.D. Thesis, Manipur University, Manipur.
- Devi, Ch. Nivanonee. 2002. Vegetational structure and primary production of the macrophytes of Ikoplake, Manipur, Ph.D. Thesis, Manipur University, Manipur.
- Devi, N. Beenakumari and Sharma, B.M.2002. Life-form analysis of the macrophytes of the Loktak Lake, Manipur, India. *Indian J. Environ&Ecoplan.* 6(3):451-458.
- Ellenberg, H and Mueller-Dombois, D 1967. A key to Raunkiaer plant life forms with revised sub-divisions. *Ber. Geobot Inst. ETH. Stiftg. Rubel. Zurich* 37:56-73.
- Mathivanan,V, Vijayan,P. and Sabhanayakan, S. 2005. Pollution studies on river Cauvery in Mettur, Tamil Nadu. *J. Expt. Zoology*, 8:321-328.
- Meher-Homji, V.M. 1981. Environmental Implications of life-form spectra from India. *J.Ecol. taxon. Bot.* 2:23-30.
- Modern. T.V. & N. Cedergreen 2002. Sources of nutrients to rooted submerged macrophytes going in a nutrient – rich stream. *Freshwater Biology* 47:282-291.
- Puri, D.S., Meher-Homji, V.M, Gupta, R.K. and Puri S. 1990. *Forest Ecology Vol-I: Phytogeography and Forest Conservation.* Oxford and IBH Publishing Co.Ltd. New Delhi.
- Rana, S.V.S. 2009. *Ecology and Environmental Science (Fourth Edition)* pp.109-119. PHI Learning Pvt. Ltd. New Delhi.
- Raunkiaer, C, 1934. *The life forms of plants and statistical plant Geography.* Oxford. Clarendon Press.
- Singh Khelchandra K. and Manihar Sharma B. (2013). *Studies on the life-form characteristics and biological spectrum of the aquatic macrophytes in Kharungpat Lake, Manipur, Northeast India.* Bioresources and Traditional Knowledge of Northeast India. ISBN 987-81-924321-3-7
- Usha, Kh. 2002. *Macrophyte Ecology of Poiroupatlake, Manipur.* Ph.D. Thesis, Manipur University, Manipur.