

Seasonal variations of Molluscan forms in relation to lake water characteristics in Koothaippar lake ecosystem, Tiruchirappalli District, Tamil Nadu, South India.

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Abstract

Wetlands support many aquatic organisms especially molluscan forms. Studies on the status and distribution of fresh water molluscs are lacking because of difficulties in taxonomy. The current study was carried out at the Koothaippar lake, Tiruchirappalli district, Tamil Nadu, from October 2013 to June 2014. Hand picking and quadrat methods were applied for the collection of molluscan forms in the lake. Five different fresh water molluscan species comprising two orders and three different families were recorded, besides two unidentified molluscan forms were also recorded during the study. In addition, the study investigated the effects of physico-chemical parameters of water on the distribution of freshwater molluscan forms in the Koothaippar wetlands. The study showed that the physico-chemical parameters of water influenced the distribution and abundance of fresh water molluscan.

Keywords: Molluscan forms, freshwater wetlands, distribution, physic-chemical parameters of water, interaction and conservation.

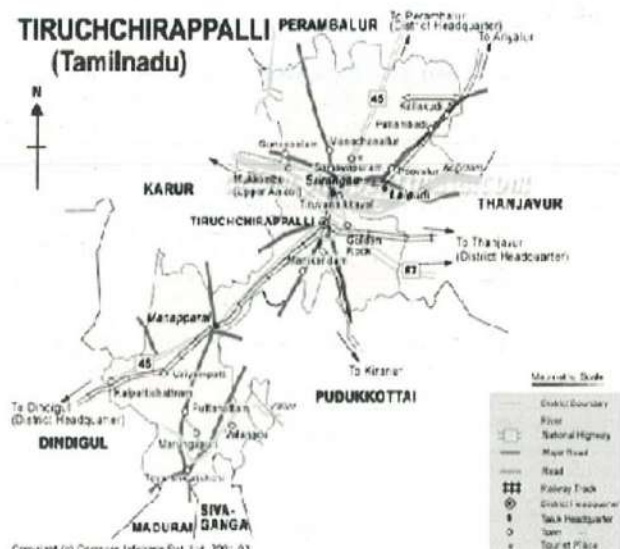
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INTRODUCTION

Wetlands are the most productive and biologically diverse in the world but very fragile ecosystems (Gibbs, 1993). The wetlands support variety of life forms in which they support various species of molluscan forms. The molluscan forms play a significant role in the aquatic ecosystem as indicator species, reflecting the pollution levels in that ecosystem, thereby intimating the diverse distribution of other macro forms. Totally out of the 415 families in the phylum Mollusca, only 257 families are represented in the Indian subcontinent and of these, freshwater mollusca are represented by 210 species under 52 genera and 21 families (SubbaRao, 1993, Annandale, 1907, Oliver, 1960). Freshwater molluscs are mainly divided into two groups viz., lotic and lentic water. Some of the species especially *Pila globosa* and *Bellamya bengalensis* are also found in the agricultural wetlands i.e. paddy crop fields. Many of the freshwater species of molluscs are very vital sources of food both for aquatic animals as well as for human beings. Species like *Bellamya bengalensis*, *Pila globosa*, *Brotia costula*, *Angulya graoxytropas*, and *Lamellidans marginalis* and *Lamellidan scorrialis* are found to produce pearls. The great majority of molluscan species and the largest

number of individuals occur under alkaline conditions (Smith, 2001). The distribution and availability of molluscan forms are based on the amount of dissolved salts especially calcium carbonate in water, which is



↔ Arrow indicates the location of the lake Koothaippar at Tiruchirappalli.

essential material for shell formation, besides many other water chemistry factors could influence the fresh water molluscan forms (Pennak and Robery, 2004). However, studies on the freshwater molluscan forms in Tamil Nadu is scanty and to some extent no research work has been undertaken in relation to molluscan fauna of Koothaippar Lake, Tiruchirappalli

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District, Tamil Nadu. Based on the above information the present study was planned to carry out to study the distribution and factors influencing the abundance of fresh water molluscan forms in the Kothaippar lake with the following objectives including

- to assess the distribution of molluscan forms in the Koothaippar lake, and
- to evaluate the influence of molluscan forms in relation to physic-chemical parameters of water.

MATERIAL AND METHODS

Study Area

Koothaippar Lake is situated in Tiruchirapalli District, Tamilnadu, South India, about 15 km south of Tiruchirapalli (10°47'50"N; 78°46'16"E) is one of the important seasonal wetland which supplies water for irrigation (Fig.1.). There are many small villages, and towns on all sides of the lake. There are totally eight outlets in both the regions of the lake through which more than twenty five thousand acres of fields are getting irrigation, besides lending it for aquaculture practices. The crops cultivated using the water from the lake are paddy, sugarcane, groundnut and betel. The lake is under the control of PWD and the Forest Department has no direct role to play with reference to its fauna and flora. This lake is an attraction for a variety of birds, Molluscs, insects and plants. Koothaippar lake and its watershed are situated in

the rain shadow region of Southwest Monsoon (June – August) and receive Northeast Monsoon (September – December) only. The climate is subtropical. Hot weather prevails in the months of March to May, and the Maximum temperature varies from 38° C to 40° C. The study area was divided into two different regions viz., region I and II. The region of the lake was categorised based on the water depth and other ecological factors.

Study period

Data were collected from October 2013 to June 2014, which comprises three different seasons viz., Monsoon, 2013 (October – December), Post – Monsoon, 2014 (January - March) and Summer, 2014 (April – June).

Collection of Molluscan species

Specimens were collected by hand picking method from dry parts of the regions and where water was shallow scoop net was used. All samples were transported to laboratory in large plastic bottles. The freshwater molluscs were washed, counted, photographed and identified using the key of Subba Rao (1993). 1³(1 X1 X 1) foot, quadrats were laid at the foraging ground and molluscan samples were collected, separated and the dead and live were brought to the laboratory for further identification. Quadrats are small plots of uniform shape and size, placed randomly in selected foraging sites for sampling

Table.1. Checklist of Molluscan forms of Koothaippar lake recorded during the study period.

S. No	Scientific Name	Family	Order	Status
1	<i>Pila globosa</i>	Ampullariidae	Mesogastropoda	+++
2	<i>Pila virens</i>	Ampullariidae	Mesogastropoda	++
3	<i>Bellamya bengalensis</i>	Viviparoidae	Mesogastropoda	+++
4	<i>Lamellidens marginalis</i>	Unionidae	Trigoinoida	+++
5	<i>Parreysia favidens</i>	Unionidae	Trigoinoida	+

(+++ abundant ; ++less abundant; + rare)

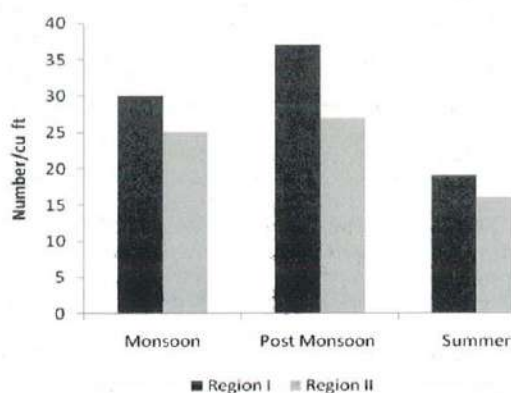


Fig.2. Distribution of Molluscan forms in Region I and Region II of Koothaippar lake during different seasons of the study period.

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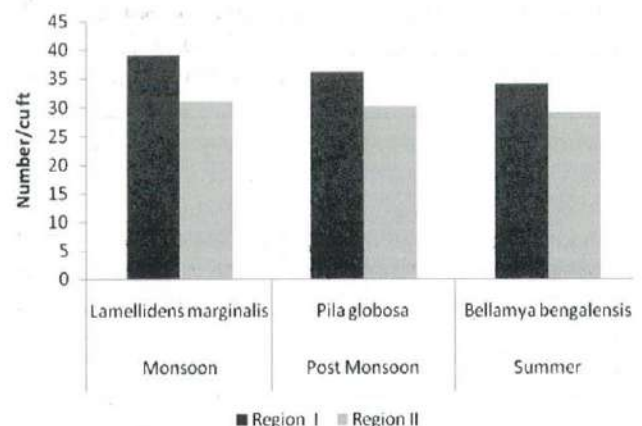


Fig.3. Dominant species recorded in Region I and Region II during different seasons of the study period.

purposes. The number of quadrats laid, was based on the size of the foraging ground.

Water and ambient Temperature

Water and ambient Temperature were recorded by using a digital and held Thermometer.

Water Quality Analysis

The water samples were collected from two regions of the lake at three different sites and from each site three samples were collected for the analysis. The collected water samples were sent to the PWD, Water Testing Laboratory, Tiruchirappalli, for obtaining the results of the water chemistry parameters such as pH, electrical conductivity, carbonate, bicarbonate, chloride (mg/l), calcium (mg/l), magnesium (mg/l), sodium (mg/l) potassium (mg/l), Rsc (mg/l) and sodium absorption ratio (SAR).

RESULTS

Molluscan Studies

Five different molluscan species, representing two order and three families were recorded in lake during the study period (Table.1). Highest distribution of molluscan forms was recorded in the region I when compared to the region II, across the seasons of the study periods (Fig. 2). Among the five identified species of molluscan forms in the lake *Pila globosa*, *Bellamya bengalensis* and *Lamellidens marginalis* were the most dominant species (Fig.3).

Table.2. Seasonal variations in the physico – chemical parameters of water in Region I of Koothaippar lake recorded during the study period.

Water parameters	Seasons		
	Monsoon 2013	Post monsoon	Summer 2014
Water temperature (°C)	29.31±2.05	33.5±0.95	36.14±1.17
pH	7.78±0.45	8.13±0.22	8.02±0.37
Ec (mho.sec)	0.68±0.104	0.80±0.05	1.26±0.44
Carbonate	0.58±0.38	0.4±0.11	0.51±0.20
Bicarbonate	2.8±2.10	3.8±0.58	4.32±1.55
Chloride (mg/l)	2.91±0.60	4.1±0.54	7.78±3.33
Calcium (mg/l)	1.73±0.58	1.75±0.23	2.08±0.81
Magnesium (mg/l)	2.5±0.69	2.46±0.55	3.85±2.04
Sodium (mg/l)	2.26±0.71	3.89±0.84	6.17±2.02
Potassium (mg/l)	0.37±0.20	0.30±0.04	0.44±0.09
Rsc (mg/l)	0.21±0.23	0.71±0.52	0.93±0.65
Sodium absorption ratio	1.59±0.43	2.67±0.83	3.62±2.51

Water is the most important factor which seems to determine the habitat preference and activities of molluscs based on the amount of dissolved salts especially calcium carbonate in water, which is the essential material for shell formation. Minimum water temperature was recorded in monsoon (29.31±2.05 °C), while maximum in summer season (36.14±1.17 °C). Low pH was recorded during Monsoon (7.78±0.45), while maximum during Post Monsoon (8.13±0.22). Electrical conductivity was recorded minimum in monsoon (0.68±0.104 mho/sec), while maximum in summer (1.26±0.44 mho/sec.). Whereas the other parameters like carbonate was recorded minimum in post monsoon (0.4±0.11mg/l), while maximum in monsoon (0.58±0.38 mg/l), minimum bicarbonate during monsoon season (2.8±2.10 mg/l), and maximum in summer (4.32±1.55 mg/l), lowest chloride recorded in monsoon (2.91±0.60 mg/l) and highest values of chloride recorded in (7.78±3.33 mg/l) summer, Calcium was recorded in low quantity during monsoon season (1.73±0.58 mg/l), while the maximum recorded in summer (2.08±0.81 (mg/l)), low amount of Magnesium was recorded in monsoon (2.5±0.69 mg/l) and high was recorded in summer (3.85±2.04 mg/l), minimum Sodium level was recorded in (2.26±0.71 mg/l) monsoon, while maximum was recorded in summer (6.17±2.02 (mg/l)), Potassium was recorded minimum in post monsoon (0.30±0.04 mg/l) and high in summer season (0.44±0.09 mg/l),

Table.3. Seasonal variations in the physico – chemical parameters of water in Region II of Koothaippar lake recorded during the study period.

Water parameters	Seasons		
	Monsoon 2013	Post monsoon	Summer 2014
Water temperature (°C)	30±2.12	31±2.75	35.71±2.43
pH	7.98±0.32	8±0.14	8.01±0.35
Ec (mho.sec)	0.76±0.16	0.81±0.06	1.12±0.18
Carbonate	0.06±0.32	0.4±0.14	0.47±0.25
Bicarbonate	3.87±1.46	3.4±1.07	3.72±0.79
Chloride (mg/l)	2.73±0.62	4.36±0.17	7.01±1.73
Calcium (mg/l)	0.06±0.42	1.8±0.43	1.7±0.43
Magnesium (mg/l)	1.98±0.70	2±0.16	3.32±1
Sodium (mg/l)	3.1±1.08	3.89±1.07	6.02±1.15
Potassium (mg/l)	0.39±0.15	0.36±0.07	0.4±0.10
Rsc (mg/l)	0.7±0.4	0.9±0.8	1.75±0.7
Sodium absorption ratio	1.59±0.43	2.67±0.83	3.62±2.51

minimum residue was recorded in monsoon (0.21 ± 0.23 mg/l) while maximum in summer (0.93 ± 0.65 mg/l). The minimum SAR was recorded in monsoon (1.59 ± 0.43) and maximum recorded in summer (3.62 ± 2.51).

Physico-chemical parameters of water in Region II:

Water temperature was recorded lowest in monsoon (30 ± 2.12 °C), while maximum in summer season (35.71 ± 2.43 °C), low pH was recorded during monsoon (7.98 ± 0.32), while maximum during summer (8.01 ± 0.35), electrical conductivity was recorded minimum in monsoon (0.76 ± 0.16 mho/sec), while maximum in summer (1.12 ± 0.18 mho/sec.). Whereas, the other parameters like carbonate was recorded minimum in post monsoon (0.4 ± 0.14 mg/l), while maximum in summer (0.47 ± 0.25 mg/l), minimum bicarbonate during Postmonsoon season (3.4 ± 1.07 mg/l) and high amount in monsoon (3.87 ± 1.46 mg/l). Lowest chloride recorded in monsoon (2.73 ± 0.62 mg/l) and highest values of chloride recorded in (7.01 ± 1.73 mg/l) summer. Calcium was recorded in low quantity during monsoon (0.06 ± 0.42 mg/l), while maximum recorded in Post-monsoon (1.8 ± 0.43 mg/l), low amount of Magnesium was recorded in monsoon (1.98 ± 0.70 mg/l) and high was recorded in summer (3.32 ± 1 mg/l). Minimum Sodium level was recorded in (3.1 ± 1.08 mg/l) monsoon, while maximum was recorded in summer (6.02 ± 1.15 mg/l), Potassium was recorded minimum in post monsoon (0.30 ± 0.04 mg/l) and high in summer season (0.4 ± 0.10 mg/l), minimum residue was recorded in monsoon (0.21 ± 0.23 mg/l) while maximum in summer (1.75 ± 0.7 mg/l), minimum SAR was recorded in monsoon (2.12 ± 0.70) and maximum recorded in summer (3.85 ± 0.52).

DISCUSSION

The distribution and availability of certain species of Molluscan forms are entirely linked to the availability of food sources, primary productivity, characteristics of the water which supports the life forms over there and the physical parameters like water and atmospheric temperature. (Maheswari and Thiyagesan, 2014). These fluctuations and variations in the physico-chemical parameters of lake water act as important factors in deciding the availability, distribution and abundance of a particular Molluscan species in the study area, which in turn influences the preference of this habitat by water birds in general and in particular the mollusc eating birds such as Asian Openbill Stork (Maheswari, 2005).

Study reveals that there is a significant influence of lake water characteristics on the distribution and abundance of fresh water molluscan forms over the two regions of Koothaipparlake, besides the influence of both water and atmospheric temperature. Totally, five different identified molluscan forms, belonging to three families and two orders and two unidentified molluscan forms were recorded during the study period.

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